



Trees and Public Health

TREE CITY USA®
BULLETIN

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Few readers of this bulletin need to be reminded of the benefits trees provide to our communities. However, thinking of trees in terms of public health is a relatively new insight into the importance of the urban forest. With nearly 80 percent of all Americans living in densely populated areas, the implications of trees benefiting public health are huge. This also helps underscore the necessity of planting and caring for trees.

It has been an exciting adventure watching the field of urban forestry emerge and mature through the years. The term itself was not coined until 1965. It still sounded a bit strange to many ears in 1972 when the Arbor Day Foundation was created and in 1976 when the Tree City USA program was launched. Today urban forestry is widely accepted as an important part of communities of all sizes. Like any good idea, however, it continues to grow and change.

Among the changes I've noticed are the underlying reasons why trees in our cities deserve attention. When we published the first issue of Tree City USA Bulletin in 1987, the emphasis was on planting trees for their shade and beauty. These are good reasons and remain so today. But by the 1990s, research results coming from the U.S. Forest Service and others showed that community trees provide far more services. Moreover, it was found that their benefits can be quantified. For example, we could point out to municipal officials that planting 1 million trees in the Sacramento area would save \$10 million in annual energy costs. Or that the 979,000 trees in Minneapolis remove 384 tons of air pollutants each year. We learned that in Boise, Idaho, the city spends about \$33 a year per tree in its rights of way but in return receives \$43 per tree in energy savings, reduced stormwater runoff costs, increased property values, and improvements in air quality. Thanks to the i-Tree suite of computer programs, this wealth of information can be calculated for any community and can provide management guidance, including tips on the best species of trees to plant.

In this issue of the Tree City USA Bulletin, we introduce another giant step forward in why we should value trees and why their stewardship should be considered part of a city's essential infrastructure. Trees are increasingly linked to public health. In the pages that follow, we provide some of the growing body of evidence that shows the importance of trees to both the physical and mental health of our citizens. We encourage you to add these benefits to the messages you communicate to residents and city officials in seeking support for trees and urban forestry in your community.

We have always said, "Trees are terrific." Now we have more reasons to say why.

Matt Harris, Chief Executive



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How Trees Benefit Public Health

As early as 1882, Frederick Law Olmsted, Father of Landscape Architecture, observed that the influences of nature “touch us so quietly that we are hardly conscious of them.” He also believed that bringing nature into a city was important to the mental and physical health of its residents; essentially that it had a healing effect. Olmsted based his opinions entirely on intuition and thought the subject “too complex, subtle, and spiritual” to be easily studied. How pleased Olmsted would be to know that science is now confirming his insights — and adding more. Here are a few of the many findings resulting from research that confirms a link between trees and human health.

According to the Association of Schools of Public Health, “Public health is the science and art of protecting and improving the health of communities through education, promotion of healthy lifestyles, and research for disease and injury prevention. Public health improves the health and well-being of people in communities around the globe.”

Trees and green space in our living environment are part of a lifestyle that contributes to health. It is time to recognize this and consider trees as a public health issue,

including the need for educational and promotional efforts to build support for planting and properly caring for trees.

In 2010, researchers at the University of Melbourne examined 93 peer-reviewed papers about urban forestry and its relationship to human health. The authors found that there are four major mechanisms for explaining the relationships. With minor changes and recognizing some overlap, we have used these categories in providing examples of studies that highlight health benefits provided by trees.

PHYSICAL ACTION BY TREES

There is a direct link between air pollution and health. According to the Lawrence Berkeley Laboratory, young children and elderly people often suffer more from the effects of air pollution. Individuals with heart and lung diseases are especially affected, including the 20 million Americans who suffer from asthma. One study estimated that 30 percent of childhood asthma is due to environmental exposures, costing the nation \$2 million per year. Studies also suggest that air pollution may contribute to the development of asthma in previously healthy people. Trees help counter air pollution.

- The leaves of trees filter the air, absorbing pollutants that trigger asthma such as sulfur dioxide, nitrogen oxide, and particulate matter (dust, soot, fly ash, diesel exhaust particles, wood smoke, and sulfate aerosols).
- Trees sequester carbon as foliar and woody biomass, reducing global warming, urban heat islands, and ozone production. Because of shading in summer and breaking the wind in winter, energy use is reduced, new power plants are avoided, and the output of pollutants from those that use fossil fuels is thereby reduced.

- Photosynthesis provides life-giving oxygen, and transpiration gives off water vapor that adds to the cooling influence of trees.
- When trees shade asphalt and parked vehicles, the evaporation of hydrocarbon emissions from leaked gasoline is reduced. This reduces a component of smog.
- Between 1973 and 1994, cases of skin cancer doubled. A California health official blamed thinning of the ozone layer in the stratosphere where harmful ultraviolet rays are normally blocked. He reported that 90 percent of all skin cancer is caused by sunlight and that 80 percent of a person’s sun exposure occurs during childhood — with the damage taking its toll later in life. Shade trees over children’s play areas, ball field benches and bleachers, and swimming pool lawns can help reduce direct sun exposure while still allowing the benefits of outdoor activities.

WHAT ABOUT VOCs?

VOCs are volatile organic compounds — chemicals that contribute to ozone pollution. Sources range from felt-tipped pens to building materials. It is true that trees also give off VOCs, mostly isoprenes and monoterpenes. This can be significant, especially in hot climates. The good news is that trees also absorb a quantity of VOCs, especially when under stress, and species vary in their VOC output. Where ozone pollution is a problem, select species with low VOC production rates. Visit arborday.org/bulletins for links to websites that can help.



HUMAN PHYSICAL ACTIVITY ENCOURAGED BY TREES

Physical activity provides benefits ranging from fighting obesity and reducing cholesterol to increasing brain size and functions. Anything that can be done to encourage exercise contributes to public health. Trees and associated green space play an important role.

- Although studies have produced mixed results on why some people engage in outdoor exercise and others do not, two important factors that survive scientific scrutiny are accessibility and attractiveness. Trees obviously contribute to making outdoor spaces attractive, whether they are shopping areas, parks, or tree-lined streets.
- A study of urban adults in Europe found that residents in areas with the highest levels of greenery were three times more likely to be physically active and 40 percent less likely to be overweight than those living in the least green settings.
- Tree lawns are perceived by residents to mean more walkable streets. This not only invites adults to exercise, it has been found to promote more physical activity in children and young people.
- In communities where walk-to-school programs encourage children to be more active, parents usually worry about safety. Research shows that streets having wide sidewalks and 8-foot tree lawns with trees are perceived by parents to be the safest.
- One study found that elderly people who had nearby parks and tree-lined streets showed greater longevity.



RESTORATION AND INDIVIDUAL BENEFITS

Classic studies by Roger Ulrich have highlighted the role of trees in some amazing ways, especially in the recovery of hospital patients. Trees can help reduce stress, restore cognitive function in individuals, and enhance their ability to better face the demands of life.

- Hospital patients with a view of trees instead of a brick wall were found to spend 8.5 percent fewer post-operative days in the hospital and required fewer injections of pain killers.
- In various experiments, trees and natural settings have been found to reduce muscle tension and blood pressure.
- Domestic violence and aggressive behavior were found to occur less in housing projects with trees. This may be due to reduced stress that subsequently allows conflicts to be dealt with in more positive ways.
- Office workers with a view of nature report being more satisfied with their jobs and take significantly fewer sick days than workers without such window views.
- Exposure to trees has been shown to improve thought process and problem-solving skills, raise the level of self-discipline and other traits leading to a more promising future for children, and to improve the behavior of children with attention disorders.
- Roadside trees and green landscaping can reduce driver stress and aggression, calm traffic, and reduce accidents.

SOCIAL SUPPORT

Some of the most striking research has shown a relationship between trees and reduced violence in and around urban housing projects. Dr. Ming (Frances) Kuo, one of the leading researchers, explains that the presence of trees draws people outside where neighborly conversations ensue, social bonds are created, and children can be watched.

- By bringing neighbors together outside through attractive spaces or planting projects, positive interactions take place that help reduce crime.
- Children play in outdoor spaces with trees about twice as often as in barren spaces, and the rate of beneficial creative play is higher.

Communities Recognize the Benefits

Visionary city officials, urban foresters, and others recognize the role of trees in public health and are moving the concept forward in support of trees and urban forestry. This win-win situation not only contributes to public health, but provides all the other benefits of trees as well, including economic perks.

THE U.S. CONFERENCE OF MAYORS



It is not a coincidence that a tree is part of the logo for a major initiative sponsored by the U.S. Conference of Mayors.

“Mayors have single-handedly taken action on climate protection efforts and in many cases, creatively launched local energy efficiency programs to help reduce our carbon footprint in American cities,” wrote

Tom Cochran, CEO and executive director of the organization.

More than 1,000 mayors nationwide have gone on record as taking steps to fight greenhouse gases. Although driven largely by the need to conserve energy and fight climate change, the underlying purpose of the campaign is improvement of the urban environment and protection of human health. One result has been a boon to tree planting in such places as Denver, Salt Lake City, and numerous other metropolitan areas. New York City’s ambitious program, called PlaNYC, calls for 1 million trees to help meet the mayor’s goal of “a greener, greater New York.”



THE PROVIDENCE, RHODE ISLAND, EXPERIENCE

The award-winning Providence Housing Authority provides homes for more than 5,700 residents. The mission is “to develop and maintain decent, safe, and sanitary housing, and to address the economic and social needs of residents.” Trees have become a major part of accomplishing this mission.

In the 1990s when researchers William Sullivan and Ming (Frances) Kuo were completing their initial research on the relationship between green space and human health, then-Providence city forester John Campanini invited them to speak at a conference in his state. More than 100 city officials and members of the Rhode Island Tree Council attended, including an aide to Stephen O’Rourke, executive director of the Providence Housing Authority. Information from the conference made its way to O’Rourke, who has become a champion of landscaping the projects under his charge.

“Areas that once would have been a blight are now an asset,” said Campanini, now a technical advisor to the Tree Council. “The change was dramatic. People started talking with each other and even banded together to set their own rules. They became active in policing their own places and violent crime went down.”

John has observed that even public works directors are reading about the behavioral changes that can occur from the use of trees. He said that green infrastructure is now part of planning and not just something on the margins.

“It (findings from tree and public health studies) has raised the bar in urban planning,” he said.

In both new and renovated public housing projects, trees and green space have taken on new meaning in Providence, Rhode Island, and elsewhere. It is a result of studies showing the relationship between trees and reduced human stress, greater congeniality between neighbors, and other beneficial changes in both mental and physical health.



THE SUSTAINABLE SITES INITIATIVE

The Sustainable Sites Initiative™ (SITES®) is an interdisciplinary effort by the American Society of Landscape Architects, the Lady Bird Johnson Wildflower Center at The University of Texas at Austin, and the United States Botanic Garden to create voluntary national guidelines and performance benchmarks for sustainable land design and construction and maintenance practices. A goal of this program is to enhance physical, mental, and social well-being as a result of interaction with nature. Although much of the focus is on site selection and a project's physical characteristics, there is an entire section devoted to Human Health and Well-Being. This section contains a significant part of the prerequisites for being designated a Sustainable Site.



The Pete V. Domenici U.S. Courthouse Sustainable Landscape Renovation used sustainable strategies and practices to repurpose a former 4.4-acre greyfield in downtown Albuquerque, New Mexico.

PLAYGROUND SHADE TREES IN ARKANSAS

The Arkansas Forestry Commission has taken seriously a message from the American Cancer Society that children exposed to too much sun risk skin cancer later in life. Shade can counter the threat. A study by Purdue University determined that with 90 percent tree canopy cover, the ultraviolet protection factors are 10 times greater than with none, giving the same Sun Protection Factor as found in 10-rated sunscreen lotion.

Under the leadership of Patti S. Erwin, Arkansas urban forestry coordinator, the Shade Trees on Playgrounds program (STOP) was initiated to plant trees in school yards. Funded by grant money and volunteer labor, large-maturing hardwood trees have been planted at participating schools. To get extra educational value from the project, school representatives attended a workshop, and a curriculum was designed that

incorporated math, science, history, and a variety of activities. Children not only learned more about the benefits of trees and participated in the planting — complete with a ceremony — they also became responsible for the ongoing watering and care of the trees.



Arkansas' Washington Magnet School



How to Communicate Health Benefits

Public health and safety are always on the minds of municipal leadership. Trees as beautification are far down the list of priorities. The communication challenge is to gain awareness and understanding at all levels of the community that trees are part of the public health agenda. Here are some ways that message can be communicated.

HIGH-TECH COMMUNICATION



Blogs, Twitter and websites now speed the flow of information. These tools can be used effectively to spread the word about the exciting relationships between trees and human health. For example, when Joe Rojas-Burke of the The Oregonian posted on his blog the study we mention on page 8, Forest Service researcher Geof Donovan started receiving phone calls within weeks. Formerly, it would have taken months or years before research results reached other

researchers, and longer before ordinary citizens would learn about them. More than 400 people soon linked to the story on Facebook and more than 100 used Twitter. Another innovation is the researcher's own website. In Dr. Donovan's case, one need only go to his site and click on any of the author's publications. Instantly the entire research report is available.

WRITE A LETTER TO THE EDITOR

Few parts of a local newspaper get read by more people than the letters section. Most readers will be unaware of the connection between trees and public health, so this would be a good way to bring that to the attention of residents in your area. Social scientists call this kind of information "salient;" that is, people will associate it with their own well-being and consider it especially important. In turn, it will help garner support for your community forest.

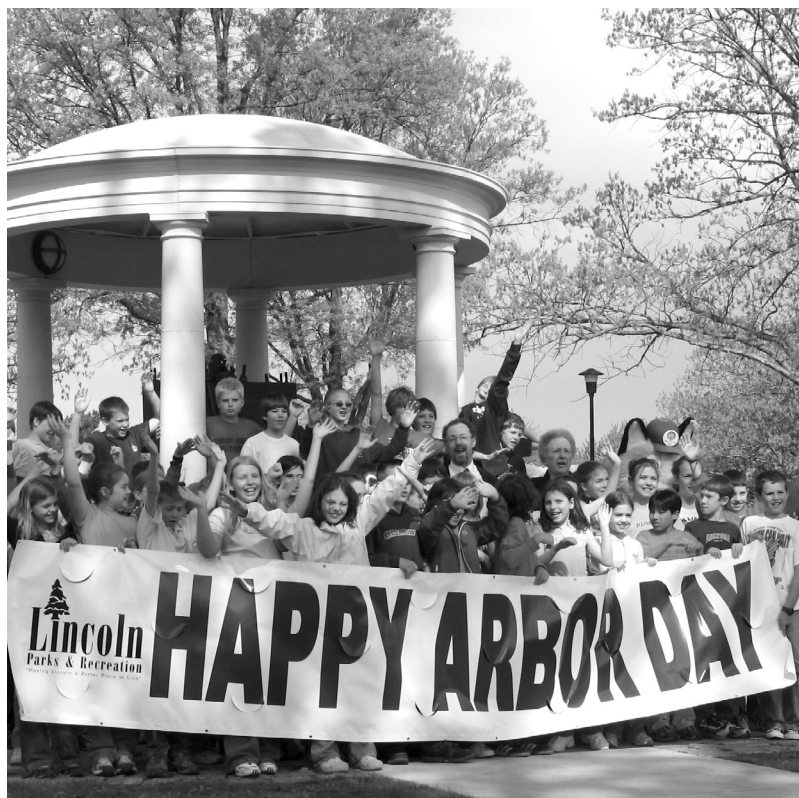
When writing your letter, remember these points:

- Keep it short and focused on one theme — the health benefits of trees.
- Make your message positive. Don't refer to neglected trees, a removal fiasco, a budget shortage, or other local problems. If these problems exist, let readers make the connection on their own.
- Avoid technical terms or explanations. Use language that is easy to understand.
- Provide a way for readers to get more information, such as visiting arborday.org/bulletins.



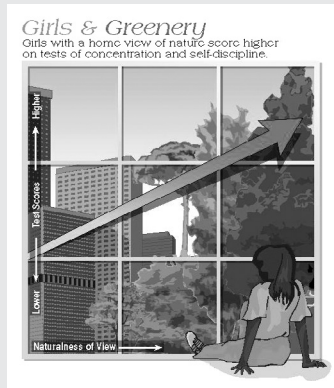
Arbor Day celebrations remain one of the best ways to gain local media attention. As part of your celebration, you can:

- Emphasize public health benefits by modifying the sample Arbor Day Proclamation found at arborday.org.
- Create a media package or news release that highlights the relationship between trees and human health.
- In one or more of the Arbor Day presentations, have someone discuss the public health benefits that are described in this bulletin.
- Include the health benefits of trees in classroom or other presentations to children.
- Have children create a poem or skit that informs others about the health benefits.



Few things focus public attention on trees as much as an Arbor Day celebration. Public health can easily be made part of the program.

SINGLE-TOPIC FLIERS



Much pioneering work has been done at the Landscape and Human Health Laboratory of the University of Illinois at Urbana-Champaign. One of the effective ways that Dr. Kuo and her colleagues have communicated the results of their studies has been the use of colorful, single-sheet, two-sided fliers that focus on one topic. Through concise and easy-to-understand

communication, the laboratory's findings have been disseminated and used nationwide. Sample copies are available from the lab. A link is provided at arborday.org/bulletins.



SPEAK OUT

Urban foresters are being joined by commercial arborists in giving talks to school groups and otherwise helping residents better understand trees and tree care. Some, like Tim Kastning of Grace Tree Service in Hayden, Idaho, also write columns for their local newspapers. To get started, write a sample column or two and take it to the editor of your paper with your proposal to write on a tree topic, say, once a week. If the editor is not interested in a regular column, ask about special issues or inserts that most papers have several times a year. A gardening special would be especially appropriate. To give a school talk, contact the principal or a teacher you know and give him or her an idea of what you will cover and how. In either case, showing the relationship of trees to human health will be an aspect of tree information that is almost sure to be of interest.

Arborist Gerard Fournier of Didsbury, Alberta, received recognition as an International Society of Arboriculture's Tree Professional of Arboriculture in 2009. He was honored in part for his commitment to communicate about trees. Fournier uses school visits, a website, radio, and social media such as Facebook to reach out to others about trees.



A Mystery — Cause and Effect

In the field of social research, one of the most difficult challenges is to establish cause and effect. That is, we may know there is a correlation between the presence of trees and various health benefits, but what exactly is the reason for it?

A good example was an intriguing study conducted in Portland, Oregon, by Geof Donovan and his colleagues at the U.S. Forest Service Pacific Northwest Research Station. The researchers found a relationship between healthy babies and trees within 50 meters (164 feet) of their homes. For each 10 percent increase in tree canopy in this zone around a house, the rate of undersized newborns decreased by 1.42 per 1,000 births. By applying this finding to the improvement of public health and the reduction of medical costs, we can see that if the city were to increase tree cover by 33 percent, there would be three fewer undersized newborns per 1,000 births. That, of course, is not even mentioning the other benefits described in this bulletin.

The research question is: What is the exact role of trees in producing healthier babies? Other research suggests that exposure to nature can reduce stress levels. Stress in pregnant women is known to be harmful to the developing fetus and can increase the probability of underweight birth. Perhaps that is the cause of the beneficial effect. Or is it that women of a certain background are more drawn to living in an area with trees? Perhaps that same kind of woman is more likely to take better care of herself?

“In our model we tried to account for about 100 variables,” Dr. Donovan said. “This isn’t the final word.”

The conclusion is that there is definitely an important link identified by the research. Whatever the explanation, the bottom line is that trees are involved. It is one more piece of evidence that trees are important to public health.



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