



INTERNATIONAL BACKYARDING FACT BOOK

YOUR YARD ISN'T JUST PRETTY; IT'S ALSO PURPOSEFUL

Science proves that spending time living near, caring for, and enjoying the green space around us has undeniable benefits for people and the planet.

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TurfMutt.com

Work in Your Yard, and It Will Work for You (and the Planet)

For 15 years the [TurfMutt Foundation](#) has advocated for the care and use of yards, parks, and other green spaces – what the Foundation has dubbed “backyarding.” The outdoor areas around us not only make everyday activities like working, dining, and working out more enjoyable; they are also good for our health and well-being – and that of the planet. The TurfMutt Foundation is pleased to present the International Backyarding Fact Book, which includes a host of scientific evidence to support the benefits of backyarding.



Your yard is not just for aesthetics; it is also purposeful. It offers a place for children and pets to play, acts as an outdoor living room, and provides habitat and food for wildlife. What you choose to plant in your yard can also affect climate change on a microlevel. Plants, shrubs, trees, and grass are “environmental superheroes” that capture and filter rainwater, produce oxygen, and absorb carbon, just to name a few benefits.



Putting the right plant in the right place is the key to successful backyarding. This “Golden Rule” of backyarding means selecting plants that support your family’s lifestyle and ones that will thrive in your climate zone with minimal input from you. It is also about choosing a variety of greenery that will bloom year-round to support local pollinators and serve the connected ecosystem.

For more information, visit [TurfMutt.com](#)

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TABLE OF CONTENTS

Invest in Your Yard for Health & Happiness.....	5
The Family Yard & Physical Health.....	6-7
Living Landscapes & Mental Well-being.....	8-9
Green Space & Learning.....	10-11
Green Space & Children’s Health.....	12-13
Children’s Happiness & Green Space.....	14-15
The Outdoor Living Room & Play Space.....	16-17
Green Space & Equity.....	18
The Pandemic & Backyarding.....	19
Dogs & Better Health.....	20
Financial Benefits of the Family Yard.....	21
Biodiversity & Wildlife.....	22
Heat Islands.....	23
Air Quality.....	24
Oxygen Production.....	24
Carbon Sequestration.....	25
Noise Pollution.....	25
Rainwater Harvesting & Storm Water Runoff.....	26
Soil Erosion.....	27
Fire Break.....	27
Plastic Grass, Artificial or Synthetic Turf.....	28
Sources.....	23-41

Note: “” below indicates new information that has been added since the last update to this document.*



Invest in Your Yard for Health & Happiness

Having the right plants, shrubs, trees, and grass in your yard offers numerous benefits.

- **Remember, nature starts at your backdoor.** Many Canadians (24%) spent more time in managed landscapes, including yards, in 2022 compared to 2021, according to a new survey conducted by The Harris Poll for the TurfMutt Foundation.¹ Nearly a quarter of Americans who have a yard (24%) are spending more time in their yards now than before the COVID-19 pandemic. And they are really enjoying the extra time outside. Over 3 in 5 Americans who have a yard (63%) say they have enjoyed doing more activities in their yard since the pandemic began.²
- **Backyard more.** According to a Harris Poll conducted for the TurfMutt Foundation, roughly nine in 10 Canadians (91%) currently have a yard, and while many spend time doing typical yard-related activities in it, a good proportion also use their yard for leisure activities and other purposes like spending time with friends and family, cooking, lounging, and playing with pets.³
- **Choose the appropriate living landscapes.** Choosing the right plants and putting them in the right place will make your landscape easier to maintain and more beneficial to local pollinators. Consult plant hardiness zone maps to determine the best types of turf, trees, shrubs, and plants for your location.
- **Select the right grass.** Nearly all Americans have a yard, and 89% of those who do correctly believe having grass in their yard is good for the environment.⁴ More than 4 in 5 Canadians (85%) believe having a yard is an important part of living an environmentally friendly lifestyle. Selecting the right grass for your climate and lifestyle is important.
- **Mix native plants with adaptive plants and grasses.** In human-made cities and suburbs, we must incorporate plants in areas with a lot of concrete, asphalt, people, and traffic. You need both native plants and drought-resistant adaptive species that can thrive in these conditions.
- **Incorporate pollinator plants.** Remember to keep bees, butterflies, bats, and birds in mind when planting. Your yard and our community green spaces are part of the connected ecosystem that they rely on for food and shelter.
- **Plant to slow and capture water.** Water sheets off hard surfaces, asphalt, and other hardscapes in cities and suburbs. Grass and plants slow down and capture this water, recharging underground aquifers.
- **Water wisely.** Only water your yard when it is necessary. Install watering solutions – like smart controllers on irrigation systems – to help you use less water while maintaining a living landscape.
- **Don't forget, too much water is bad for grass.** Over-watered grass gets lazy, growing roots in a horizontal pattern. With less water, grass sends its roots deeper – vertically – seeking water. By working harder, grass does a better job of sequestering carbon and releasing oxygen.



THE FAMILY YARD & PHYSICAL HEALTH

Living landscapes are a key part of a healthy lifestyle.

- *Researchers found that people living near green spaces, including parks or forests, age slower than those in dense urban environments.⁵
- *Recent research suggests that spending just a few minutes walking outside may enhance mood, memory, and the ability to absorb new information.⁶
- Low-income levels and a lack of green spaces are among the factors that can harm brain health, according to a new study by University of Miami Miller School of Medicine researchers.⁷
- Greener neighborhoods can stop us from aging on a genetic level, according to new research.⁸
- Spending time in green space helps improve sleep quality.⁹
- Lack of green space may be linked to high blood pressure in people with type 1 diabetes.¹⁰
- Living near green spaces could add 2.5 years to your life, according to new research published in the peer-reviewed journal *Science Advances*.¹¹
- A recent UK study shows that two hours a week of nature exposure is all you need to get to improve your health and well-being.¹²
- A study published in *Nature* shows there are neurological benefits to exercising in green space, including better working memory and concentration.¹³
- Adults living closer to outdoor spaces and water may decrease their risk of developing cognitive impairment and dementia, according to a recent study.¹⁴
- As part of a new holistic approach to patient well-being, some people in the U.K. will be advised by their doctor to connect to nature as part of the healing process.¹⁵
- Planting more trees in cities could cut deaths from summer heat, according to a European study that shows increasing urban tree coverage to 30% can lower temperatures by as much as 32 degrees.¹⁶
- Wooded areas expose people to phytoncides, or essential oils, that trees emit to protect themselves from germs and insects. Research finds inhaling phytoncides improves immune system function.¹⁷
- Women who live in residential areas with elevated levels of green space had better brain health compared to women who lived in areas with less green space, according to a recent study.¹⁸
- When you go outside, bacteria from soil, plants, and the air transfer to your body, which has the potential to benefit overall health.¹⁹
- Exposure to nature and outdoor exercise during childhood is a strong predictor of nature exposure and connectedness later in life.²⁰
- Spending at least 120 minutes a week in nature is associated with good health and well-being according to UK researchers.²¹
- Living near green space makes it easier for people to quit smoking, according to researchers.²²

- Using data from more than 24,000 English adults, researchers found that exposure to nature, even strolling through a city park, makes people engage in more eco-friendly behaviors like recycling, buying local and seasonal produce, and engaging in environmental volunteering.²³
- The first single study to investigate the contribution of both nature contact and connection to human health, well-being, and pro-environmental behaviors found that physically and psychologically reconnecting with nature can be beneficial for human health and well-being, while at the same time encouraging individuals to act in ways that protect the health of the planet.²⁴
- In Philadelphia, scientists estimate that 403 premature deaths could be prevented annually if the city meets its goal of increasing tree canopy cover to 30%.²⁵
- A review of research published between 1976 and 2017 found consistent associations between greater urban green space exposure and decreased mortality, heart rate, and violence, as well as between greater urban green space exposure and increased attention, mood, and physical activity.²⁶
- More trees reduce premature deaths in cities, according to research that pulled data from nine studies involving more than 8 million people in seven countries.²⁷ Specifically, for every 10% increase in vegetation that is within 1,600 feet of your home, your probability of death drops by 4%.
- Medicare costs tend to be lower in counties with more trees and shrubs, a recent study finds.²⁸
- People who have access to green spaces live longer, according to Harvard University researchers.²⁹
- Natural vegetation (“greenness”) may benefit maternal health and fetal growth by providing opportunities for physical activity and psychological restoration.³⁰
- Short-term memory is improved 20% by walking in nature or just looking at a natural scene.³¹
- Physicians are now prescribing time outdoors for some patients, according to recent reports.³² Park Rx America is a non-profit with a mission to encourage physicians to prescribe doses of nature.³³
- According to Canadian researchers, living in a greener neighborhood could lower the risk of early death.³⁴
- People who live within a half mile of green space were found to have a lower incidence of 15 diseases by Dutch researchers — including heart disease, diabetes, asthma, migraines, depression and anxiety.
- A 2015 study found that people living on streets with more trees had better heart and metabolic health.³⁵
- Australian men and women in their 60s who gardened regularly had a 36% lower risk of dementia than those who did not garden.³⁶
- People who gardened for at least 30 minutes a week had lower body mass indexes (BMIs) – a measure of body fat – as well as higher levels of self-esteem and better moods overall. They also reported lower levels of tension and stress.³⁷
- Studies show that tasks conducted under the calming influence of nature are performed better and with greater accuracy, yielding a higher quality result. Spending time in gardens, for instance, can improve memory performance and attention span by 20%.³⁸



LIVING LANDSCAPES & MENTAL WELL-BEING

Spending time in green space makes us happier, healthier people.

- *City dwellers who have more exposure to urban green spaces require fewer mental health services, a new study suggests.³⁹
- *A study in China demonstrated that the perceived condition of one's neighborhood – which was assessed by satisfaction with greening, safety, parking, lighting, among other factors – is associated with depression. Physical activity helped mediate the relationship.⁴⁰
- *According to a systematic review of research, green spaces decrease the risk of psychiatric disorders, including depression, anxiety, dementia, schizophrenia, and ADHD.⁴¹
- A recent 10-year longitudinal dynamic panel study published in the journal Planetary Health revealed that greater exposure to green and blue spaces was associated with reduced common mental disorders.⁴²
- Visits to parks, community gardens, and other urban green spaces may lower city dwellers' use of drugs for anxiety, insomnia, depression, high blood pressure, and asthma.⁴³
- A 2019 review of research from the University of Washington revealed that contact with nature is associated with increased well-being and happiness.⁴⁴
- A University of Michigan study found that walking in a natural space for at least 10 minutes a day, three days a week, reduced levels of cortisol, a hormone related to stress.⁴⁵
- Finnish researchers found that people diagnosed with depression who were prescribed 12 weekly "nature-based sessions" in addition to standard care experienced less psychological distress than a control group that received only standard care.⁴⁶
- People who visited urban parks for just 21 minutes showed a reduction in cortisol (stress hormone) levels and reported increased overall well-being.⁴⁷
- The yard has become a place to de-stress, with more than two thirds of Americans who have a yard (69%) saying doing yard work, such as mowing, trimming or planting, is one of the ways they like to de-stress these days. This is especially true among parents of kids under 18 as they are more likely than their counterparts without kids under 18 to cite this (76% vs. 65%).⁴⁸
- A study involving 160 parents who lived with their children in a homeless shelter in the Netherlands found that those who engaged in nature-based activities with their children reported higher parental satisfaction and lower frustration than those who did indoor activities with their kids.⁴⁹

- Responses from nearly 800 adults from 42 different countries showed that frequency of contact with nature in childhood predicts certain aspects of adult personality, including higher levels of creative imagination and intellectual curiosity and lower levels of anxiety and depression.⁵⁰
- Scientists evaluating the mental health of a cross-section of the U.S. found that increased time outdoors was significantly associated with decreased odds of meeting criteria for depression.⁵¹
- Childhood exposure to green space is associated with lower risk for schizophrenia in adulthood, according to Danish researchers.⁵²
- A UK study found that young city residents gain mental health benefits – including a stronger sense of self and feelings of escape, connection, and care – through everyday experiences with urban nature.⁵³
- College-age people experience mental health benefits after spending as little as 10-20 minutes in nature.⁵⁴
- Meta-analysis of 143 studies showed that greenspace exposure reduces the risk of a number of health-related concerns and that the health benefits of greenspace exposure may be greater for people living in deprived communities.⁵⁵
- People living in neighborhoods with more birds, shrubs, and trees are less likely to suffer from depression, anxiety, and stress.⁵⁶
- Family leisure time in a community park provides space and time for strengthening family bonds and for enhancing self-satisfaction and happiness.⁵⁷
- A systematic research review concluded that “the balance of evidence indicates conclusively that knowing and experiencing nature makes us generally happier, healthier people.”⁵⁸
- People who had close contact with the environment during childhood have better mental health and vitality as adults.⁵⁹
- An increase in the “greenness” of an environment corresponds to lower levels of psychological distress in teenagers, according to UCLA researchers.⁶⁰
- Urban nature experiences – like spending just 20 minutes in a park – has been shown to reduce stress.⁶¹
- Spending just five minutes in a natural setting can help improve your mood.⁶²
- Homes in the U.S. are getting bigger, while yards are getting smaller, a detriment to our overall mental health.⁶³
- Greening of vacant urban areas in Philadelphia reduced feelings of depression by 41.5% and reduced poor mental health by 62.8% for those living near the vacant lots.⁶⁴
- Walking in nature is beneficial for people with major depressive disorder.⁶⁵
- German scientists found urban dwellers living near the forest may be better able to cope with stress.⁶⁶
- Researchers in England found that people moving to greener areas experienced an immediate improvement in mental health that was sustained for at least three years after they moved. The study also showed that people relocating to a more built-up area suffered a drop in mental health.⁶⁷
- *Mycobacterium vaccae* in soil mirrors the effect on neurons that drugs like Prozac provide. The bacterium stimulates serotonin production, which makes you relaxed and happier.⁶⁸
- Walking or running in green spaces, rather than synthetic environments, led to decreased anger, fatigue and feelings of depression, while increasing attention levels.⁶⁹



GREEN SPACE & LEARNING

Research shows exposure to nature can improve children's ability to learn.

- *A recent study from researchers at the University of British Columbia (UBC) followed nearly 30,000 children in Vancouver to determine that the closer the children lived to green spaces, the better chance they had of reaching milestones in emotional maturity, language skills, and general knowledge.⁷⁰
- After three public schools in low-income neighborhoods in Chicago developed a green schoolyard on their grounds, behavioral mapping showed a significant decrease in sedentary activity and significant increases in positive social interactions.⁷¹
- Children attending nature preschools showed better learning behaviors as well as more enhanced peer play behaviors than children attending traditional preschools, according to a study conducted in the U.S.⁷²
- A systematic review of literature indicates a total of 98 positive child development outcomes of nature play. These include connection to nature, stewardship of nature, self-confidence and self-regulation.⁷³
- Nature-based environmental education programs may improve health-related quality of life and STEM capacity in low-income Black and Hispanic youth, according to a recent study.⁷⁴
- A love of nature – including the desire to spend time in nature and visit green spaces – is passed down to children from their parents genetically, according to a new study out of Singapore.⁷⁵
- Children prefer school grounds with biodiverse vegetation over paved ones.⁷⁶
- Observations and surveys completed before and after the greening of schoolyards at two Chicago, schools indicate that green schoolyards can provide a safe space for children and adults to engage in social, outdoor activities and thus benefit from the increased access to nature.⁷⁷
- A review of research paints a convincing picture of a cause-and-effect relationship between nature and children's learning and development, including children with ADHD.⁷⁸
- Children in green urban spaces are likely to perform better academically.⁷⁹
- A recent review of the literature examined the impact of schoolyard greening on children's physical activity and socioemotional health. With few exceptions, most studies demonstrated beneficial changes on both outcomes due to greening.⁸⁰
- Trees on or near school grounds are positively linked to academic achievement in sixth-grade students.⁸¹
- Learning outside can help children develop important skills for future success in the workplace, including social and critical thinking skills.⁸²

- Children who participated in an urban farming youth internship program experienced a number of long-term benefits, including higher college enrollment, connectedness to the environment and the community, healthy eating habits, and higher levels of self-confidence.⁸³
- Children in Bangladesh earned significantly higher science scores after being taught outdoors versus their indoor classrooms.⁸⁴
- A review of research published between 1990 and 2010 indicates garden-based learning positively academic outcomes, including improvements in science, math and language arts.⁸⁵
- Children who attend schools in greener areas are at lower risk of having attention-deficit/hyperactivity disorder symptoms.⁸⁶
- “Greening” under-privileged urban neighborhoods in Chicago with tree canopy and grass/shrub cover has the potential to mitigate academic underachievement.⁸⁷ Chicago girls living in public housing performed better on tests measuring self-discipline if they had greener views from their apartments.⁸⁸
- The National Institutes of Health is tracking the changes in children’s brains due to screen time. Early results show kids who have more than seven hours of screen time per day score lower on language and cognitive tests.⁸⁹
- Excessive screen time has been linked to learning delays in Canadian preschoolers.⁹⁰
- Primary schoolchildren who have been raised in homes surrounded by more green space tend to have larger volumes of white and grey matter in areas of the brain associated with improved cognitive function.⁹¹
- Teaching outside can help students be more attentive to learning.⁹²
- Children gain attention and working memory benefits when they are exposed to greenery.⁹³
- Researchers found that Barcelona school children who had more exposure to the outdoors performed better on cognitive testing.⁹⁴



GREEN SPACE & CHILDREN'S HEALTH

Children benefit from exposure to living landscapes in several ways.

- *Children aged four to six living near parks, gardens, or fields have increased bone density, according to a study conducted in Belgium.⁹⁵
- *A study led by University of Minnesota's Masonic Cancer Center and the University of Michigan Medical School suggests that residential greenery can mitigate cancer risks in children.⁹⁶
- A systematic review of six studies shows that even passive nature engagement (greenness around schools and in urban parks) has the potential to positively impact children's attention capacity, mood and memory.⁹⁷
- Mental health and youth development programs held at parks in Florida for at-risk youth were shown to have the potential to prevent violence among the kids.⁹⁸
- A study of U.S. mothers and daughters, ages 10-12, finds spending time together outdoors improves connectedness and communication.⁹⁹
- A visitor's garden in a prison setting promotes positive parent-child interactions, according to a survey and interviews conducted at a women's prison in the U.S.¹⁰⁰
- Surveys completed by 587 youth (age 11-14) in rural South Carolina showed that exposure and connection to nature were positively associated with growth in the five Cs of positive youth development (competence, connection, confidence, character, and caring).¹⁰¹
- Community tree canopy coverage significantly decreased the odds of conduct problems in children with autism.¹⁰²
- Children feel better physically and mentally after spending some time outside in nature.¹⁰³
- A systematic review and meta-analysis of studies from nine countries found that greater access to green space predicted higher levels of physical activity, healthier weight, and lower levels of screen time in children and youth.¹⁰⁴
- A review of research discovered that children who have indirect or direct access to nature while visiting pediatric healthcare centers experience reduced pain and stress, enhanced social functioning, and an increased sense of control.¹⁰⁵
- Finnish children attending a childcare center with natural forest floor in their play yard had more diverse skin and gut bacteria and signs of better immune system functioning than those in centers without the biodiverse elements.¹⁰⁶
- A literature review indicates greater access to green space predicts activity level and weight-related health outcomes, providing some support for a positive association between greenness and higher levels of physical activity, healthier weight, and less screen time for children and youth.¹⁰⁷

- A literature review on the potential impact of childhood exposure to green space identified four areas of positive impact: perinatal health, physical exercise, respiratory health, and neurodevelopmental health.¹⁰⁸
- More greenness at school is associated with healthier weight in children and adolescents, according to Chinese researchers.¹⁰⁹
- Iranian children hospitalized in rooms with a dish garden showed significantly greater gains in physical and neuropsychological health than children without the gardens in their rooms.¹¹⁰
- Street greenery around schools in China was significantly associated with children's active transport to school and healthier body weight for the children.¹¹¹
- A review of research on pediatric healthcare building design found that healing gardens and other nature-related elements like natural lighting are associated with reduced stress and pain and an overall improved sense of well-being in children.¹¹²
- Nearby urban green space is positively linked to the development of pro-social behaviors in children and adolescents, according to a systematic search of 15 studies.¹¹³
- Children eat more fruits and vegetables if they are homegrown, according to new Saint Louis University research.¹¹⁴
- A review of literature concluded that greenness may help protect children from asthma by moderating factors that contribute to the respiratory disease.¹¹⁵
- In China, greater greenness near schools had a beneficial effect on blood pressure, especially in overweight or obese children.¹¹⁶
- EEG readings showed that viewing living plants prompted improvements in attention, concentration, and feelings of comfort in children.¹¹⁷
- Access to neighborhood parks and green space is linked to higher activity levels in children in Norway.¹¹⁸
- Children living in the countryside spend more time outside and have better motor skills than children living in metropolitan areas.¹¹⁹
- Children with greater exposure to nature demonstrate higher levels of self-regulation.¹²⁰
- Scientists have discovered a link between teen's frequent use of digital media and symptoms of ADHD.¹²¹ Time in nature is one effective antidote.
- Natural environments have been shown to improve parent-child communication, resulting in more responsive and connected communication compared to an indoor setting.¹²²
- Children who are raised on farms in a "dirtier" environment than an urban setting not only have a stronger immune system but are also better able to manage social stress.¹²³
- Exposure to natural settings may be widely effective in reducing ADHD symptoms.¹²⁴
- A study of over 1,000 mother-child pairs indicates that residential exposure to green space is positively associated with the neurodevelopment of young children.¹²⁵



CHILDREN'S HAPPINESS & GREEN SPACE

Being outside sparks joy in kids and improves their mental health.

- *Children living in surroundings with more green space tend to have lower anxiety, according to a recent study.¹²⁶
- A systematic review of 14 studies from multiple countries indicates that young children living near nature and public open space tend to have better mental health than young children without nearby green space.¹²⁷
- A study involving 774 Scottish children (age 10-11) found that immediate neighborhood green space and private gardens are positively related to children's well-being. The level of impact tends to be greater for low- versus high-income children.¹²⁸
- Findings from 14 studies of youth ages 10-19 indicate positive associations between residential greenspace exposure and the children's mental well-being, including fewer depressive symptoms, improved mood and decreased stress.¹²⁹
- Window views to green landscapes help high schoolers recover from attention fatigue and stress.¹³⁰
- Children's stress levels fall within minutes of seeing green spaces.¹³¹
- The first study to link connectedness to nature to happiness and pro-ecological behaviors found that children who grow up feeling connected to nature are happier and more likely to become eco-friendly compared to those who suffer from a nature deficit disorder.¹³²
- Empirical research over the last 40 years identifies positive associations between nature activities and well-being in children and youth, including self-esteem, confidence, positive and negative affect, stress reduction and resilience.¹³³
- A systematic, scoping review of research indicates that elevated levels of screen time in children are associated with depression, anxiety and stress while green time tends to be associated with positive mental health, better cognitive functioning, and improved academic achievement.¹³⁴
- Primary students in Germany with more natural window views in their classrooms reported less perceived stress and more attention in class than students with fewer natural window views.¹³⁵
- A school-based nature education program had a significant and positive effect on the health-related quality of life markers of low-income youth.¹³⁶
- Horticulture-related activities have been shown to reduce stress levels of elementary school children with emotional and behavioral concerns, according to researchers in Korea.¹³⁷
- Children experience psychological, social, and pro-environmental benefits from spending time in nature as opposed to those who spent time in a museum.¹³⁸
- Increased exposure to nature reduces elementary students' anxiety.¹³⁹
- An Australian study revealed that students spent more time on-task in outdoor classrooms versus indoor ones.¹⁴⁰

- Scientists in Mexico discovered children’s connectedness to nature resulted in feeling emotionally connected with all elements of a natural environment and feeling happier as a result.¹⁴¹
- Urban minority youth who participated in an environmental education and nature contact program reported an overall improvement in health-related quality of life.¹⁴²
- Urban park soundscapes can help children recover from stress, according to Chinese researchers.¹⁴³
- Spending time in public open spaces increases children’s chances of experiencing “happy moments” compared to spending time in commercial areas like shopping malls, according to a study of over 10,000 children.¹⁴⁴
- Children with more access to natural areas as well as more perceived nature in the home and school environment had lower stress levels, suggesting that nearby nature bolsters children’s resilience in dealing with stress.¹⁴⁵
- Results of a study of rural children in grades 3-5 showed the impact of life stress was lower among children with elevated levels of nearby nature than among those with little nearby nature.¹⁴⁶
- A systematic review of current literature concluded that benefits associated with children’s access to green environments include improved confidence, social interactions, cognitive development, academic achievement, and emotional well-being.¹⁴⁷
- Children in the UK who spent just one hour per week learning outdoors showed significant, immediate improvements in mood and longer-term improvements in well-being.¹⁴⁸
- Any activity that gets children thinking and acting spontaneously outdoors without needing adult control can help them develop complex thinking abilities, social skills, and creativity.¹⁴⁹
- The “greenness” of residential neighborhoods in South Korea is associated with children demonstrating lower levels of aggressive behaviors and fewer attention problems.¹⁵⁰



THE OUTDOOR LIVING ROOM & PLAY SPACE

Green space is a safe place for children and pets to play and learn.

- A sobering UK study found that children now spend an average of 2.5 hours per day using technology, compared to 1.6 hours per day playing outside. They also found a disparity in outdoor play time by family income, with children from wealthy families averaging 2.5 hours per day outside compared to 1.2 hours on average for children from low-income households.¹⁵¹
- Outdoor play in shorter, more frequent increments can boost physical activity in early learning settings, according to Canadian researchers.¹⁵²
- A review of 16 studies suggests that “nature play” with plants, sand, rocks, etc., may positively impact children’s physical health and cognitive development.¹⁵³
- A Canadian research study discovered that exposures to electronic screen technology may be related to declines in the importance of nature in the lives of young people.”¹⁵⁴
- A study involving 80 children from eight different early childhood centers found a significant positive correlation between children’s play, well-being and involvement. Scientists discovered that children engaged in more functional play outdoors, and more symbolic play indoors, while non-play activities were slightly higher in the outdoor environment.¹⁵⁵
- Kindergarteners – especially girls – who spent more time in green schoolyards and in the outdoors in general showed higher gains in self-regulation than those who did not have as much exposure.¹⁵⁶
- Greening of daycare outdoor spaces by adding sod, peat blocks, and planters for vegetables and flowers, provide rich opportunities for creative play and learning, according to new research.¹⁵⁷
- An analysis of 16 quantitative studies focusing on play in natural environments found that unstructured nature play fostered increased physical activity and was consistently linked to positive impacts in imagination, creativity and dramatic play.¹⁵⁸
- Canadian researchers discovered that adolescents consider being outdoors less important than access to nature, indicating that screen time is a barrier to connecting to nature.¹⁵⁹
- Urban youth in San Francisco revealed three themes relating to what they want in outdoor recreation: connecting with family and friends, escape and unplug, and discover the adventure.¹⁶⁰
- Trees, lawns, and exercise trails in urban green space can promote adolescents’ physical activity and health by increasing frequency and duration of exercising outdoors.¹⁶¹
- A comprehensive assessment in Canada indicates that physical activity can improve kids’ brain health by boosting both cognitive ability and mental wellness.¹⁶² Time in nature – even your own backyard – can be a gateway to this much-needed physical activity.
- Scientists have concluded that the majority of U.S. kids are not getting the recommended amount of physical activity they need and that only 5% are meeting the 60-minutes-per-day goal.¹⁶³

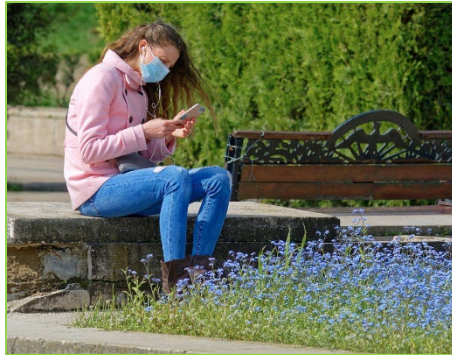
- Scientists have concluded that children may reduce the risk of short-sightedness by spending more time playing outdoors.¹⁶⁴
- Outdoor play increases fitness levels and builds active, healthy bodies, an important strategy in helping the 1 in 3 American kids who are obese get fit.¹⁶⁵
- Research shows children reap numerous health, social and personal benefits from spending time outside playing.¹⁶⁶
- Combined, trees and grass foster activities such as recreation, which is important for child development.¹⁶⁷
- Nine out of 10 Americans have a yard, and 78% of Americans have grass in their outdoor family room.¹⁶⁸



EQUITY & GREEN SPACE

Access to green space is a crucial factor in promoting equity in communities.

- A 2020 analysis indicates that residents of low-income communities, communities of color, and families with children have less access to nature.¹⁶⁹
- One in three U.S. residents do not have a park or green space within a 10-minute walk of home, according to the Trust for Public Land.¹⁷⁰
- A study of four school districts across North Carolina found that more socially vulnerable neighborhoods had less green space than less vulnerable neighborhoods.¹⁷¹
- An inventory of access to urban green space across 16 municipalities in Mexico City determined that access to urban green space is linked to the socioeconomic status of the neighborhood.¹⁷²
- The Green Space Index from Fields in Trust identified that around 2.8 million people in the UK are not within a ten-minute walk of green spaces.¹⁷³
- Most residents of Southeast Michigan (70%) do not have equal access to urban green spaces, according to a University of Michigan study. The study also found having several tiny green spaces within walking distance of residents was more valuable than one large park in creating green space equality.¹⁷⁴
- Improving the quantity and quality of public green space in disadvantaged neighborhoods may help reduce mental health inequities, according to a review of 14 studies.¹⁷⁵
- Green schoolyards may be powerful drivers of health equity by promoting well-being at an individual, school and community level, especially for urban, low-income communities.¹⁷⁶
- A systematic review of literature from nearly every continent in the world indicates that green space provides more protective health effects for disadvantaged populations, which could promote health equity in communities if acted upon.¹⁷⁷
- A study conducted in two eastern European cities found that over 80% of residents have limited access to green space, but scientists hypothesize that making informal green spaces available for recreation could help reduce inequity in access to nature.¹⁷⁸
- Research focusing on two Eastern-European cities indicates that removing restrictions to accessing informal greenspace could help reduce inequity in access to nature.¹⁷⁹
- Park prescription programs are gaining traction, but according to data analyzed from 78 low-income families, there are barriers to frequent park visits, including cost, lack of information about park locations and concerns about safety.¹⁸⁰
- A longitudinal study of a park prescription program for low-income families found that increased visits to neighborhood parks significantly increased children's resilience while decreasing their stress levels.¹⁸¹
- Improving the quantity and quality of public open space in disadvantaged neighborhoods may help reduce mental health inequities, according to a systematic review of literature.¹⁸²



THE PANDEMIC & GREEN SPACE

During the pandemic, people turned to nature and their own backyards to cope.

- Accessibility to green space helped buffer mental health decline during the pandemic, according to evidence from big data in the UK.¹⁸³
- An investigation into the spread of COVID in the U.S. indicates that population density was the most likely factor directly impacting the transmission of the disease and that urban vegetation weakened the association.¹⁸⁴
- Adults in the U.S. with higher “nature connectedness” responded to the pandemic differently than adults without high nature connectedness, including greater compliance with pandemic precautions and an appreciation of how movement restrictions benefited the environment.¹⁸⁵
- With indoor closures and restrictions due to the pandemic, green spaces have become one of the only sources of resilience. Park visitation has increased worldwide during the pandemic, highlighting the key role and benefits provided by parks, especially urban and community parks.¹⁸⁶
- U.K. researchers are encouraging policymakers to make more funds available to improve and maintain green spaces so residents can reap the health and well-being rewards they provide.¹⁸⁷
- Green space and park use was associated with less emotional distress among U.S. college students during the pandemic.¹⁸⁸
- An international study found greater odds of depression and anxiety among adults who faced more severe COVID lockdowns but concluded that contact with nature reduced the negative effects.¹⁸⁹
- Bulgarian university students who spent an average of 20 hours per day at home during COVID reported better mental health if they had access to a garden, a view of greenery from their window, or houseplants.¹⁹⁰
- A recent poll conducted for the Nature Conservancy of Canada indicates that 94% of people credit time spent in nature with helping them cope with stress and anxiety caused by the pandemic’s second wave.¹⁹¹
- Canadians who reported better mental health during the pandemic were more likely to report having exercised outdoors.¹⁹²
- Due to the coronavirus pandemic, kids spent more time playing outside and breathing in clean air, and a UK research study indicates children will miss the outdoors when things return to normal.¹⁹³
- COVID-related restrictions negatively impacted the mental health of children and youth, but according to scientists, being outdoors can help mitigate these adverse impacts.¹⁹⁴
- A study from North Carolina State University found outdoor play and nature-based activities helped buffer some of the negative mental health impacts of the COVID-19 pandemic for adolescents.¹⁹⁵
- During the coronavirus pandemic especially, pets provided companionship, consistency, and joy.¹⁹⁶



DOGS & BETTER HEALTH

No one knows & loves your backyard like the family dog. Having one is good for your health.

- *The typical yard does not offer enough stimulation to prompt an adequate amount of movement for your dog, a scientist from Tufts University suggests. Dogs need to be exercised for human companionship, mental stimulation, and relief of chronic stress.¹⁹⁷
- According to a new poll commissioned by the TurfMutt Foundation and conducted by The Harris Poll, roughly nine in 10 Canadians (88%) recognize that having a yard is important for a pet's health and happiness.¹⁹⁸
- A review of studies by the American Heart Association found that dog ownership was associated with a 24% risk reduction for all-cause mortality as compared to non-ownership.¹⁹⁹
- Having a canine companion in the home can be beneficial for children with autism spectrum disorder and their families, according to recent research.²⁰⁰
- According to a recent study, toddlers from dog-owning families were 30% less likely to have conduct and peer problems compared to young children from families without a dog.²⁰¹
- Exposure to household dogs and cats in childhood has been linked to a reduced risk of being diagnosed with schizophrenia or bipolar disorder.²⁰²
- Dog owners are more likely to engage in moderate physical activity than non-dog owners. In fact, dog owners walk an average of 300 minutes per week, while those without a dog walk 168 minutes per week on average.²⁰³
- Playing with or even just petting a dog lowers blood pressure, slows heart rate, regulates breathing and relaxes muscle tension.²⁰⁴
- When dogs and humans interact with one another they get a dose of oxytocin, a.k.a. the "cuddle hormone."²⁰⁵
- Dog ownership is linked to a 21% reduction in the risk of death from cardiovascular disease.²⁰⁶
- Having a strong attachment to a pet makes people feel more connected to their communities and to their human relationships.²⁰⁷



FINANCIAL BENEFITS OF GREEN SPACE

Living landscapes are good for property values.

- According to a new poll commissioned by the TurfMutt Foundation and conducted by The Harris Poll, 92% of Canadians believe having a yard increases a home's value.²⁰⁸ More than 3 in 4 (76%) recent Canadian yard owners have invested financially in their yard over the past two years with landscaping (47%) and gardens (46%) topping the list of investments.
- Nearly three-quarters of Americans overall (72%) say a spacious yard would be at the top of their wish list if they were looking for a new home.²⁰⁹
- Over 90% of respondents in a recent U.S. survey said landscaping has an impact on their decision to buy or rent a home. In the same survey, three in four millennials said they will still consider buying an outdated or rundown home if the yard is already landscaped.²¹⁰
- According to the U.S. Forest Service's Northern Research Station, the nation's urban canopies, which are home to an estimated 5.5 billion trees, provide roughly \$18 billion in annual benefits through the removal of pollution from the air (\$5.4 billion), carbon sequestration (\$4.8 billion), reduced emissions (\$2.7 billion), and improved energy efficiency in buildings (\$5.4 billion).²¹¹
- A beautiful landscape improves curb appeal and can increase home values by as much as 17%.²¹²
- Landscaping in vacant lots has been shown to reduce overall crime by more than 13%, reduce burglary by 22%, and decrease nuisance reports by 30%.²¹³
- Among Realtors®, 94% have suggested sellers improve curb appeal before listing a home for sale. 99% of REALTORS® believe curb appeal is important to a potential buyer.²¹⁴
- Each front yard tree adds 1% to a homeowner's sale price, while large specimen trees can add 10% to property values.²¹⁵
- According to the Urban Forest Coalition, 100 million mature trees around U.S. residences save approximately \$2 billion annually in reduced energy costs.²¹⁶
- Planting a tree on the west side of your house has been shown to reduce energy bills by 3% in 5 years and 12% in 15 years.²¹⁷
- Strategically placed trees save up to 56% on annual air conditioning costs. In the wintertime, evergreens that block winter winds can save 3% on heating.²¹⁸
- In tree-lined commercial districts, people shop more frequently, take longer shopping trips, and are willing to spend 12% more for goods.²¹⁹
- According to a British study of people who exercise in nature, outdoor exercise delivers an estimated £2.2bn of health benefits to adults in England each year.²²⁰
- Cost/benefit analyses show that landscaped plants are worth the investment in resources, especially water. Selecting drought resistant plants, coupled with proper management and irrigation, allows lawns and landscapes to flourish while still saving water.²²¹



BIODIVERSITY & WILDLIFE

Living landscapes support biodiversity and wildlife.

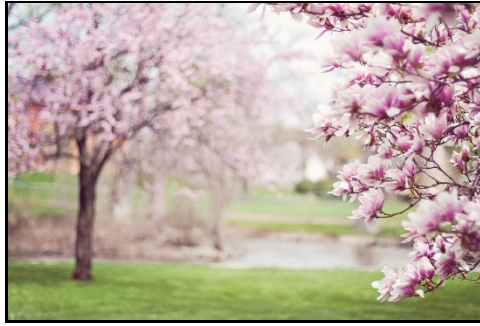
- Areas with lower bird diversity have more mental health hospital admissions, research suggests.²²²
- Two studies published in *Scientific Reports* indicate that seeing or hearing birds could be good for our mental health.²²³
- A study led by Yale School of the Environment reveals that expanding wildlife restoration and increasing biodiversity could lead to the capture of an additional 6.41 billion tons of CO2 emissions each year.²²⁴ The family yard and community green space are an important part of the connected ecosystem.
- According to a new survey commissioned by the TurfMutt Foundation and conducted by The Harris Poll, nearly three quarters of Canadians (72%) believe their yard is part of the connected ecosystem, giving pollinators and wildlife food and shelter.²²⁵
- Increasing the biodiversity of urban green spaces can help people and the planet adapt to the urban environment in the face of climate change.²²⁶
- Having more bird species in their vicinity increases life satisfaction for Europeans as much as a higher income does, according to recent research.²²⁷
- The 2020 National Gardening Survey from the National Wildlife Federation shows more Americans are purposefully planting for wildlife and pollinators than ever before.²²⁸
- A study published in the *Journal Science* found that nearly 3 billion birds have disappeared in North America since 1970. Adding native trees, bushes and other plants to our backyards and community green spaces offers food and protection.²²⁹
- Your yard and our parks, schoolyards and other community green spaces are vital to the world's ecosystem. Nature starts in your own backyard.
- Tiny forests, small city forests as big as a tennis court in the Netherlands (600 trees of 40 species), have been shown to increase biodiversity.²³⁰
- Urban environments are largely responsible for the loss of biodiversity. Increasing natural habits for birds, insects and other animals with living landscapes can help combat this problem.²³¹
- Drought is negatively impacting many species who rely on green space for food and shelter. Small mammals are more likely to be impacted than large mammals that can simply move elsewhere to find food, water and shelter.²³²
- Grass, trees and shrubs and other plant life provide food and habitat for birds and small mammals.²³³ Insects, spiders and worms live among the grass blades and below the surface in the turf.



HEAT ISLANDS

Living landscapes combat the heat island effect in urban areas.

- A recent report by the research group Climate Central shows that more than 40 million Americans live in urban heat islands.²³⁴
- According to a Joint Research Centre study, more vegetation in targeted urban areas can mitigate extreme heat more effectively than uniformly creating green areas.²³⁵
- According to the EPA, a review of research studies and data found that in the U.S., the heat island effect results in daytime temperatures in urban areas that are 1-7°F higher than temperatures in the outlying areas.
- Increasing tree and vegetation cover lowers surface and air temperatures by providing shade and cooling through a process called evapotranspiration. Planting vegetation and grass, or installing green roofs, are among the strategies the EPA recommends to mitigate the heat island effect.²³⁶
- Lawns can be 30° cooler than asphalt and 14° cooler than bare soil.²³⁷
- A recent study indicates that school parks can serve as a tool for heat island adaptation and health promotion.²³⁸
- According to researchers in Australia, domestic yards account for more than 40% of tree cover and 30% of grass cover and that the density of greenery in household yards kept land surface temperatures up to 6° cooler than non-vegetated areas.²³⁹
- Eight average-sized front lawns can provide the cooling equivalent to air-conditioning for 18 homes.²⁴⁰
- Urban forests help keep cities cool. In fact, large parks or tracts of urban trees can cool daytime summer temperatures by about 10°. Shaded ground can be up to 36° cooler than unshaded ground.²⁴¹



AIR QUALITY

Green space improves air quality.

- *Working under the premise that a lack of vegetation is making people sick, the Green Heart Initiative in Louisville, Ky., is planting trees and shrubs to decrease the level of air pollution by increasing the amount of green space.²⁴²
- Healthy lawns and other landscape plants contribute to improved air quality by acting as traps for dust and other airborne particles.²⁴³
- According to scientists in Brazil, urban forests can help mitigate air pollution, making cities better able to manage climate change and making them more livable.²⁴⁴
- More than 160,000 people could die over the next decade from strokes and heart attacks caused by air pollution, the British Heart Foundation (BHF) warns.²⁴⁵
- Short-term exposure to ambient air pollution has been associated with mental health issues in children, especially anxiety and risk of suicide.²⁴⁶
- Children who live in areas with bad air pollution are more likely to develop asthma, but improving air quality in smog-prone Southern California has resulted in a decrease in the number of kids with asthma.²⁴⁷
- In the U.S., more than 26 million people – including more than 6 million children – have asthma, according to the Centers for Disease Control,²⁴⁸ a condition worsened by air pollution.
- In the U.K., four in 10 children are breathing “toxic air” at school, which breaches World Health Organization guidelines.²⁴⁹
- Without the oxygen-producing boost that plants such as grass, trees and shrubs offer, air quality levels will get even worse in drought-stressed areas that have programs promoting the removal of living landscapes.

OXYGEN PRODUCTION

Our living landscapes are incredible oxygen-making machines.

- According to The Lawn Institute, one 5,000 square feet grass lawn can produce enough oxygen each day to support 14 to 34 people, depending on location.²⁵⁰
- A turf area 50' x 50' produces enough oxygen to meet the daily needs of a family of four.²⁵¹
- Two mature trees provide enough oxygen for one person to breathe over the course of a year.²⁵²
- One tree produces nearly 260 pounds of oxygen each year.²⁵³
In L.A. alone, trees remove nearly 2,000 tons of air pollution each year.²⁵⁴



CARBON SEQUESTRATION

Turfgrass is a carbon sink.

- According to a study published in the journal Nature Climate Change, dozens of European cities could reach net zero carbon emissions over the next 10 years by incorporating nature into their infrastructure.²⁵⁵
- Carbon sinks absorb the greenhouse gas carbon dioxide from the atmosphere. Plants absorb carbon dioxide from the atmosphere to use in photosynthesis. Some of this carbon is transferred to soil as plants die and decompose.²⁵⁶
- The dense canopy and fibrous root system in a lawn sequesters carbon so well that it outweighs the carbon used for maintaining the grass by as much as seven-fold.²⁵⁷
- Scientists have found that recycling grass clippings on lawns (called grasscycling) will sequester even more carbon.²⁵⁸
- An average-sized home lawn in the U.S. has the potential to sequester 20.3 to 163.4 kg C/lawn/year.²⁵⁹
- Strategies for reducing water use that alter urban land cover can result in significant atmospheric responses that must be considered to ensure efforts to mitigate climate warming are not reversed.²⁶⁰

NOISE POLLUTION

Living plants help control noise pollution.

- Data from sensors placed in urban European households with young children showed that homes with more surrounding green space had less road noise and indoor particulate matter.²⁶¹
- The World Health Organization has concluded that noise pollution is a threat to our well-being.²⁶²
- The average community noise level is four times higher than it was 20 years ago.
- Grassy areas absorb noise, which cuts down on excessive sound, a growing problem in urban areas, where hardscape and pavement reverberates sound.
- Scientists found that green roofs have the highest potential to enhance quietness in courtyards and may be able to reduce noise by up to 7.5 decibels.²⁶³



RAINWATER HARVESTING & STORM WATER RUNOFF

Living landscapes reduce runoff and capture and filter rainwater, recharging underground aquifers.

- *In February 2024, an atmospheric river pounded Los Angeles with rain, and the city's "sponge" infrastructure, which was created by replacing surfaces like concrete with dirt and plants, helped gather 8.6 billion gallons of water. That is enough to sustain over 100,000 households for an entire year.²⁶⁴
- Rainwater "sheets off" hard surfaces, like hardscapes, artificial turf, parking lots, driveways and roads. Instead of going into the ground, rainwater becomes fast-moving storm water runoff, which pollutes water systems.
- A 5,000 square-foot living lawn has the potential to capture around 2,000 gallons of rainwater before runoff occurs.
- A doubling of grass blade density results in a two-fold increase in infiltration rate and a 66% reduction in runoff.²⁶⁵
- Planting trees results in less runoff and erosion, allowing more recharging of the ground water supply and resulting in less sediment and chemicals in streams.²⁶⁶
- Grassy areas also mitigate storm water runoff. Acting like a sponge, grass slows down and absorbs runoff, cleanses water of impurities and dust, and recharges groundwater aquifers.
- The biology of turfgrass makes lawns a nearly ideal medium for the biodegradation of all sorts of environmental contamination.²⁶⁷
- The grass filtration system is so effective that rainwater filtered through a healthy lawn is often as much as 10 times less acidic than water running off a hard surface.²⁶⁸
- Turfgrasses can remediate contaminated soil by cleaning it; grasses are more effective at cleansing contaminated soil than trees or shrubs.²⁶⁹
- Replacement of turf with other vegetation will not provide the cleansing capabilities grass offers.²⁷⁰



SOIL EROSION

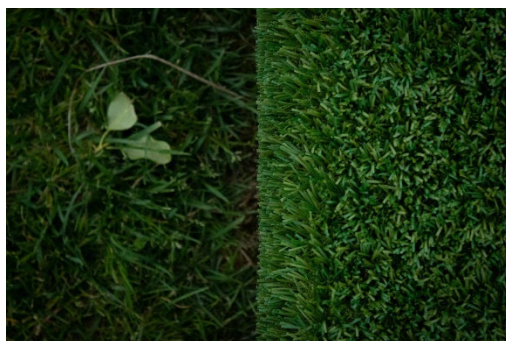
Plants control soil erosion.

- Grass helps control erosion by slowing down water runoff. Water running off a sodded area will take 28-46 times longer than if the water was on five popular erosion-control materials. Grass slows down the water runoff; thus, less soil erodes.²⁷¹
- Turfgrass controls erosion through its natural, dense and fibrous root system, which holds soil in place.²⁷²
- Tests show that a dense lawn is six times more effective than a wheat field and four times better than a hayfield at absorbing rainfall.²⁷³
- Sediment losses from sodded areas are eight to 15 times less than for tested man-made erosion control materials and 10 times less than for a straw covered area.

FIRE BREAK

Turfgrass is a natural and effective fire break.

- 1.8 million homes across 13 western states are at “extreme or high risk” of damage from wildfires, and the cost to repair them is estimated at \$500 billion. 27 million additional properties in those states face some risk of damage and would cost about \$6.7 trillion to repair²⁷⁴.
- Per the American Society of Landscape Architects, “green infrastructure” can help protect communities from natural disasters, including drought and fire.²⁷⁵
- Living grass is a natural fire break. Healthy turfgrass can be a significant deterrent to wildfires and can help protect property.²⁷⁶
- Green grass slows the spread of wildfires because of its low fuel value, and it provides a defensible space around structures where firefighters can work effectively.²⁷⁷



PLASTIC GRASS, ARTIFICIAL OR SYNTHETIC TURF

Plastic grass is an environmental villain that does not provide habitat or support biodiversity.

- According to scientists in the UK who say yards must be full of plants to be beneficial to the local environment, artificial grass and pesticides should be banned.²⁷⁸
- Used artificial turf is expected to produce 1-4 million tons of waste in the next 10 years, and it has nowhere to go.²⁷⁹
- Plastic grass – a petroleum product – is *not* more environmentally friendly than real grass.
- Putting plastic propylene sheets in place of a living lawn destroys urban habitat for birds, insects and animals.
- Younger Americans (ages 18-34) are more likely to have an artificial or synthetic lawn than those who are 45+.²⁸⁰
- Plastic grass is hot. A 2002 Brigham Young University study revealed that synthetic-turf surface temperatures were 37° higher than asphalt and 86° hotter than natural turf.²⁸¹ A 2012 Penn State study found it not uncommon for artificial turf temperatures to surpass 150° and can reach up to 200°.²⁸²
- Plastic grass may not "use" water to sustain itself, but it must be cooled with water and washed off with water to remove dust, dirt and pet waste. The runoff of the dirty and unsanitary water contributes to water pollution. The L.A. Department of Water & Power attracted negative attention in September 2016 when it was discovered to be using water to clean artificial turf once a week to remove dog waste.²⁸³
- According to a New Mexico State University turfgrass expert, not only does artificial turf need to be irrigated multiple times a day to keep it cool, reflection of the heat from the turf also impacts surrounding buildings and grass.²⁸⁴

SOURCES

- ¹ Study: The Harris Poll for the TurfMutt Foundation, <https://bit.ly/41Qti8B>.
- ² Study: The Harris Poll “Yards Study” Prepared for the TurfMutt Foundation, <https://www.turfmutt.com/news/poll/>.
- ³ Study: The Harris Poll for the TurfMutt Foundation: <https://bit.ly/41Qti8B>.
- ⁴ Source: The Harris Poll “Living Landscapes Report” Prepared for the Outdoor Power Equipment Institute, http://www.livinglandscapesmatter.com/wp-content/uploads/Summary_OPEI-Living-Landscapes.pdf.
- ⁵ Source: S. Scott Ogletree, Jing-Huei Huang, David Reif, Lin Yang, Christopher Dunstan, Nnamdi Osakwe, Jae In Oh, J. Aaron Hipp, The relationship between greenspace exposure and telomere length in the National Health and Nutrition Examination Survey, *Science of The Total Environment*, Volume 905, 2023, 167452, ISSN 0048-9697, <https://doi.org/10.1016/j.scitotenv.2023.167452>.
- ⁶ Source: “The Power of Walking: Boosting Cognitive Function and Mental Well-Being”; Medriva. <https://medriva.com/fitness/exercise-and-fitness/the-power-of-walking-boosting-cognitive-function-and-mental-well-being/>.
- ⁷ Source: “Greenspace and Income Levels May Affect Brain and Health”; University of Miami Miller School of Medicine. (October 2023) doi: <https://news.med.miami.edu/greenspace-brain-health-alzheimers-dementia/>
- ⁸ Source: S. Scott Ogletree, Jing-Huei Huang, David Reif, Lin Yang, Christopher Dunstan, Nnamdi Osakwe, Jae In Oh, J. Aaron Hipp, The relationship between greenspace exposure and telomere length in the National Health and Nutrition Examination Survey, *Science of The Total Environment*, Volume 905, 2023, 167452, ISSN 0048-9697, doi: <https://doi.org/10.1016/j.scitotenv.2023.167452>.
- ⁹ Source: Healthnews, “Do Green Spaces Have a Positive Impact on Sleep?”, September 2023, doi: <https://healthnews.com/sleep/sleep-hacks/do-green-spaces-have-a-positive-impact-on-sleep/>.
- ¹⁰ Source: Rieke J, et al. F20A. Presented at: ADCES23; Aug. 4-7, 2023; Houston. *Endocrine Today*. Doi: <https://www.healio.com/news/endocrinology/20230805/lack-of-green-space-may-contribute-to-elevated-bp-with-type-1-diabetes>.
- ¹¹ Source: Kyeezoo Kim et al. Inequalities in urban greenness and epigenetic aging: Different associations by race and neighborhood socioeconomic status. *Sci. Adv.* 9, eadf8140(2023). Doi: <https://www.science.org/doi/10.1126/sciadv.adf8140>
- ¹² Source: White, M.P., Alcock, I., Grellier, J. et al. Spending at least 120 minutes a week in nature is associated with good health and wellbeing. *Sci Rep* 9, 7730 (2019). doi: <https://www.nature.com/articles/s41598-019-44097-3>
- ¹³ Study: Katriina Hyvönen, Kirsi Salonen, Jane-Veera Paakkolanvaara, Pasi Väkeväinen, Kalevi Korpela, Effects of nature-based intervention in the treatment of depression: A multi-center, randomized controlled trial, *Journal of Environmental Psychology*, Volume 85, 2023, 101950, ISSN 0272-4944, doi: <https://doi.org/10.1016/j.jenvp.2022.101950>.
- ¹⁴ Source: American Academy of Neurology. <https://www.prnewswire.com/news-releases/is-living-close-to-parks-water-better-for-your-brain-301753763.html>
- ¹⁵ Source: “Nature to be prescribed to patients who tell their doctor they are unwell”, *Metro News*, https://metro-co-uk.cdn.ampproject.org/c/s/metro.co.uk/2023/01/04/go-for-walk-in-countryside-gps-to-give-patients-nature-prescription-18038926/amp/?mc_cid=c677c26ca3&mc_eid=f565ada799
- ¹⁶ Source: The Guardian, “Planting more trees in cities could cut deaths from summer heat, study says”, <https://www.theguardian.com/environment/2023/feb/01/planting-trees-cities-cut-deaths-summer-heat-study>
- ¹⁷ Study: Li, Q, M Kobayashi, Y Wakayama, H Inagaki, M Katsumata, Y Hirata, T Shimizu, et al. 2009. “Effect of Phytoncide from Trees on Human Natural Killer Cell Function.” *International Journal of Immunopathology & Pharmacology* 22 (October): 951-59. <https://www.ncbi.nlm.nih.gov/pubmed/20074458>
- ¹⁸ Study: Marcia P. Jimenez, MSc, MA, PhD1,2; Elise G. Elliott, PhD3,4; Nicole V. DeVille, PhD1,4; et al, (2022). Residential Green Space and Cognitive Function in a Large Cohort of Middle-Aged Women. doi: [10.1001/jamanetworkopen.2022.9306](https://doi.org/10.1001/jamanetworkopen.2022.9306)
- ¹⁹ Article: “Changing your microbiome could be as easy as taking a walk in the park” *Massive Science*. June 24, 2021. https://massivesci.com/articles/outdoor-green-space-microbiome-benefits-soil-air/?mc_cid=66e1a07bfe&mc_eid=f565ada799
- ²⁰ Source: Wood, C.J., Smyth, N., (2020). The health impact of nature exposure and green exercise across the life course: A pilot study. *International Journal of Environmental Health Research*, 30(2), 226-235. doi: <https://dx.doi.org/10.1080/09603123.2019.1593327>.

- ²¹ Study: White, M.P., Alcock, I., Grellier, J. *et al.* Spending at least 120 minutes a week in nature is associated with good health and wellbeing. *Sci Rep* 9, 7730 (2019). <https://doi.org/10.1038/s41598-019-44097-3>
- ²² Study: Leanne Martin, Mathew P. White, Sabine Pahl, Jon May, Benedict W. Wheeler, “Neighbourhood greenspace and smoking prevalence: Results from a nationally representative survey in England”, *Social Science & Medicine*, 2020, <https://doi.org/10.1016/j.socscimed.2020.113448>.
- ²³ Source: Randall, Cassidy. “The Incredibly Simple Way to Get People To Care About The Environment.” *HuffPost*, 3 Mar. 2020, https://www.huffingtonpost.in/entry/way-care-about-environment_in_5e5e4e17c5b6732f50e859c1.
- ²⁴ Source: “Reconnecting with Nature Key for the Health of People and the Planet.” *EurekaAlert!*, 13 Feb. 2020, https://www.eurekaalert.org/pub_releases/2020-02/uop-rwn021220.php.
- ²⁵ Study: Kondo, PhD, Michelle, et al. “Health Impact Assessment of Philadelphia’s 2025 Tree Canopy Cover Goals.” *The Lancet Planetary Health*, vol. 4, no. 4, Apr. 2020, pp. 149-57, doi:[https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196\(20\)30058-9/fulltext](https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(20)30058-9/fulltext).
- ²⁶ Study: Kondo, Michelle, et al. “Urban Green Space and Its Impact on Human Health.” *International Journal of Environmental Research and Public Health*, vol. 15, no. 3, Mar. 2018, doi: <https://www.mdpi.com/1660-4601/15/3/445>.
- ²⁷ Source: Bacchi, Umberto. “Greener, Longer Life: More Trees Reduce Premature Deaths in Cities.” *Reuters*, 11/20/19, <https://www.reuters.com/article/us-global-health-climatechange/greener-longer-life-more-trees-reduce-premature-deaths-in-cities-idUSKBN1XU2WJ>.
- ²⁸ Study: Becker, Douglas, Matthew H.E.M. Browning, Ming Kuo, and Stephen K. Van Den Eeden. n.d. “Is Green Land Cover Associated with Less Health Care Spending? Promising Findings from County-Level Medicare Spending in the Continental United States.” *Urban Forestry & Urban Greening* 41 (May 2019): 39-47. doi: <https://www.sciencedirect.com/science/article/pii/S161886671830534X?via%3Dihub>.
- ²⁹ Study: James, Peter, Jaime Hart, Rachel F. Banay, and Francine Laden. 2016. “Exposure to Greenness and Mortality in a Nationwide Prospective Cohort Study of Women.” *Environmental Health Perspectives* 124 (9). doi: <https://ehp.niehs.nih.gov/doi/10.1289/ehp.1510363>.
- ³⁰ Study: Fong, K.C.; Kloog, I.; Coull, B.A.; Koutrakis, P.; Laden, F.; Schwartz, J.D.; James, P. Residential Greenness and Birthweight in the State of Massachusetts, USA. *Int. J. Environ. Res. Public Health* 2018, 15, 1248. <https://www.mdpi.com/1660-4601/15/6/1248>.
- ³¹ Study: G. Berman, Marc, John Jonides, and Stephen Kaplan. 2008. “The Cognitive Benefits of Interacting with Nature.” *Psychological Science*, December. <https://journals.sagepub.com/doi/10.1111/j.1467-9280.2008.02225.x>.
- ³² Source: Wernick, Adam. 2017. “Getting Outside Is a Prescription for Better Health.” <https://www.pri.org/stories/2017-12-30/getting-outside-prescription-better-health>.
- ³³ Source: “Park Rx America - Nature Prescribed.” 2019. *Park Rx America*. Accessed October 30. <https://parkrxamerica.org/>.
- ³⁴ Study: L. Crouse, PhD, Dr. Dan, Lauren Pinault, PhD, Adele Balram, MPH, Hystad, PhD, Paul A. Peters, PhD, and Hong Chen, PhD. 2017. “Urban Greenness and Mortality in Canada’s Largest Cities: A National Cohort Study.” *The Lancet Planetary Health* 1 (7) doi: [https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196\(17\)30118-3/fulltext](https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(17)30118-3/fulltext).
- ³⁵ Study: Kardan, Omid, Peter Gozdyra, Bratislav Misic, Faisal Moola, Lyle J. Palmer, Tomas Paus, and Mar G. Berman. 2015. “Neighborhood Greenspace and Health in a Large Urban Center.” *Scientific Reports*, July. <https://www.nature.com/articles/srep11610>.
- ³⁶ Study: Simons, LA, J Simons, J McCallum, and Y Friedlander. 2006. “Lifestyle Factors and Risk of Dementia: Dubbo Study of the Elderly.” *The Medical Journal of Australia*, no. 184 (January): 68-70. <https://www.ncbi.nlm.nih.gov/pubmed/16411871>.
- ³⁷ Study: J. Wood, Carly, Jules Pretty, and Murray Griffin. 2016. “A Case-Control Study of the Health and Well-Being Benefits of Allotment Gardening.” *Journal of Public Health* 38 (3): e336-44. <http://jpubhealth.oxfordjournals.org/content/early/2015/10/18/pubmed.fdv146.abstract?sid=848f569d-8773-4a9a-a9d9-39f2e1813849>.
- ³⁸ Source: Hall, Charlie. 2016. “A Beauty-Filled Lifestyle.” *Nursery Management*, January 7. <http://www.nurserymag.com/article/a-beauty-filled-lifestyle.aspx>.
- ³⁹ Source: Makram, Omar M., Alan Pan, Jay E. Maddock, and Bita A. Kash. 2024. “Nature and Mental Health in Urban Texas: A NatureScore-Based Study” *International Journal of Environmental Research and Public Health* 21, no. 2: 168. <https://doi.org/10.3390/ijerph21020168>

- ⁴⁰ Source: Lu, Y., Li, Z., Qin, K. *et al.* Association between perceived neighborhood environment and depression among residents living in mega-communities in Guiyang, China: a cross-sectional study. *BMC Public Health* 24, 343 (2024). <https://doi.org/10.1186/s12889-024-17844-z>.
- ⁴¹ Source: Yimin Zhang, Tongyan Wu, Hao Yu, Jianfei Fu, Jin Xu, Liya Liu, Chunlan Tang, Zhen Li, Green spaces exposure and the risk of common psychiatric disorders: A meta-analysis, *SSM - Population Health*, Volume 25, 2024, 101630, ISSN 2352-8273, <https://doi.org/10.1016/j.ssmph.2024.101630>.
- ⁴² Source: Geary, Rebecca S et al., Ambient greenness, access to local green spaces, and subsequent mental health: a 10-year longitudinal dynamic panel study of 2.4 million adults in Whales (2023). *The Lancet Planetary Health*. DOI: [https://doi.org/10.1016/S2542-5196\(23\)00212-7](https://doi.org/10.1016/S2542-5196(23)00212-7).
- ⁴³ Source: Turenen, Anu et al. Cross-sectional associations of different types of nature exposure with psychotropic, antihypertensive and asthma medication. *Occupational & Environmental Medicine*. doi: <http://dx.doi.org/10.1136/oemed-2022-108491>.
- ⁴⁴ Source: Gregory N. Bratman et al., Nature and mental health: An ecosystem service perspective. *Sci. Adv.* 5, eaax0903(2019). doi: <https://www.science.org/doi/10.1126/sciadv.aax0903>.
- ⁴⁵ Study: Hunter MR, Gillespie BW and Chen SY-P (2019) Urban Nature Experiences Reduce Stress in the Context of Daily Life Based on Salivary Biomarkers. *Front. Psychol.* 10:722. doi: <https://www.frontiersin.org/articles/10.3389/fpsyg.2019.00722/full>.
- ⁴⁶ Study: Katriina Hyvönen, Kirsi Salonen, Jane-Veera Paakkolanvaara, Pasi Väkeväinen, Kalevi Korpela, Effects of nature-based intervention in the treatment of depression: A multi-center, randomized controlled trial, *Journal of Environmental Psychology*, Volume 85, 2023, 101950, ISSN 0272-4944, doi: <https://doi.org/10.1016/j.jenvp.2022.101950>.
- ⁴⁷ Study: Gao, Jie, Mancus, Gibran, Yuen, Hon et al. (December 2020). Changes in cortisol and dehydroepiandrosterone levels immediately after urban park visits. doi: <http://doi.org/10.1080/09603123.2021.2013454>
- ⁴⁸ Study: The Harris Poll “Yards Report” Prepared for the TurfMutt Foundation, <https://www.turfmutt.com/news/poll/>.
- ⁴⁹ Study: Peters, E., Mass, J., Hovinga, D., den Bogerd, N. V., Schuengel, C., (2020). Experiencing nature to satisfy basic psychological needs in parenting: A quasi-experiment in family shelters. *International Journal of Environmental Research and Public Health*, 17. doi: <http://dx.doi.org/10.3390/ijerph17228657>.
- ⁵⁰ Study: Snell, T. L., Simmonds, J. G., Klein, L. M., (2020). Exploring the impact of contact with nature in childhood on adult personality. *Urban Forestry & Urban Greening*, 55, 1-9. doi: <http://dx.doi.org/10.1016/j.ufug.2020.126864>
- ⁵¹ Study: Kantor, Bella Nichole, and Jonathan Kantor. “Mental Health Outcomes and Associations During the COVID-19 Pandemic: A Cross-Sectional Population-Based Study in the United States.” *Frontiers in Psychology* , Dec. 2020, doi: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7793873/>.
- ⁵² Study: Engemann, K., Pedersen, C.B., Agerbo, E., Arge, L., Børghlum, A.D., Erikstrup, C., Hertel, O., Hougaard, D.M., McGrath, J.J., Mors, O., Mortensen, P.B., Nordentoft, M., Sabel, C.E., Sigsgaard, T., Tsirogiannis, C., (2020). Association between childhood green space, genetic liability, and the incidence of schizophrenia. *Schizophrenia Bulletin*. doi: <http://dx.doi.org/10.1093/schbul/sbaa058>.
- ⁵³ Study: Birch, Jo, et al. “Nature Doesn’t Judge You - How Urban Nature Supports Young People’s Mental Health and Wellbeing in a Diverse UK City.” *Health & Place*, vol. 62, Mar. 2020, doi: <https://www.sciencedirect.com/science/article/pii/S135382921931158X>.
- ⁵⁴ Study: Meredith et al. 2020. Minimum time dose in nature to positively impact the mental health of college-aged students, and how to measure it: A scoping review, doi: <http://dx.doi.org/10.3389/fpsyg.2019.02942>.
- ⁵⁵ Study: Twohig-Bennett, Caoimhe, and Andy Jones. “The Health Benefits of the Great Outdoors: A Systematic Review and Meta-Analysis of Greenspace Exposure and Health Outcomes.” *ScienceDirect*, vol. 166, Oct. 2018, pp. 628-37, doi: <https://www.sciencedirect.com/science/article/pii/S0013935118303323?via%3Dihub>.
- ⁵⁶ Study: Cox , Daniel, et al. “Doses of Neighborhood Nature: The Benefits for Mental Health of Living with Nature.” *Oxford Academic*, vol. 67, no. 2, Feb. 2017, pp. 147-55, http://www.exeter.ac.uk/news/archive/2017/february/title_571299_en.html.
- ⁵⁷ Study: Chen, Chun, et al. “Playing, Parenting and Family Leisure in Parks: Exploring Emotional Geographies of Families in Guangzhou Children’s Park, China.” *Taylor & Francis Online*, Oct. 2019, <https://www.tandfonline.com/doi/full/10.1080/14733285.2019.1676879>.
- ⁵⁸ Study: Russell, Roly, Anne D. Guerry, Patricia Balvanera, Rachelle K. Gould, Xavier Basurto, Kai M.A. Chan, Sarah Klain, Jordan Levine, and Jordan Tam. 2013. “Humans and Nature: How Knowing and Experiencing Nature Affect Well-Being.” *Annual Review of Environment and Resources* 38 (October): 473-502. <http://www.annualreviews.org/doi/full/10.1146/annurev-environ-012312-110838>.

- ⁵⁹ Source: Devdiscourse News Desk. 2019. "Children Living Close to Nature Develop Better Mental and Physical Health," May 22. <https://www.devdiscourse.com/article/agency-wire/533018-children-living-close-to-nature-develop-better-mental-and-physical-health>.
- ⁶⁰ Source: Kidambi, Manya. 2019. "UCLA Study Suggests Spending Time in Green Spaces May Improve Mental Health," April 9. <http://dailybruin.com/2019/04/09/ucla-study-suggests-spending-time-in-green-spaces-may-improve-mental-health/>.
- ⁶¹ Study: Hunger, Mary Carol, Brenda W. Gillespie, and Sophie Yu-Pu Chen. 2019. "Urban Nature Experiences Reduce Stress in the Context of Daily Life Based on Salivary Biomarkers." *Frontiers in Psychology*, April. <https://www.frontiersin.org/articles/10.3389/fpsyg.2019.00722/full>.
- ⁶² Study: University of Regina, Neill, Calum, et al. *Nature Contact and Mood Benefits: Contact Duration and Mood Type*, Dec. 2018. <https://www.tandfonline.com/doi/full/10.1080/17439760.2018.1557242?scroll=top&needAccess=true>.
- ⁶³ Sources: Chacón, Felipe. "The Incredible Shrinking Yard! - Trulia Research." *Trulia Research*, 18 Oct. 2017, <https://www.trulia.com/research/lot-usage/>. Moneyish article. Hill, Catey. "How America's McMansion Obsession Is Subtly Wrecking Our Mental Health." *MarketWatch*. 18 Oct. 2017. <https://www.marketwatch.com/story/how-americas-mcmansion-obsession-is-subtly-wrecking-our-mental-health-2017-10-17>.
- ⁶⁴ Study: Eugenia C. South, MD, MS1,2Bernadette C. Hohl, PhD3Michelle C. Kondo, PhD4John M. MacDonald, PhD5Charles C. Branas, PhD. "Effect of Greening Vacant Land on Mental Health Among Urban Residents." 6,7, 20 July 2018. University of Pennsylvania, Rutgers University, Northern Research Station, Forest Service, US Department of Agriculture. <https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2688343>.
- ⁶⁵ Study: Berman, Marc. "Interacting with Nature Improves Cognition and Affect for Individuals with Depression." *PubMed Central (PMC)*, 1 Nov. 2012. Rotman Research Institute at Baycrest; University of Michigan; Stanford University. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3393816/>.
- ⁶⁶ Source: Berlin Aging Study, Kühn, Simone. "In Search of Features That Constitute an 'Enriched Environment' in Humans: Associations between Geographical Properties and Brain Structure." *Scientific Reports*, 20 Sept. 2017. <https://www.nature.com/articles/s41598-017-12046-7>.
- ⁶⁷ Source: *Hidden, Local Climate Impacts of Drought-Friendly Vegetation*. 5 Aug. 2016, https://www.eurekalert.org/pub_releases/2016-08/uosc-hlc080516.php.
- ⁶⁸ Study: "Can Bacteria Make You Smarter? ." *American Society for Microbiology*, <https://www.sciencedaily.com/releases/2010/05/100524143416.htm>.
- ⁶⁹ Source: Bowler, Diana E., et al. "A Systematic Review of Evidence for the Added Benefits to Health of Exposure to Natural Environments." *BMC Public Health*, Aug. 2010. <https://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-10-456>.
- ⁷⁰ Study: Jarvis, Ingrid, Davis, Zoe, et al, (2021). Assessing the association between lifetime exposure to greenspace and early childhood development and the mediation effects of air pollution and noise in Canada: a population-based birth cohort study. *The Lancet*. doi: [https://doi.org/10.1016/S2542-5196\(21\)00235-7](https://doi.org/10.1016/S2542-5196(21)00235-7)
- ⁷⁰ Study: Jia, P., Cao, X., Yang, H., Dai, Shaoqing, He, P., Huang, G., Wu, T., Wang, Y., (2020). Green space access in the neighbourhood and childhood obesity. *Obesity Reviews*. doi:
- ⁷¹ Study: Bates, C. R., Bohnert, A. M., Gerstein, D. E., (2018). Green schoolyards in low-income urban neighborhoods: Natural spaces for positive youth development outcomes. *Frontiers in Psychology*, 9. <https://doi.org/10.3389/fpsyg.2018.00805>
- ⁷² Study: Burgess, E., Ernst, J., (2020). Beyond traditional school readiness: How nature preschools help prepare children for academic success. *International Journal of Early Childhood Environmental Education*, 7(2), 17-33. doi: <https://files.eric.ed.gov/fulltext/EJ1255000.pdf>.
- ⁷³ Study: Ernst, J., McAllister, K., Siklander, P., Storli, R., (2021). Contributions to sustainability through young children's nature play: A systematic review. *Sustainability*, 13, 1-36. doi: <http://dx.doi.org/10.3390/su13137443>
- ⁷⁴ Study: Sprague, N., Berrigan, D., Ekenga, C.C., (2020). An analysis of the educational and health-related benefits of nature-based environmental education in low-income Black and Hispanic children. *Health Equity*, 4(1), 198-210. doi: <http://dx.doi.org/10.1089/heq.2019.0118>
- ⁷⁵ Study: Chang, Chia-chen, Cox, Daniel, Fan, Qiao, et al. (2022). People's desire to be in nature and how they experience it are partially heritable. *PLOS Biology*. doi: <https://doi.org/10.1371/journal.pbio.3001500>
- ⁷⁶ Study: Lindemann-Matthies, Petra, and Karlheinz Kohler. "Naturalized versus Traditional School Grounds: Which Elements Do Students Prefer and Why?" *ScienceDirect*, vol. 46, Dec. 2019, <https://www.sciencedirect.com/science/article/abs/pii/S1618866719301992?via%3Dihub>.

- ⁷⁷ Study: Bohnert, A. M., Nicholson, L. M., Mertz, L., Bates, C. R., Gerstein, D. E., (2021). Green schoolyard renovations in low-income urban neighborhoods: Benefits to students, schools, and the surrounding community. *American Journal of Community Psychology*, 1-11. doi: <http://dx.doi.org/10.1002/ajcp.12559>
- ⁷⁸ Study: Kuo, M., Barnes, M., Jordan, C., (2019). Do experiences with nature promote learning? Converging evidence of a cause-and-effect relationship. *Frontiers in Psychology*, 10. <http://dx.doi.org/10.3389/fpsyg.2019.00305>
- ⁷⁹ Study: University College London Institute of Education. E-mail, Author: "Children in Green Urban Spaces 'Perform Better Academically.'" *Child in the City*, 27 Sept. 2018. https://www.childinthecity.org/2018/09/27/children-in-green-urban-spaces-perform-better-academically/?utm_source=newsletter&utm_medium=email&utm_campaign=Newsletter%20week%202018-40.
- ⁸⁰ Source: Bikomeye, J. C., Balza, J., Beyer, K. M., (2021). The impact of schoolyard greening on children's physical activity and socioemotional health: A systematic review of experimental studies. *International Journal of Environmental Research and Public Health*, 18(535), 1-20 . doi: <http://dx.doi.org/10.3390/ijerph18020535>.
- ⁸¹ Study: Kuo, M., Klein, S. E., Browning, M. H., Zaplatosch, J., (2021). Greening for academic achievement: Prioritizing what to plant and where. *Landscape and Urban Planning*, 206. doi: <http://dx.doi.org/10.1016/j.landurbplan.2020.103962>.
- ⁸² Study: Pimlott-Wilson, H., Coates, J., (2019). Rethinking learning? Challenging and accommodating neoliberal educational agenda in the integration of Forest School into mainstream educational settings. *The Geographical Journal*, 185(3), 268-278. <http://dx.doi.org/10.1111/geoj.12302>
- ⁸³ Study: Sonti, N.F., Campbell, L.K., Johnson, M.L, Daftary-Steel, S., (2016). Long-term outcomes of an urban farming internship program. *Journal of Experiential Education*, 1-19.
- ⁸⁴ Source: *Taylor and Francis Online*, <https://www.tandfonline.com/doi/full/10.1080/01426397.2019.1569217>.
- ⁸⁵ Source: Williams, D. R., Dixon, P. S., (2013). Impact of garden-based learning on academic outcomes in schools: Synthesis of research between 1990 and 2010. *Review of Educational Research*, 1 -25.
- ⁸⁶ Study: Yang, Bo-Yi, et al. "Association Between Greenness Surrounding Schools and Kindergartens and Attention-Deficit/Hyperactivity Disorder in Children in China." *JAMA Network Open*, 12/18/19, <https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2757630>.
- ⁸⁷ Study: Pereira, Ana. "Might School Performance Grow on Trees? Examining the Link Between 'Greenness' and Academic Achievement in Urban, High-Poverty Schools." *Frontiers*, 14 Oct. 2017. University of Illinois at Urbana-Champaign. <https://www.frontiersin.org/articles/10.3389/fpsyg.2018.01669/full>.
- ⁸⁸ Source: Fabertaylor, Andrea. VIEWS OF NATURE AND SELF-DISCIPLINE: EVIDENCE FROM INNER CITY CHILDREN. *Science Direct*. Accessed 11 Feb. 2019. University of Illinois Urbana-Champaign. <https://www.sciencedirect.com/science/article/abs/pii/S0272494401902415>.
- ⁸⁹ Source: "NIH Releases First Dataset from Unprecedented Study of Adolescent Brain Development." *National Institutes of Health (NIH)*, 13 Feb. 2018. <https://www.nih.gov/news-events/news-releases/nih-releases-first-dataset-unprecedented-study-adolescent-brain-development>.
- ⁹⁰ Study: University of Calgary. McCoy, Author. "Excessive Screen Time Linked to Preschool Learning Delays." *News*, 28 Jan. 2019. <http://www.ucalgary.ca/news/excessive-screen-time-linked-preschool-learning-delays>. <https://www.ucalgary.ca/utoday/issue/2019-01-28/excessive-screen-time-linked-preschool-learning-delays>.
- ⁹¹ Study: "Being raised in greener neighborhoods may have beneficial effects on brain development," University of California - Los Angeles. *ScienceDaily*, 23 Feb. 2018. <https://www.sciencedaily.com/releases/2018/02/180223100626.htm>.
- ⁹² Study: SOYLU, Meryem. "Do Lessons in Nature Boost Subsequent Classroom Engagement? Refueling Students in Flight." *Frontiers*, 28 Aug. 2017. <https://www.frontiersin.org/articles/10.3389/fpsyg.2017.02253/full>.
- ⁹³ Article: Mooney, Chris. "Why Green Spaces Are Good for Your Kid's Brain." *The Washington Post*, 15 June 2015. <http://www.washingtonpost.com/news/energy-environment/wp/2015/06/15/why-green-spaces-are-good-for-your-kids-brain/?postshare=3751434485282465>.
- ⁹⁴ Study: "Green Spaces and Cognitive Development in Primary Schoolchildren" *PNAS*, May 2015. <https://www.pnas.org/content/112/26/7937>.
- ⁹⁵ Source: Sleurs H, Silva AI, Bijmens EM, et al. Exposure to Residential Green Space and Bone Mineral Density in Young Children. *JAMA Netw Open*. 2024;7(1):e2350214. doi: <https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2813603>.
- ⁹⁶ Source: Williams, L. A., et al. (2024). PM2.5, vegetation density, and childhood cancer: a case-control registry-based study from Texas 1995-2011. *JNCI: Journal of the National Cancer Institute*. doi.org/10.1093/jnci/djae035.

-
- ⁹⁷ Study: Norwood, M.F., Lakhani, A., Fullagar, S., Maujean, A., Downes, M., Byrne, J., Stewart, A., Barber, B., Kendall, E., (2019). A narrative and systematic review of the behavioural, cognitive and emotional effects of passive nature exposure on young people: Evidence for prescribing change. *Landscape and Urban Planning*, 189, 71-79. doi: <http://dx.doi.org/10.1016/j.landurbplan.2019.04.007>
- ⁹⁸ Study: D'Agostino, E.M., Frazier, S.L., Hansen, E., Patel, H.H., Ahmed, Z., Okeke, D., Nardi, M.I., Messiah, S.E., (2019). Two-year changes in neighborhood juvenile arrests after implementation of an afterschool park-based mental health promotion program in Miami-Dade County, Florida, 2015-2017. *American Journal of Public Health*. doi: <http://dx.doi.org/10.2105/AJPH.2019.305050>
- ⁹⁹ Study: Izenstark, D., Ebata, A.T., (2019). Why families go outside: An exploration of mothers' and daughters' family-based nature activities. *Leisure Sciences*. doi: <http://dx.doi.org/10.1080/01490400.2019.1625293>
- ¹⁰⁰ Study: Toews, B., Wagenfeld, A., Stevens, J., Shoemaker, C., (2020). Feeling at home in nature: A mixed method study of the impact of visitor activities and preferences in a prison visiting room garden. *Journal of Offender Rehabilitation*, 59(4), 223-246. doi: <http://dx.doi.org/10.1080/10509674.2020.1733165>
- ¹⁰¹ Study: Bowers, E. P., Larson, L. R., Parry, B. J., (2021). Nature as an ecological asset for positive youth development: Empirical evidence from rural communities. *Frontiers in Psychology*, 12. doi: <http://dx.doi.org/10.3389/fpsyg.2021.688574>
- ¹⁰² Study: Barger, B., Larson, L. R., Ogletree, S., Torquati, J., Rosenberg, S., Gaither, C. J., Bartz, J. M., Gardner, A., Moody, E., (2020). Tree canopy coverage predicts lower conduct problem severity in children with ASD. *Journal of Mental Health Research in Intellectual Disabilities*, 13(1), 43-61. <http://dx.doi.org/10.1080/19315864.2020.1714824>
- ¹⁰³ Study: Astrid N. Zamora et al, Exploring the beliefs and perceptions of spending time in nature among U.S. youth, *BMC Public Health* (2021). <https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-021-11622-x>
- ¹⁰⁴ Study: Jia, P., Cao, X., Yang, H., Dai, Shaoqing, He, P., Huang, G., Wu, T., Wang, Y., (2020). Green space access in the neighbourhood and childhood obesity. *Obesity Reviews*. doi: <http://dx.doi.org/10.1111/obr.13100>.
- ¹⁰⁵ Study: Gaminiesfahani, H., Lozanovska, M., Tucker, R., (2020). A scoping review of the impact on children of the built environment design characteristics of healing spaces. *Health Environments Research & Design Journal*. doi: <https://journals.sagepub.com/doi/10.1177/1937586720903845>.
- ¹⁰⁶ Study: Roslund, M.I., Puhakka, R., Grönroos, M., Nurminen, N., Oikarinen, S., Gazali, A.M., Cinek, O., Kramná, L., Siter, N., Vari, H.K., Soininen, L., Parajuli, A., Rajaniemi, J., Kinnunen, T., Laitinen, O.H., (2020). Biodiversity intervention enhances immune regulation and health-associated commensal microbiota among daycare children. *Science Advances*, 6(42). doi: <http://dx.doi.org/10.1126/sciadv.aba2578>.
- ¹⁰⁷ Study: Jia, P., Cao, X., Yang, H., Dai, Shaoqing, He, P., Huang, G., Wu, T., Wang, Y., (2020). Green space access in the neighbourhood and childhood obesity. *Obesity Reviews*. doi: <http://dx.doi.org/10.1111/obr.13100>.
- ¹⁰⁸ Study: Islam, M. Z., Johnson, J., Sly, P. D., (2020). Green space and early childhood development: A systematic review. *Reviews on Environmental Health*, 35(2), 189-200. doi: <http://dx.doi.org/10.1515/reveh-2019-0046>.
- ¹⁰⁹ Study: Bao, W., Yang, B., Zou, Z., Ma, J., Jing, J., Wang, H., Luo, J., Zhang, X., Luo, C., Wang, H., Zhao, H., Pan, D., Gui, Z., Zhang, J., Guo, Y., (2021). Greenness surrounding schools and adiposity in children and adolescents: Findings from a national population-based study in China. *Environmental Research*, 192. doi: <http://dx.doi.org/10.1016/j.envres.2020.110289>.
- ¹¹⁰ Study: Yar, M. A., Kazemi, F., (2020). The role of dish gardens on the physical and neuropsychological improvement of hospitalized children. *Urban Forestry & Urban Greening*, 53. doi: <http://dx.doi.org/10.1016/j.ufug.2020.126713>.
- ¹¹¹ Study: Yang, Y., Lu, Y., Yang, L., Gou, Z., Zhang, X., (2020). Urban greenery, active school transport, and body weight among Hong Kong children. *Travel Behavior and Society*, 20, 104-113. doi: <http://dx.doi.org/10.1016/j.tbs.2020.03.001>.
- ¹¹² Study: Gaminiesfahani, H., Lozanovska, M., Tucker, R., (2020). A scoping review of the impact on children of the built environment design characteristics of healing spaces. *Health Environments Research & Design Journal*. doi: <http://dx.doi.org/10.1177/1937586720903845>.
- ¹¹³ Putra, I.G.N.E., Astell-Burt, T., Cliff, D.P., Vella, S.A., John, E.E., Feng, X, (2020). The relationship between green space and prosocial behaviour among children and adolescents: A systematic review. *Frontiers in Psychology*, 11: <http://dx.doi.org/10.3389/fpsyg.2020.00859>.

-
- ¹¹⁴ Study: Saint Louis University. "Children Eat More Fruits And Vegetables If They Are Homegrown." ScienceDaily. ScienceDaily, 19 April 2007. www.sciencedaily.com/releases/2007/04/070418163652.htm.
- ¹¹⁵ Study: Hartley et al. 2020. Effect of greenness on asthma in children: A systematic review, doi: <http://dx.doi.org/10.1111/phn.12701>.
- ¹¹⁶ Study: Xiao, Xiang, et al. "Greenness around Schools Associated with Lower Risk of Hypertension among Children: Findings from the Seven Northeastern Cities Study in China." ScienceDirect, vol. 256, Jan. 2020, <https://www.sciencedirect.com/science/article/pii/S0269749119331598?via%3Dihub>.
- ¹¹⁷ Study: Oh, Yun-Ah, et al. "Real Foliage Plants as Visual Stimuli to Improve Concentration and Attention in Elementary Students ." International Journal of Environmental Research and Public Health, Jan. 2019, <https://www.mdpi.com/1660-4601/16/5/796>.
- ¹¹⁸ Study: Andersson Nordbø, Emma Charlott, et al. "Neighborhood Green Spaces, Facilities and Population Density as Predictors of Activity Participation among 8-Year-Olds: A Cross-Sectional GIS Study Based on the Norwegian Mother and Child Cohort Study." BMC Public Health, Oct. 2019, <https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-019-7795-9>.
- ¹¹⁹ Study: Niemistö, Donna. "Environmental Correlates of Motor Competence in Children—The Skilled Kids Study." MDPI, 4 June 2019. <https://www.mdpi.com/1660-4601/16/11/1989>.
- ¹²⁰ Study: Staaks, Overbeeka, Authors. A Dose of Nature: Two Three-Level Meta-Analyses of the Beneficial Effects of Exposure to Nature on Children's Self-Regulation. Accessed 11 Feb. 2019. <https://www.sciencedirect.com/science/article/pii/S0272494419301264>.
- ¹²¹ Study: University of Southern California, University of California San Diego & University of California. Authors, For. "Digital Media Use and ADHD in Adolescents." Chaelin K. Ra, Junhan Cho, PhD, Matthew D. Stone, BA, Julianne De La Cerda, BA, Nicholas . Goldenson, BA, Elizabeth Moroney, MA, Irene Tung, MA, Steve S. Lee, PhD, Adam M. Leventhal, PhD. 1,4, 17 July 2018. <https://jamanetwork.com/journals/jama/fullarticle/2687861>.
- ¹²² Study: University of Manchester, University of Oxford & Cardiff University, Panel Thea Cameron-Faulkner, Joanna Melville, Meredith Gattisc, Authors. *Responding to Nature: Natural Environments Improve Parent-Child Communication*. Science Direct. Accessed 11 Feb. 2019. <https://www.sciencedirect.com/science/article/abs/pii/S0272494418301178>.
- ¹²³ Study: Böbel, Till S., et al. "Less Immune Activation Following Social Stress in Rural vs. Urban Participants Raised with Regular or No Animal Contact, Respectively." PNAS , Less immune activation following social stress in rural vs. urban participants raised with regular or no animal contact, respectively, <https://www.pnas.org/content/115/20/5259>.
- ¹²⁴ Study: Wells, N.M. (2000). "At Home with Nature: Effects of "greenness" on children's cognitive functioning. Environment and Behavior." (32), 6, pp 775-795. <http://eab.sagepub.com/cgi/content/abstract/32/6/775>.
- ¹²⁵ Study: Liao, Jiaqiang, et al. "Residential Exposure to Green Space and Early Childhood Neurodevelopment." ScienceDirect, vol. 128, July 2019, pp. 70-76, <https://www.sciencedirect.com/science/article/pii/S0160412018325856?via%3Dihub>.
- ¹²⁶ Source: Núria de la Osa, Jose-Blas Navarro, Eva Penelo, Antonia Valentí, Lourdes Ezpeleta, Payam Davdand, Long-term exposure to greenspace and anxiety from preschool and primary school children, Journal of Environmental Psychology, Volume 93, 2024, 102207, ISSN 0272-4944, <https://doi.org/10.1016/j.jenvp.2023.102207>.
- ¹²⁷ Study: Alderton, A., Villanueva, K., O'Connor, M., Boulangé, C., Badland, H., (2019). Reducing inequities in early childhood mental health: How might the neighborhood built environment help close the gap? A systematic search and critical review. International Journal of Environmental Research and Public Health, 16. <http://dx.doi.org/10.3390/ijerph16091516>
- ¹²⁸ Study: McCrorie, P., Olsen, J. R., Caryl, F. M., Nicholls, N., Mitchell, R., (2021). Neighborhood natural space and the narrowing of socioeconomic inequality in children's social, emotional, and behavioural wellbeing. Wellbeing, space and society, 2. <https://doi.org/10.1016/j.wss.2021.100051>
- ¹²⁹ Study: Zhang, Y., Mavoa, S., Zhao, J., Raphael, D., Smith, M., (2020). The association between green space and adolescents' mental well-being: A systematic review. International Journal of Environmental Research and Public Health, 17(6640). doi: <http://dx.doi.org/10.3390/ijerph17186640>
- ¹³⁰ Study: Li, D., Sullivan, W.C., (2016). Impact of views to school landscapes on recovery from stress and mental fatigue. Landscape and Urban Planning, 148, 149-158. <http://dx.doi.org/10.1016/j.landurbplan.2015.12.015>

- ¹³¹ Study: Kuo, PhD, Frances E., and Andrea Faber Taylor, PhD. "A Potential Natural Treatment for Attention-Deficit/Hyperactivity Disorder: Evidence from a National Study." *American Journal of Public Health* 94.9. Sept. 2004. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1448497/>.
- ¹³² Source: Chadwich, Jonathan. "Children Who Grow up Feeling Close to Nature Are Happier and More Likely to Care for the Planet than Those Who Suffer from 'Nature Deficit Disorder', Study Shows." *Daily Mail*, 26 Feb. 2020, <https://www.dailymail.co.uk/sciencetech/article-8046155/Children-grow-feeling-closer-nature-happier-says-study.html>.
- ¹³³ Roberts, A., Hinds, J., Camic, P.M., (2019). Nature activities and wellbeing in children and young people: A systematic literature review. *Journal of Adventure Education and Outdoor Learning*: <http://dx.doi.org/10.1080/14729679.2019.1660195>.
- ¹³⁴ Study: Oswald, T. K., Rumbold, A. R., Kedzior, S. G. E., Moore, V. M., (2020). Psychological impacts of "screen time" and "green time" for children and adolescents: A systematic scoping review. *PLOS ONE*, 15(9), 1-52. doi: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0237725>.
- ¹³⁵ Study: Lindemann-Matthies, P., Benkowitz, D., Hellinger, F., (2021). Associations between the naturalness of window and interior classroom views, subjective well-being of primary school children and their performance in an attention and concentration test. *Landscape and Urban Planning*, 214. doi: <http://dx.doi.org/10.1016/j.landurbplan.2021.104146>
- ¹³⁶ Study: Sprague, N. L., Ekenga, C. C., (2021). The impact of nature-based education on health-related quality of life among low-income youth: Results from an intervention study. *Journal of Public Health*, 1-8. doi: <http://dx.doi.org/10.1093/pubmed/fdaa243>
- ¹³⁷ Study: Lee, M.J., Oh, W., Jang, J.S., Lee, J.Y., (2018). A pilot study: Horticulture-related activities significantly reduce stress and salivary cortisol concentration of maladjusted elementary school children. *Complementary Therapies in Medicine*, 37, 172-177.
- ¹³⁸ Study: L.Dopko, Raelyne. "The Psychological and Social Benefits of a Nature Experience for Children: A Preliminary Investigation." <https://www.sciencedirect.com/science/article/pii/S0272494418307102>. Accessed 11 Feb. 2019. <https://www.sciencedirect.com/science/article/pii/S0272494418307102?via%3Dihub>.
- ¹³⁹ Study: Rian, S. W., Coll, K. M., (2021). Increased exposure to nature reduces elementary students' anxiety. *Ecopsychology*. doi: <http://dx.doi.org/10.1089/eco.2020.0070>
- ¹⁴⁰ Study: Norwood, M. F., Lakhani, A., Kendall, E., (2021). Teaching traditional indoor school lessons in nature: The effects on student learning and behaviour. *Landscape and Urban Planning*, 206, 1-10. doi: <https://doi.org/10.1016/j.landurbplan.2020.103963>
- ¹⁴¹ Study: Barrera-Hernandez, Sotelo-Castillo, et al, 2020. Connectedness to Nature: Its Impact on Sustainable Behaviors and Happiness in Children, doi: <https://www.frontiersin.org/articles/10.3389/fpsyg.2020.00276/full>.
- ¹⁴² Study: Ekenga, C.C., Sprague, N., Shobiye, D.M., (2019). Promoting health-related quality of life in minority youth through environmental education and nature contact. *Sustainability*, 11. doi: <http://dx.doi.org/10.3390/su11133544>.
- ¹⁴³ Study: Shu, S., Ma, H., (2020). Restorative effects of urban park soundscapes on children's psychophysiological stress. *Applied Acoustics*, 164.
- ¹⁴⁴ Study: Benita, Bansal & Tunçer, 2019. Public spaces and happiness: Evidence from a large-scale field experiment, doi: <http://dx.doi.org/10.1016/j.healthplace.2019.01.014>.
- ¹⁴⁵ Study: Corraliza, Collado, & Bethelmy, 2012. Nature as a moderator of stress in urban children, doi: <http://dx.doi.org/10.1016/j.sbspro.2012.03.347>.
- ¹⁴⁶ Study: Wells & Evans, 2003. Nearby nature: A buffer of life stress among rural children, doi: <http://dx.doi.org/10.1177/0013916503035003001>.
- ¹⁴⁷ Study: McCormick, R., (2017). Does access to green space impact the mental well-being of children: A systematic review. *Journal of Pediatric Nursing*, 37, 3-7, doi: <http://dx.doi.org/10.1016/j.pedn.2017.08.027>.
- ¹⁴⁸ Study: Harvey, D.J., Montgomery, L.N., Harvey, H., Hall, F., Gange, A.C., Watling, D., (2020). Psychological benefits of a biodiversity-focused outdoor learning program for primary school children. *Journal of Environmental Psychology*, 67, doi: <http://dx.doi.org/10.1016/j.jenvp.2019.101381>.
- ¹⁴⁹ Source: "Playing Freely in Nature May Boost Complex Thinking, Social Skills in Kids: Study." *PTI*, 17 Feb. 2020, <https://www.theweek.in/news/health/2020/02/17/Playing-freely-in-nature-may-boost-complex-thinking-social-skills-in-kids-Study.html>.
- ¹⁵⁰ Study: Lee, Mihye, et al. "Community Greenness and Neurobehavioral Health in Children and Adolescents." *ScienceDirect*, vol. 672, July 2019, pp. 381-88, <https://linkinghub.elsevier.com/retrieve/pii/S004896971931469X>.

- ¹⁵¹ Source: Metro, “Wealthy Children Spend Double the Time Outdoors Than Those from Lower Class Families”. June 27, 2022. https://metro.co.uk/2022/06/27/wealthy-children-spend-double-the-time-outdoors-than-poorer-kids-16896077/?mc_cid=5ef446986d&mc_eid=f565ada799
- ¹⁵² Study: Applied Physiology, Nutrition, and Metabolism (July 15, 2013). doi: <https://doi.org/10.1139/apnm-2013-0137>.
- ¹⁵³ Source: Dankiw, K.A., Tsiros, M.D., Baldock, K.L., Kumar, S., (2020). The impacts of unstructured nature play on health in early childhood development: A systematic review. PLoS ONE, 15(2). doi: <http://dx.doi.org/10.1371/journal.pone.0229006>.
- ¹⁵⁴ Study: Michaelson, V., King, N., Janssen, I., Lawal, S., Pickett, W., (2020). Electronic screen technology use and connection to nature in Canadian adolescents: A mixed methods study. Canadian Journal of Public Health. doi: <http://dx.doi.org/10.17269/s41997-019-00289-y>.
- ¹⁵⁵ Study: Storli, R., Sandseter, E.B.H., (2019). Children's play, well-being and involvement: How children play indoors and outdoors in Norwegian early childhood education and care institutions. International Journal of Play, 8(1), 65-78: <http://dx.doi.org/10.1080/21594937.2019.1580338>.
- ¹⁵⁶ Study: Faber Taylor, A., Butts-Wilmsmeyer, C., (2020). Self-regulation gains in kindergarten related to frequency of green schoolyard use. Journal of Environmental Psychology, 70. <http://dx.doi.org/10.1016/j.jenvp.2020.101440>
- ¹⁵⁷ Study: Puhakka, R., Rantala, O., Roslund, M.I., Rajaniemi, J., Laitinen, O.H., Sinkkonen, A., ADELE Research Group, (2019). Greening of daycare yards with biodiverse materials affords well-being, play and environmental relationships. International Journal of Environmental Research and Public Health, 16(16). <http://dx.doi.org/10.3390/ijerph16162948>
- ¹⁵⁸ Study: Dankiw, K.A., Tsiros, M.D., Baldock, K.L., Kumar, S., (2020). The impacts of unstructured nature play on health in early childhood development: A systematic review. PLoS ONE, 15(2)
- ¹⁵⁹ Source: Ramjuttun , Neha. *Medical News Bulletin*, 26 Feb. 2020, <https://medicalnewsbulletin.com/why-screen-time-reduces-time-spent-outdoors/>.
- ¹⁶⁰ Study: Goldenberg et al. 2019. San Francisco youth outdoor recreation intentions through themed message, doi: <http://dx.doi.org/10.18666/JOREL-2019-V11-I3-9935>.
- ¹⁶¹ Study: Akpınar, Abdullah. “Green Exercise: How Are Characteristics of Urban Green Spaces Associated with Adolescents’ Physical Activity and Health?” *International Journal of Environmental Research & Public Health*, 09/17/19, <https://www.mdpi.com/1660-4601/16/21/4281>.
- ¹⁶² Study: “The Brain + Body Equation - The 2019 ParticipACTION Report Card on Physical Activity and for Children and Youth.” *ParticipACTION*. Accessed 11 Feb. 2019. <https://www.participaction.com/en-ca/resources/report-card>.
- ¹⁶³ Source: Nationwide Children’s Hospital, Ohio. Academy of Pediatrics, American. “Physical Activity Should Be a Vital Sign of Children’s Overall Health.” *Medical Xpress*. Accessed 11 Feb. 2019. <https://medicalxpress.com/news/2018-11-physical-vital-children-health.html>.
- ¹⁶⁴ Study: Katie M Williams^{1,2}, Eva. “Early Life Factors for Myopia in the British Twins Early Development Study.” *British Journal of Ophthalmology*, 1 Aug. 2019. <https://bjophtholmol.com/content/early/2018/10/03/bjophtholmol-2018-312439>.
- ¹⁶⁵ Study: CDC’s National Center for Chronic Disease Prevention and Health Promotion. Division of Adolescent and School Health. *Childhood Obesity*, 20 Oct. 2008. <http://www.cdc.gov/HealthyYouth/obesity>.
- ¹⁶⁶ Source: *Health Benefits & Tips* . <https://www.nwf.org/Home/Kids-and-Family/Connecting-Kids-and-Nature/Health-Benefits-and-Tips>.
- ¹⁶⁷ Taylor, Andrea F., et al. “Growing Up in the Inner City: Green Spaces as Places to Grow.” *SAGE Journals*, 1 Jan. 1998. Accessed 11 Mar. 2019. <https://journals.sagepub.com/doi/abs/10.1177/0013916598301001>.
- ¹⁶⁸ Source: The Harris Poll “Living Landscapes Report” Prepared for the Outdoor Power Equipment Institute.” http://www.livinglandscapesmatter.com/wp-content/uploads/Summary_OPEI-Living-Landscapes.pdf.
- ¹⁶⁹ Source: Center for American Progress, <https://www.americanprogress.org/article/the-nature-gap/>.
- ¹⁷⁰ Source: 10-Minute Walk Program, <https://10minutewalk.org/>.
- ¹⁷¹ Study: Zhang, Z., Martin, K. L., Stevenson, K. T., Yao, Y., (2021). Equally green? Understanding the distribution of urban green infrastructure across student demographic demographics in four public school districts in North Carolina, USA. *Urban Forestry & Urban Greening*, 67, doi: <https://doi.org/10.1016/j.ufug.2021.127434>
- ¹⁷² Study: Huerta, C. M., (2022). Rethinking the distribution of urban green spaces in Mexico City: Lessons from the COVID-19 outbreak. *Urban Forestry & Urban Greening*, 70, doi: <https://doi.org/10.1016/j.ufug.2022.127525>
- ¹⁷³ Source: “Green Space Index: Looking to the Future”, <https://storymaps.arcgis.com/stories/83b164ac89d14890a7004772da10ada4>.

- ¹⁷⁴ Study: Jianxing Guan, Runzi Wang, Derek Van Berkel, Zhongyao Liang, How spatial patterns affect urban green space equity at different equity levels: A Bayesian quantile regression approach, *Landscape and Urban Planning*, Volume 233, 2023, 104709, ISSN 0169-2046, doi: <https://doi.org/10.1016/j.landurbplan.2023.104709>.
- ¹⁷⁵ Study: Alderton, A., Villanueva, K., O'Connor, M., Boulangé, C., Badland, H., (2019). Reducing inequities in early childhood mental health: How might the neighborhood built environment help close the gap? A systematic search and critical review. *International Journal of Environmental Research and Public Health*, 16. doi: <http://dx.doi.org/10.3390/ijerph16091516>
- ¹⁷⁶ Study: Bohnert, A. M., Nicholson, L. M., Mertz, L., Bates, C. R., Gerstein, D. E., (2021). Green schoolyard renovations in low-income urban neighborhoods: Benefits to students, schools, and the surrounding community. *American Journal of Community Psychology*, 1-11. doi: <http://dx.doi.org/10.1002/ajcp.12559>
- ¹⁷⁷ Study: Rigolon, A., Browning, M. H. E. M., McAnirlin, O., Yoon, H., (2021). Green space and health equity: A systematic review on the potential of green space to reduce health disparities. *Journal of Environmental and Public Health*, 18, 1-27. doi: <http://dx.doi.org/10.3390/ijerph18052563>
- ¹⁷⁸ Study: Sikorska, D., Laszkiewicz, E., Krauze, K., Sikorski, P., (2020). The role of informal green spaces in reducing inequalities in urban green space availability to children and seniors. *Environmental Science & Policy*, 108, 144-154. doi: <http://dx.doi.org/10.1016/j.envsci.2020.03.007>
- ¹⁷⁹ Study: Sikorska, D., Laszkiewicz, E., Krauze, K., Sikorski, P., (2020). The role of informal green spaces in reducing inequalities in urban green space availability to children and seniors. *Environmental Science & Policy*, 108, 144-154. doi: <http://dx.doi.org/10.1016/j.envsci.2020.03.007>.
- ¹⁸⁰ Study: Razani, N., Hills, N.K., Thompson, D., Rutherford, G.W., (2020). The association of knowledge, attitudes and access with park use before and after a park-prescription intervention for low-income families in the U.S.. *International Journal of Environmental Research and Public Health*, 17. doi: <http://dx.doi.org/10.3390/ijerph17030701>
- ¹⁸¹ Study: Razani et al. 2019. Clinic and park partnerships for childhood resilience: A prospective study of park prescriptions, doi: <http://dx.doi.org/10.1016/j.healthplace.2019.04.008>.
- ¹⁸² Study: Alderton, Amanda, et al. "Reducing Inequities in Early Childhood Mental Health: How Might the Neighborhood Built Environment Help Close the Gap? A Systematic Search and Critical Review ." *International Journal of Environmental Research and Public Health*, Apr. 2019, doi: <https://www.mdpi.com/1660-4601/16/9/1516>.
- ¹⁸³ Study: Lee, K.O., Mai, K.M. & Park, S. Green space accessibility helps buffer declined mental health during the COVID-19 pandemic: evidence from big data in the United Kingdom. *Nat. Mental Health* 1, 124-134 (2023). <https://doi.org/10.1038/s44220-023-00018-y>
- ¹⁸⁴ Study: You, Y., Pan, S., (2020). Urban vegetation slows down the spread of Coronavirus Disease (COVID-19) in the United States. *Geophysical Research Letters*, 47(18), 1-9. doi: <http://dx.doi.org/10.1029/2020GL089286>.
- ¹⁸⁵ Study: Haasova, S., Czellar, S., Rahmani, L., Morgan, N., (2020). Connectedness with nature and individual responses to a pandemic: An exploratory study. *Frontiers in Psychology*, 11. doi: <http://dx.doi.org/10.3389/fpsyg.2020.02215>.
- ¹⁸⁶ Study: Geng, Dehui (Christina), et al. "Impacts of COVID-19 Pandemic on Urban Park Visitation: A Global Analysis." *NCBI*, Nov. 2020, pp. 1-15, doi: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7660132/>.
- ¹⁸⁷ Source: University of Sheffield . 2019. "Invest in Green Space to Boost Well-being across Cities, Say Researchers." *PhysOrg*, March 27.
- ¹⁸⁸ Study: Lincoln R. Larson, Lauren E. Mullenbach, Matthew H.E.M. Browning, Alessandro Rigolon, Jennifer Thomsen, Elizabeth Covelli Metcalf, Nathan P. Reigner, Iryna Sharaievska, Olivia McAnirlin, Ashley D'Antonio, Scott Cloutier, Marco Helbich, S.M. Labib, Greenspace and park use associated with less emotional distress among college students in the United States during the COVID-19 pandemic, *Environmental Research*, 2021, 112367, ISSN 0013-9351, <https://doi.org/10.1016/j.envres.2021.112367>.
- ¹⁸⁹ Study: Pouso, S., Borja, A., Fleming, L. E., Gómez-Baggethun, E., White, M. P., Ulyarra, M. C., (2021). Contact with blue-green spaces during the COVID-19 pandemic lockdown beneficial for mental health. *Science of the Total Environment*, 756. doi: <http://dx.doi.org/10.1016/j.scitotenv.2020.143984>.
- ¹⁹⁰ Study: Dzhambov, A. M., Lercher, P., Browning, M. H. E. M., Stoyanov, D., Petrova, N., Novakov, S., Dimitrova, D. D., (2020). Does greenery experienced indoors and outdoors provide an escape and support mental health during the COVID-19 quarantine?. *Environmental Research*. doi: <http://dx.doi.org/10.1016/j.envres.2020.110420>.
- ¹⁹¹ Source: Dueck, Shannon. 02/15/21, <https://portageonline.com/local/canadians-using-nature-to-cope-with-pandemic>.
- ¹⁹² Study: C. Colley, Rachel, et al. "Exercise and Screen Time during the COVID-19 Pandemic." *Statistics Canada*, doi: <https://www150.statcan.gc.ca/n1/pub/82-003-x/2020006/article/00001-eng.htm>.

- ¹⁹³ Source: Dorking, Marie. “Children Will Miss the Outdoors When Lockdown Ends, Research Suggests.” *Yahoo Sports*, 8 June 2020, <https://sports.yahoo.com/children-will-miss-outdoors-lockdown-ends-092240821.html>.
- ¹⁹⁴ Study: Cowie, H., Myers, C., (2020). The impact of the COVID-19 pandemic on the mental health and well-being of children and young people. *Children and Society*. doi: <http://dx.doi.org/10.1111/chso.12430>.
- ¹⁹⁵ Study: Brent Jackson, S., et al. (2021) Outdoor Activity Participation Improves Adolescents’ Mental Health and Well-Being during the COVID-19 Pandemic. *International Journal of Environmental Research and Public Health*. doi: <https://www.mdpi.com/1660-4601/18/5/2506>.
- ¹⁹⁶ Source: Hunt, Elle. “How Pets Are Helping Us through the Coronavirus Crisis .” *The Guardian*, 3 Apr. 2020, https://www.theguardian.com/world/2020/apr/03/pets-helping-coronavirus-crisis-animals?CMP=oth_b-aplnews_d-1.
- ¹⁹⁷ Source: The Washington Post. “Why Skipping Your Dog’s Walk is a Bigger Deal Than You Think.” February 20, 2024. www.washingtonpost.com/home/2024/02/20/dog-walks-better-for-health/?utm_campaign=wp_post_most&utm_medium=email&utm_source=newsletter&wpisrc=nl_most&carta-url=https%3A%2F%2Fs2.washingtonpost.com%2Fcar-ln-tr%2F3ccf0f5%2F65d4e2be398354184fd785b8%2F5c434e38ade4e25cb2889ef0%2F26%2F54%2F65d4e2be398354184fd785b8
- ¹⁹⁸ Study: The Harris Poll for the TurfMutt Foundation, <https://bit.ly/41Qti8B>.
- ¹⁹⁹ Source: “Dog Ownership Associated with Longer Life, Especially among Heart Attack and Stroke Survivors.” American Heart Association, 8 Oct. 2019, <https://newsroom.heart.org/news/dog-ownership-associated-with-longer-life-especially-among-heart-attack-and-stroke-survivors>.
- ²⁰⁰ Study: Harwood, C., Kaczmarek, E., Drake, D., (2019). Parental perceptions of the nature of the relationship children with autism spectrum disorders share with their canine companion. *Journal of Autism and Developmental Disorders*, 49, 248-259. <http://dx.doi.org/10.1007/s10803-018-3759-7>.
- ²⁰¹ Study: Wenden, E.J., Lester, L., Zubrick, S.R. *et al.* The relationship between dog ownership, dog play, family dog walking, and pre-schooler social-emotional development: findings from the PLAYCE observational study. *Pediatr Res* (2020). <https://doi.org/10.1038/s41390-020-1007-2>
- ²⁰² Study: Yolken, Robert, et al. “Exposure to Household Pet Cats and Dogs in Childhood and Risk of Subsequent Diagnosis of Schizophrenia or Bipolar Disorder.” *PLOS | ONE* , 12/02/19, <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0225320>.
- ²⁰³ Study: “Relationships among Dog Ownership and Leisure-Time Walking in Western Canadian Adults.” *PubMed - NCBI*. <https://www.ncbi.nlm.nih.gov/pubmed/16459211>. Accessed 11 Mar. 2019. <https://www.ncbi.nlm.nih.gov/pubmed/16459211>.
- ²⁰⁴ Source: Coren, Stanley. FRSC. “Health and Psychological Benefits of Bonding with a Pet Dog.” *Psychology Today*, 7 June 2009. <https://www.psychologytoday.com/ca/blog/canine-corner/200906/health-and-psychological-benefits-bonding-pet-dog>.
- ²⁰⁵ Study: “Dog’s gaze at its owner increases owner’s urinary oxytocin during social interaction.” *PubMeddev. PubMed - NCBI*. Accessed 11 Mar. 2019. <https://www.ncbi.nlm.nih.gov/pubmed/19124024> .
- ²⁰⁶ Study: Mwenya Mubanga, Liisa Byberg, Agneta Egenvall, Erik Ingelsson, Tove Fall. “Dog Ownership and Survival after a Major Cardiovascular Event.” *AHA / ASA Journals AHA / ASA Journals*. Accessed 11 Mar. 2019. <https://www.ahajournals.org/doi/10.1161/CIRCOUTCOMES.118.005342>.
- ²⁰⁷ Study: Mueller, Megan. “Is Human-Animal Interaction (HAI) Linked to Positive Youth Development.” *Taylor and Francis Online*. Accessed 11 Mar. 2019. <https://www.tandfonline.com/doi/abs/10.1080/10888691.2014.864205?journalCode=hads20>.
- ²⁰⁸ Study: The Harris Poll for the TurfMutt Foundation, <https://bit.ly/41Qti8B>.
- ²⁰⁹ Study: The Harris Poll “Yards Report” Prepared for the TurfMutt Foundation, <https://www.turfmutt.com/news/poll/>.
- ²¹⁰ Article: <https://www.growingmagazine.com/landscaping-insights-that-all-homeowners-should-know-this-year/>
- ²¹¹ Study: Nowak, David J; Greenfield, Eric J. 2018. US Urban Forest Statistics, Values, and Projections. *Journal of Forestry*. 116(2): 164-177, doi: <https://doi.org/10.1093/jofore/fvx004>.
- ²¹² Source: Elam, Emmett, and Andrea Stigarll. “Landscape and House Appearance Impacts on the Price of Single-Family Houses.” *Journal of Environmental Horticulture*, Dec. 2012. <https://www.hrijournal.org/doi/full/10.24266/0738-2898.30.4.182>.
- ²¹³ Study: Proceedings of the National Academy of Sciences. “Citywide Cluster Randomized Trial to Restore Blighted Vacant Land and Its Effects on Violence, Crime, and Fear.” *PNAS*, 20 Mar. 2018. <https://www.pnas.org/content/115/12/2946>.

- ²¹⁴ Source: “2018 Remodeling Impact Report: Outdoor Features.” *National Association of Realtors®*. PDF. 11 Mar. 2019. <https://www.nar.realtor/sites/default/files/documents/2018-05-remodeling-impact-outdoor-features-05-23-2018.pdf>.
- ²¹⁵ Source: Anderson, L.M.; Cordell, H.K. 1988. “Residential property values improve by landscaping with trees.” *Southern Journal of Applied Forestry* 9: 162-166. Neely, D., ed. 1988. *Valuation of landscape trees, shrubs, and other plants*, 7th ed. Urbana, IL: International Society of Arboriculture. <https://academic.oup.com/sjaf/article-abstract/9/3/162/4794520?redirectedFrom=PDF>.
- ²¹⁶ Source: Nowak, David J.; Stein, Susan M.; Randler, Paula B.; Greenfield, Eric J.; Comas, Sara J.; Carr, Mary A.; Alig, Ralph J. “Sustaining America’s urban trees and forests: a Forests on the Edge report.” Gen.Tech. Rep. NRS-62. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. p. 6. 2010. Accessed 11 Mar. 2019. *Open Space Conservation*. <https://www.nrs.fs.usda.gov/pubs/35572>.
- ²¹⁷ Source: “The Benefits of Trees.” *Arborday.Org*, 11 Mar. 2019. <https://www.arborday.org/trees/benefits.cfm>. Accessed 11 Mar. 2019.
- ²¹⁸ Source: McPherson, E.G.; Simpson, J.R.; Peper, P.J.; Maco, S.E.; Gardner, S.L.; Cozad, S.K.; Xiao, Q. 2005. “Midwest community tree guide: benefits, costs, and strategic planting.” NA-TP-05-06. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northeastern Area State and Private Forestry. <https://www.fs.usda.gov/treesearch/pubs/25927>.
- ²¹⁹ Source: Wolf, K.L. “Nature and commerce: human ecology in business districts.” In Kollin, C., ed. *Building Cities of Green: Proceedings of the 1999 National Urban Forest Conference*. Washington, DC: American Forests: 56-59, 1999. <https://www.naturewithin.info/CityBiz/1999AmFor.pdf>.
- ²²⁰ Study: panel White, M.P., et al. “Recreational physical activity in natural environments and implications for health: A population based cross-sectional study in England.” *ScienceDirect*. Accessed 11 Mar. 2019. <https://www.sciencedirect.com/science/article/pii/S0091743516302298>.
- ²²¹ Source: Pittenger, Dennis R. and Hodel, Donald R. “The California Drought and Landscape Water Use.” *University of California Cooperative Extension. Environmental Horticulture*. Accessed 11 Mar. 2019. <ucanr.edu/sites/HodelPalmsTrees/files/215524.pdf>.
- ²²² Source: Geo: Geography And Environment Journal, “Exploring the relationship between bird diversity and anxiety and mood disorder hospitalization rates, August 2023, doi: <https://doi.org/10.1002/geo2.127>.”
- ²²³ Source: The Washington Post, <https://www.washingtonpost.com/wellness/interactive/2023/birds-song-nature-mental-health-benefits/>.
- ²²⁴ Study: Schmitz, O.J., Sylvén, M., Atwood, T.B. et al. Trophic rewilding can expand natural climate solutions. *Nat. Clim. Chang.* 13, 324-333 (2023). doi: <https://doi.org/10.1038/s41558-023-01631-6>.
- ²²⁵ Study: The Harris Poll for the TurfMutt Foundation, <https://bit.ly/41Qti8B>.
- ²²⁶ Study: Reyes-Riveros, R., Altamirano, A., Barrera, F. D. L., Rozas-Vasquez, D., Vieli, L., Meli, P., (2021). Linking public urban green spaces and human well-being: A systematic review. *Urban Forestry & Urban Greening*, 61. doi: <http://dx.doi.org/10.1016/j.ufug.2021.127105>.
- ²²⁷ Study: Joel Methorst, Katrin Rehdanz, Thomas Mueller, Bernd Hansjürgens, Aletta Bonn, Katrin Böhning-Gaese. The importance of species diversity for human well-being in Europe. *Ecological Economics*, 2020; 106917. doi: 10.1016/j.ecolecon.2020.106917.
- ²²⁸ Source: “New Survey Shows Americans Increasingly Gardening to Benefit Wildlife, Pollinators.” *National Wildlife Federation*, <https://www.nwf.org/Home/Latest-News/Press-Releases/2020/05-05-20-2020-National-Gardening-Survey>. Accessed 30 Aug. 2020.
- ²²⁹ Study: Rosenberg, Kenneth V., et al. “Decline of the North American avifauna.” *Science*, 4 Oct. 2019. <https://science.sciencemag.org/content/366/6461/120>.
- ²³⁰ Study: “Urban Tiny Forests Are Good for Biodiversity.” “Urban Tiny Forests Are Good for Biodiversity.” *Wageningen University & Research: WUR*, 23 Apr. 2018, <https://www.wur.nl/en/newsarticle/Urban-tiny-forests-are-good-for-biodiversity.htm>.
- ²³¹ Study: McKinney, Michael, L. “Urbanization, Biodiversity, and Conservation: The Impacts of Urbanization on Native Species Are Poorly Studied, but Educating a Highly Urbanized Human Population about These Impacts Can Greatly Improve Species Conservation in All Ecosystems.” *OUP Academic*, 1 Oct. 2002. <http://bioscience.oxfordjournals.org/content/52/10/883.full>.
- ²³² Article: Worland, Justin. “How the California Drought is Hurting Wildlife” *Time*. 1 June 2015. <http://time.com/3901467/california-drought-wildlife/>.
- ²³³ Article: Saunders, Manu. “Birds, bees and bugs: your garden is an ecosystem, and it needs looking after.” *The Conversation*, 26 Sept. 2016. <http://theconversation.com/birds-bees-and-bugs-your-garden-is-an-ecosystem-and-it-needs-looking-after-65226>.

- ²³⁴ Source: “Urban Heat Hot Spots”, Climate Central, July 2023, doi: <https://www.climatecentral.org/climate-matters/urban-heat-islands-2023>.
- ²³⁵ Study: Massaro, E., Schifanella, R., Piccardo, M. et al. Spatially-optimized urban greening for reduction of population exposure to land surface temperature extremes. *Nat Commun* 14, 2903 (2023). doi: <https://doi.org/10.1038/s41467-023-38596-1>.
- ²³⁶ Source: Environmental Protection Agency. “Heat Islands Cooling Strategies”. doi: <https://www.epa.gov/heatislands/heat-island-cooling-strategies>.
- ²³⁷ Source: *Lawn Central*. <https://www.lawncentral.com/home/lawns-matter/>.
- ²³⁸ Source: Aminpour, F., (2021). The physical characteristics of children's preferred natural settings in primary school grounds. *Urban Forestry & Urban Greening*. <http://dx.doi.org/10.1016/j.ufug.2021.127163>
- ²³⁹ Source: University, Macquarie. “A Cooler Home Is Right in Your Own Back Yard.” *Phys.Org*, <https://phys.org/news/2020-03-cooler-home-yard.html>. Accessed 30 Aug. 2020.
- ²⁴⁰ Source: Alliance for Water Efficiency . *Landscape, Irrigation, and Outdoor Water Use*. <https://www.allianceforwaterefficiency.org/resources/outdoor> .
- ²⁴¹ Source: Lenart, Melanie. Extension.org. “Trees and Local Temperature.” *Trees for Energy Conservation* *Trees for Energy Conservation*, 10 Sept. 2019. doi: <https://trees-energy-conservation.extension.org/trees-and-local-temperature/>
- ²⁴² Source: WDRB. January 30, “University of Louisville researcher trying to improve public health with trees.” www.wdrb.com/news/education/university-of-louisville-researcher-trying-to-improve-public-health-with-trees/article_409fa7ec-bf9a-11ee-ab64-53ad598d1529.html.
- ²⁴³ Source: University of Minnesota Extension, “Environmental Benefits of Healthy Lawns.” doi: <https://extension.umn.edu/lawncare/environmental-benefits-healthy-lawns#turfgrass-benefits-air-quality-637163>.
- ²⁴⁴ Study: e Almeida, L.d.O., Favaro, A., Raimundo-Costa, W. et al. Influence of urban forest on traffic air pollution and children respiratory health. *Environ Monit Assess* 192, 175 (2020). doi: <https://doi.org/10.1007/s10661-020-8142-4>.
- ²⁴⁵ Report: “Air Pollution Could Kill 160,000 in next Decade - Report .” *The Guardian* , <https://www.theguardian.com/environment/2020/jan/13/air-pollution-kill-160000-next-decade-report>.
- ²⁴⁶ Source: Cincinnati Children's Hospital Medical Center. “Studies Link Air Pollution to Mental Health Issues in Children.” *ScienceDaily*, 25 Sept. 2019. <https://www.sciencedaily.com/releases/2019/09/190925075731.htm>.
- ²⁴⁷ Study: Garcia, Erika, PhD, et al. “Association of Changes in Air Quality With Incident Asthma in Children in California, 1993-2014.” *Jama*, 21 May 2019. <https://jamanetwork.com/journals/jama/fullarticle/2733972>.
- ²⁴⁸ Source: Centers for Disease Control & Prevention, Cdc. “Most Recent Asthma Data Available from CDC.” *Centers for Disease Control and Prevention*, 25 Mar. 2019. https://www.cdc.gov/asthma/most_recent_data.htm.
- ²⁴⁹ Sources: Donnelly, Laura. “Four in Ten Children Are Breathing ‘Toxic Air’ at School.” *Telegraph.Co.Uk*, 7 Jan. 2019. <https://www.telegraph.co.uk/news/2019/01/07/four-ten-children-breathing-toxic-air-school-run/>.
- ²⁵⁰ Source: The Lawn Institute, “Oxygen Production”, <https://www.thelawninstitute.org/environmental-benefits/oxygen-production/>
- ²⁵¹ Source: Leonard, Mark. “Lawns and the Air That We Breathe.” *ScienTurfic Sod*. Accessed 11 Mar. 2019. <https://www.scienturificsod.com/growing-great-lawns/lawns-and-the-air-that-we-breathe/>.
- ²⁵² Source: “American Forests.” *American Forests*, 1 Nov. 2019. <http://www.americanforests.org/explore-forests/forest-facts/>.
- ²⁵³ Source: *Tree & Rain Forest Facts*. doi: <https://growingairfoundation.org/facts/>.
- ²⁵⁴ Source: Nowak, David J. et al. “Assessing urban forest effects and values, Los Angeles' urban forest.” *Northern Research Station*. USDA Forest Service. doi: <http://www.nrs.fs.fed.us/pubs/37671>.
- ²⁵⁵ Source: Haozhi Pan et al, Contribution of prioritized urban nature-based solutions allocation to carbon neutrality, *Nature Climate Change* (2023). DOI: 10.1038/s41558-023-01737-x.
- ²⁵⁶ Source: Thompson, Andrea. “What Is a Carbon Sink?” *Live Science*, 21 Dec. 2012. <https://www.livescience.com/32354-what-is-a-carbon-sink.html>.
- ²⁵⁷ Source: “Evaluation of Turfgrasses for Stress Tolerance in a Transition-Zone Environment - UNIVERSITY OF ARKANSAS.” *USDA; U.S. Department of Agriculture*. Accessed 11 Mar. 2019. <http://www.reeis.usda.gov/web/crisprojectpages/0223645-evaluation-of-turfgrasses-for-stress-tolerance-in-a-transition-zone-environment.html>.
- ²⁵⁸ Source: “Looking for Lawns.” *Earth Observatory; NASA*, 8 Nov. 2005. <http://earthobservatory.nasa.gov/Features/Lawn/lawn3.php>.

- ²⁵⁹ Source: Zirkle, Gina, et al. "Modeling Carbon Sequestration in Home Lawns." *HortScience*, vol. 46, no. 5, May 2011, pp. 808-814, <https://journals.ashs.org/hortsci/view/journals/hortsci/46/5/article-p808.xml>.
- ²⁶⁰ Source: "Hidden, Local Climate Impacts of Drought-Friendly Vegetation: New Research Explores the Climate Impact of Drought Vegetation Efforts." University of Southern California. *ScienceDaily*, 5 Aug. 2016. <https://www.sciencedaily.com/releases/2016/08/160805155141.htm>.
- ²⁶¹ Study: Mueller, W., Steinle, S., Pärkkä, J., Parmes, E., Liedes, H., Kuijpers, E., Pronk, A., Sarigiannis, D., Karakitsios, S., Chapizanis, D., Maggos, T., Stamatelopoulou, A., Wilkinson, P., Milner, J., Vardoulakis, S., (2020). Urban greenspace and the indoor environment: Pathways to health via indoor particulate matter, noise, and road noise annoyance. *Environmental Research*, 180. doi: <http://dx.doi.org/10.1016/j.envres.2019.108850>.
- ²⁶² Source: Goines, Lisa, RN and Hagler, Louis, MD. "Noise Pollution: A Modern Plague." *NoNoise.org*. Accessed 11 Mar. 2019. <http://www.nonoise.org/library/smj/smj.htm>.
- ²⁶³ Source: "Alliance for Community Trees." *Arbor Day. Northland Nemo*. Accessed 11 Mar. 2019. <http://actrees.org/news/trees-in-the-news/research/urban-greening-reduces-noise-pollution/>.
- ²⁶⁴ Source: Wired. "Los Angeles Just Proved How Spongy a City Can Be." February 19, 2024. doi: www.wired.com/story/los-angeles-just-proved-how-spongy-a-city-can-be/.
- ²⁶⁵ Source: The Lawn Institute. "Lawns & Urban Water". doi: <https://www.thelawninstitute.org/environmental-benefits/runoff-reduction/>.
- ²⁶⁶ Source: Center for Watershed Protection. "Trees and Stormwater Runoff". doi: <https://cwp.org/reducing-stormwater-runoff/>.
- ²⁶⁷ Source: The Lawn Institute. "Runoff Reduction." doi: <https://www.thelawninstitute.org/environmental-benefits/runoff-reduction/>.
- ²⁶⁸ Source: The Lawn Institute. "Runoff Reduction". doi: <https://www.thelawninstitute.org/environmental-benefits/runoff-reduction/>.
- ²⁶⁹ Source: Walton, B.T., E.A. Guturie, and A.M. Hoylmar. "Toxicant Degradation in the Rhizosphere in T. Anderson and JR. Coats, editors, Bioremediation through the Rhizosphere Technology, ACS Ser. 563. *American Chemical Society*." Washington, D.C. 1994. Page 11-25; Toal, E. M., C. Yeomans, K. Killham, and A.A. Meharg, 2000, A Review of Rhizosphere Carbon Flow Modeling. *Plant Soil*, 222: 263-281.
- ²⁷⁰ Erickson, J.L., Cisar, G.H. Snyder, and J.C. Molin. "Phosphorus and Potassium Leaching under contrasting residential landscape models established on a sandy soil." 2005. *Crop Science*, 45: 546-552.
- ²⁷¹ Source: *Turfgrass Sod vs. Other Erosion Control Methods* . <https://lawnnation.com/benefits-features-facts-about-lawn-sod/turfgrass-sod-vs-other-erosion-control-methods-a-cost-benefit-analysis/>.
- ²⁷² Source: NPS.gov. *Benefits of Turf Grass* . <https://www.nps.gov/subjects/turfmanagement/benefits.htm>.
- ²⁷³ Source: <https://extension.unl.edu/statewide/platte/Lawns%20and%20Water%20Pollution.pdf>. Accessed 11 May 2019.
- ²⁷⁴ Source: Leefeldt, Ed. *Nearly 2 Million Western Homes Face "Severe Risk" of Fire*. 26 Oct. 2016, <https://www.climatesignals.org/headlines/nearly-2-million-western-homes-face-severe-risk-fire>.
- ²⁷⁵ Source: "Professional Practice." 2019. Accessed 11 Mar. 2019. *American Society of Landscape Architects*. <https://www.asla.org/resilient>.
- ²⁷⁶ Source: "Evaluation of Turfgrasses for Stress Tolerance in a Transition-Zone Environment - UNIVERSITY OF ARKANSAS." U.S. Department of Agriculture. Accessed 11 Mar. 2019. <http://www.reeis.usda.gov/web/crisprojectpages/0223645-evaluation-of-turfgrasses-for-stress-tolerance-in-a-transition-zone-environment.html>.
- ²⁷⁷ Source: Dr. Ron Sahu. "Think Before You Remove Your Lawn! The Benefits of Turfgrass." Accessed 11 Mar. 2019. <http://static1.squarespace.com/static/50a39d4ce4b0f822f291399c/t/50b67849e4b0cf86c3e8fc20/1354135625408/Lawn+Benefits+++Ron+Sahu.pdf>.
- ²⁷⁸ Source: BBC News. "Sheffield Scientists Call for Ban on Artificial Grass." April 2023. <https://www.bbc.com/news/uk-england-south-yorkshire-65375197>.
- ²⁷⁹ Source: Woodall, Candy. "'Running out of Room': How Old Turf Fields Raise Potential Environmental, Health Concerns." *York Daily Record*, 18 Nov. 2019, <https://www.ydr.com/in-depth/news/2019/11/18/old-artificial-turf-fields-raise-huge-waste-problem-environmental-concerns-across-nation/2314353001/>.
- ²⁸⁰ Source: The Harris Poll "Living Landscapes Report" Prepared for the Outdoor Power Equipment Institute, http://www.livinglandscapesmatter.com/wp-content/uploads/Summary_OPEI-Living-Landscapes.pdf
- ²⁸¹ Source: "Synthetic Surface Heat Studies." *Brigham Young University*, 2002. Retrieved from: <https://www.westcoastturf.com/getdoc.cfm?id=38>.

²⁸² Source: “Synthetic Turf Heat Evaluation: Progress Report,” *Penn State’s Center for Sports Surface Research*. 2012. Accessed 11 Apr. 2019. <http://plantscience.psu.edu/research/centers/ssrc/documents/heat-progress-report.pdf>.

²⁸³ Source: “CBS2 Investigation: Amid Drought, LADWP Caught Watering Artificial Turf At Substations.” *CBS Los Angeles*, 09/15/2016. <http://losangeles.cbslocal.com/2016/09/15/cbs2-investigation-amid-drought-ladwp-caught-watering-artificial-turf-at-substations/>.

²⁸⁴ Source: “NMSU compares artificial turf to real grass in water usage,” *Las Cruces Sun-Times* on 3 Nov. 2019. Feb. 24, 2018. <http://www.lcsun-news.com/story/news/education/nmsu/2018/02/24/nmsu-compares-artificial-turf-real-grass-water-usage/370397002/>.