



Solving Urban Issues With Trees

**TREE CITY USA®
BULLETIN**

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Today, our cities and towns are facing significant issues that affect the everyday lives of residents. Rising temperatures are matched with rising electricity bills. Air pollution and flooding can wreak havoc. Polluted sites can put community health at risk and be costly to clean up. And food deserts are becoming more and more common.

While each of these issues presents a completely different problem for urban dwellers, the solution is the same: trees.

Community trees are some of the hardest-working trees out there. When planted in the right place, they can be the remedy to many of the issues facing your city — and those who call it home.



Breaking Up Heat Islands

In some urban areas, temperatures tend to be higher than in their suburban counterparts. These are known as heat islands, and summer air temperatures in urban heat islands can be anywhere from 2 to 22 degrees Fahrenheit higher than surrounding areas.



Including lush, green spaces within urban settings will help prevent heat islands.

What causes the higher temps? The Environmental Protection Agency has identified five major factors that come into play:

1. **Less Natural Landscaping** – Trees, plants, and bodies of water tend to cool the air through shade and moisture, unlike impervious surfaces.
2. **Urban Material Properties** – Human-made materials are less likely to reflect solar energy, and they also absorb more heat from the sun.
3. **Urban Geometry** – Narrower streets and tall buildings block wind flow and impede a building's ability to release heat.
4. **Heat Created by Human Activity** – Automobiles, industrial facilities, and even air conditioning units generate additional heat.
5. **Weather and Geography** – Sunny, calm weather will increase the temperatures within a heat island, as will any geographic formations (such as mountains) that can block wind patterns.

THE HUMAN COST OF HEAT ISLANDS

The heat island effect doesn't just turn up the temperature; it contributes to heat-related deaths and heat-related illnesses among city residents. And this issue is

only magnified with extreme summer temperatures that are becoming more common in the face of climate change. The heatwave that hit the Pacific Northwest in 2021 is a striking example. In Oregon, more than 100 people died in the record-breaking temperatures. Most were Portland residents, many of whom lacked air conditioners or fans.

TREES TO COOL OUR CITIES

Fortunately, there is a way to address the heat island effect head-on. Research shows that trees can play an important role in cooling our communities and reducing health problems related to heat stress. Just look at some of the statistics:

- In summertime, trees reflect between 70% and 90% of the sun's energy back into the atmosphere.
- Trees can reduce surrounding air temperatures as much as 7.2° F during the hot season.
- Adequate tree shade lowers parking lot surface temps by approximately 36° F.

Tree planting — whether in a city park, along streets, or in private lawns — can effectively help lower urban temperatures and reduce the health implications of heat stress. Breaking up urban heat islands and greening our communities will not only help to combat increasing temperatures but also improve overall well-being and save lives.

Lowering Energy Costs

With the changing climate and increase in urban heat islands has come a change in energy consumption. And for many cities across the country, this is cause for concern. Trees offer a simple, long-term, and cost-effective solution to the increased strain being placed on the nation's power grid.

By planting trees near houses and office buildings, homeowners and businesses alike can reduce summer and winter energy use — and that translates to lower energy bills. On average, trees can reduce summer energy costs by up to 20%.

WHERE TO PLANT WHICH TYPES OF TREES

Deciduous shade trees – Plant on the west and southwest side of a home or building to provide shade from the intense afternoon sun. When planted on the east side, these trees can also provide shade from morning sun. These trees will also allow sun through their barren branches in the winter months, providing additional warmth.

Evergreens – Plant along the north side to provide a wind block in colder months.

Ornamental trees and shrubs – These smaller species can be a great choice to provide shade for a window or air conditioner, which can help the unit run more efficiently.

HOW TO PROMOTE TREE PLANTING ON PRIVATE PROPERTY

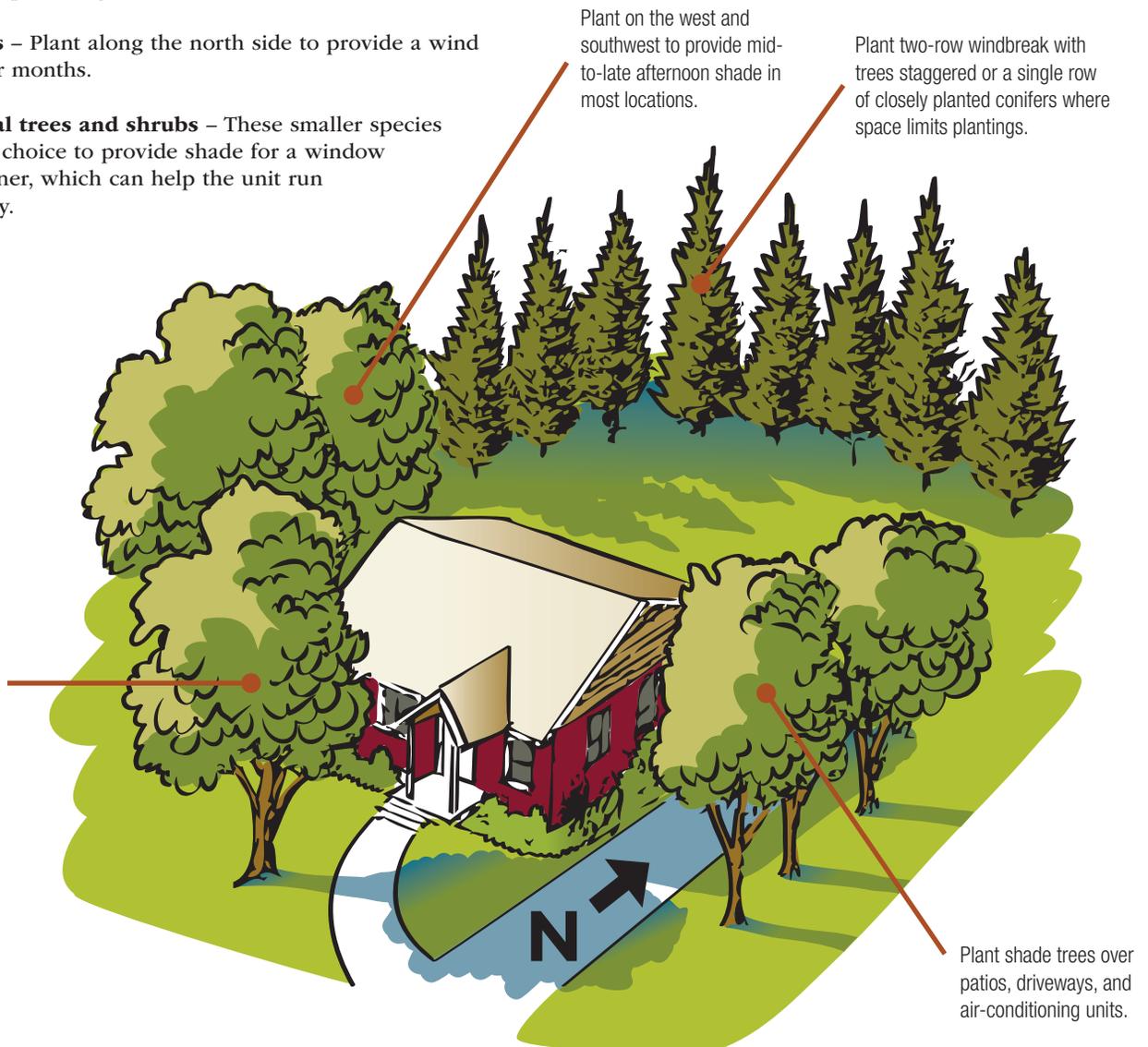
To encourage homeowners and business owners to plant trees near their homes and buildings, many communities have partnered with local utility companies to distribute trees. Typically, these trees are given out at no cost to recipients at local community events.

The Arbor Day Foundation offers support for community tree distributions through its Community Canopy program. You can find more information about this turnkey solution at arborday.org/communitycanopy.

Plant on the west and southwest to provide mid-to-late afternoon shade in most locations.

Plant two-row windbreak with trees staggered or a single row of closely planted conifers where space limits plantings.

Shade east and west windows, but prune lower branches to prevent blocking the view.



Plant shade trees over patios, driveways, and air-conditioning units.

Reducing Particulate Matter Pollution

Air pollution is a major problem in many urban areas — one that affects not only the environment but also our health. The World Health Organization (WHO) paints a clear picture of the reality we must face about this issue. Approximately nine out of 10 people are breathing air that does not comply with the WHO Air Quality Guidelines, and the organization has now recognized air pollution as “one of the biggest environmental threats to human health.”

Particulate matter is one of the air pollutants studied more thoroughly. Of the most concern is small particulate matter (measuring 10 micrometers or less in diameter, known as PM_{10}) and fine particulate matter (measuring 2.5 micrometers or less in diameter, known as $PM_{2.5}$), which can get deep inside the lungs.

According to the EPA, particulate matter comes from multiple sources — including smokestacks, construction sites, fires, power plants, and cars. And the WHO’s International Agency for Research on Cancer (IARC) has classified it as a carcinogenic.

While awareness of this issue is growing, urban air quality continues to decline. Conversely, people living in urban areas are experiencing health issues caused by particulate matter, affecting both the cardiovascular and respiratory systems, among other organs.

It is clear that a problem of this seriousness and this magnitude requires dramatic response. The course of action is simple: plant trees.

Trees act as natural biological filters due to their large leaf areas relative to the ground and the physical properties of their surface. And there is virtually no limit to what they can filter out of the air. Across the country, it is estimated that America’s urban trees are removing 711,000 metric tons of air pollution (including ozone, nitrogen dioxide, sulfur dioxide, carbon monoxide, and small particulate matter) annually. Each mature urban tree is capable of capturing up to 50 pounds of particulate matter alone from the air each year.

So what does all of this mean? It means that trees are cleaning our air and ultimately saving lives. According to the Northern Research Station of the USDA Forest Service, scientists calculate that trees in the U.S. save more than 850 lives each year and prevent 670,000 cases of acute respiratory symptoms by reducing air pollutants.

To improve air quality moving forward, more trees must be strategically planted in cities. Every tree planted will immediately go to work filtering out pollutants and improving air quality for the entire planet. And as it grows, so does its ability to provide cleaner air.

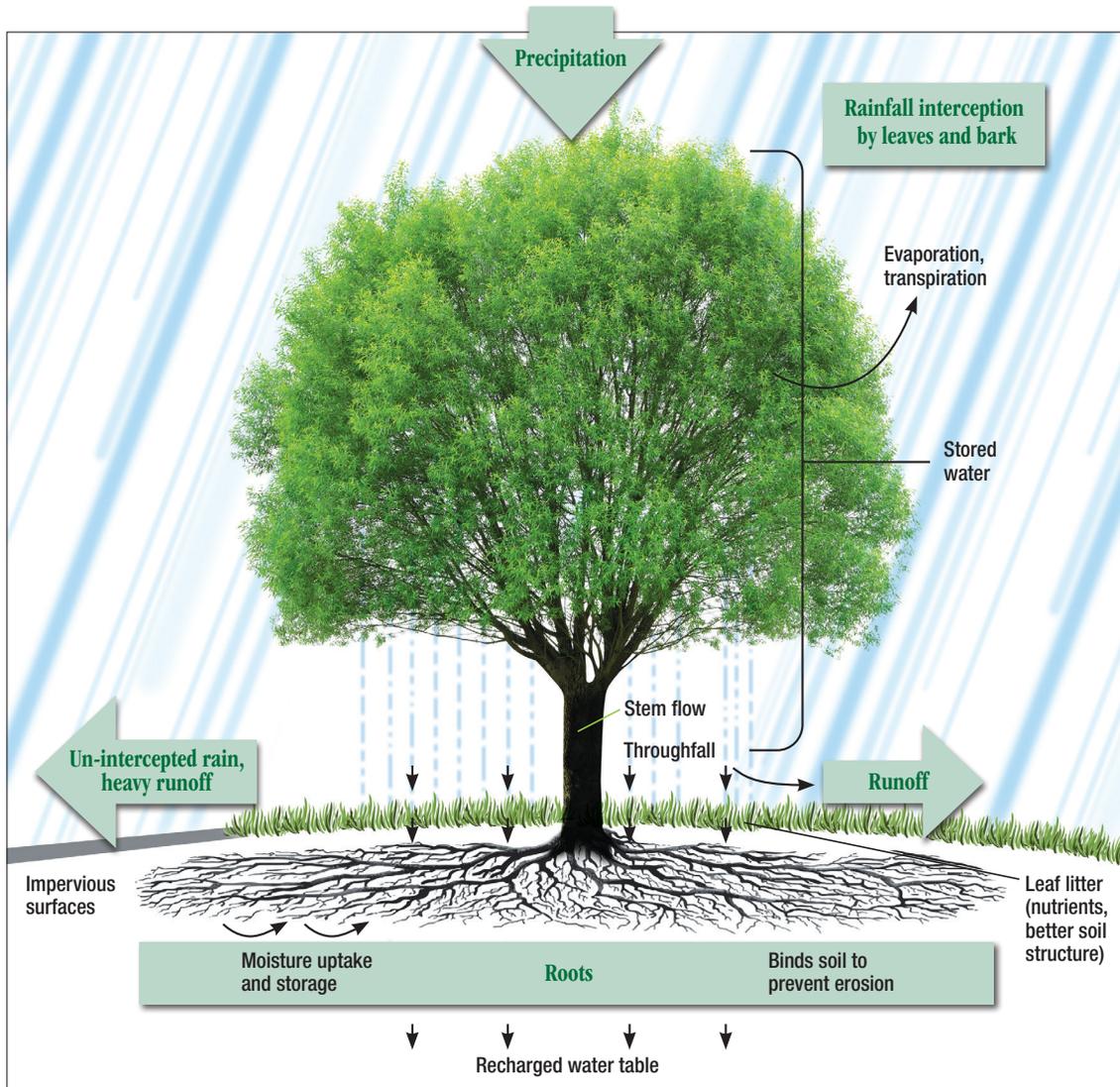
Ample community tree cover will help to reduce the amount of particulate matter pollution in the atmosphere.



Preventing Urban Flooding

One of the most overlooked and underappreciated benefits of urban trees is their ability to reduce the volume of water rushing through gutters and pipes following a storm. This means less investment in expensive infrastructure and cleaner water when the runoff reaches rivers and lakes.

Important Ways a Tree Helps with Stormwater Management



HOW DOES IT WORK?

Trees help manage stormwater in three basic ways:

1. Trees intercept rain and hold a portion of it on their leaves and bark. Part of this intercepted rain will evaporate, and part will be gradually released into the soil.
2. Fallen leaves help form a spongy layer that moderates soil temperature and helps retain moisture. It also harbors organisms that break down and recycle organic matter for use in plant growth. This important layer allows rain to percolate into the soil rather than rushing off — carrying pollutants like oil, metals, and other toxins.
3. Below ground, roots hold the soil in place and absorb water that will eventually be released into the atmosphere by transpiration.

And when you combine trees with other natural landscaping, studies have shown that as much as 65% of storm runoff can be reduced in residential areas.

Cleaning Up Contaminated Soils

A legacy of industrial contamination faces communities across the country. Hundreds of thousands of former gas stations, dry cleaners, landfills, and other decommissioned industrial facilities pose serious risks to public health.

As communities try to find new uses for this land, it can prove difficult to clean up. Land like this is called a brownfield, defined by the EPA as “a property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.” An estimated 450,000 brownfields currently exist in the U.S., and cleanup often comes with a big price tag attached.

New advances in plant microbiology have actually led to a more cost-effective and feasible solution for brownfield cleanup projects — phytoremediation. This is the process of planting trees and other plants to clean up many contaminants in soil and water.

The key is to protect the trees from phytotoxicity, an adverse effect that can be caused by chemical contamination. Thanks to research from the University of Washington, it is clear that this protection comes in the form of endophytes — microbes that can live within the trees. The new technique inoculates trees with native pollution-degrading microbes to degrade a wide variety of pollutants while reducing the trees’ mortality rate. Treating trees with endophytes protects

the trees since they break down the toxins, leaving no contaminants as a byproduct.

One phytoremediation firm, Intrinsyx Environmental, has implemented endophyte-assisted phytoremediation on more than 30 sites across the U.S. The process has been EPA- and regulator-approved, and the results they have seen are encouraging:

- 100 poplar trees can remove up to 1 million gallons of contaminated groundwater per year.
- Survival rate is an average of 95%.
- The cost can be up to 90% less than traditional remediation approaches.

In addition, the trees are providing additional benefits to the community — shade, carbon sequestration, watershed health, habitat, and natural beauty.

You can find a compilation of all brownfield locations across the U.S. at [epa.gov](https://www.epa.gov) and searching cleanups in my community.

PHYTOREMEDIATION AT WORK: MOUNTAIN VIEW, CALIFORNIA

One location using phytoremediation is the Naval Air Station at Moffett Field in Mountain View, California. This Superfund site was contaminated by disposal of toxic waste created through the development of military aircraft. Mitigation of the groundwater pollution had been ongoing for decades when one area of the site was designated for phytoremediation.

Poplar trees treated with endophytes were planted to break down a toxin called TCE. After three years, the plot saw amazing results. TCE levels went from 300 parts per million to less than 5 parts per million. And that breakdown did not lead to toxic byproducts. To learn more or request an assessment, visit arborday.org/phyto.



Photo Courtesy of Intrinsyx Environmental

With the help of endophytes, these poplars can thrive on polluted landscapes and help clean up contamination.

Providing Relief in Food Deserts

A food desert is an area where people have limited access to a variety of fresh, healthy, and affordable food. Food deserts are a serious urban concern, particularly in low-income neighborhoods where residents may not have access to vehicles or public transportation. For people living in these areas, typical grocery items like fresh fruit and vegetables may be difficult to come by at an affordable price.

One natural solution is popping up in communities around the world: community food forests. Often funded by grants and established by a mix of volunteers and local residents, these garden spaces are designed specifically to provide fresh food for neighborhoods. But more than food, the forests often build a stronger community connection.

What exactly can grow in a food forest depends on the hardiness zone and growing conditions, but the University of Minnesota Extension provides some insight into the basic structure:

A food forest is typically comprised of three to seven layers, which allow a small space to be used at multiple levels.

- The uppermost layer, or overstory, contains larger food-producing trees.
- The understory contains small trees and shrubs.
- The floor is home to herbaceous plants, root crops, ground cover crops, and vines.

A three-layer system might include apple and cherry trees, hazelnut and Juneberry shrubs, and herbaceous plants such as asparagus and rhubarb.

TIPS FOR STARTING A FOOD FOREST

- Get area residents involved from the start.
- Choose trees and plants that don't need a lot of ongoing maintenance.
- Not every plant needs to produce food — some may be for the benefit of pollinators.
- Set policies for ongoing care, management, and harvesting.
- Take every opportunity to educate volunteers about the natural world.



A LOOK AT ATLANTA'S FOOD FOREST SUCCESS

In response to the issues food deserts are creating, the city of Atlanta has established a 7-acre food forest in the Browns Mill area. Here, one-third of the population lives in poverty, and a trip to the supermarket involves a 30-minute bus ride.

The forest was established in 2016 with the help of a national nonprofit organization and funding from a USDA Forest Service Grant. It is now managed by the City's Parks and Recreation Department and cared for by more than 1,000 volunteers. It is lush with 2,500 edible and medicinal plants that are grown free from chemicals. And, best of all, it is used as a learning tool as well as a way to connect community members with their food's origin.

Community Health and Well-being: Follow the 3-30-300 Rule

Trees are key to overall community well-being, particularly amid the stresses of urban living.

Recently, new guidance has been given regarding urban forestry — a rule of thumb, if you will, to ensure that all residents can enjoy the overall health benefits community trees provide. This guideline has been proposed by Professor Cecil Konijnendijk van den Bosch, the director of the Nature Based Solutions Institute and program director (Master of Urban Forestry Leadership) at the University of British Columbia. He is widely regarded worldwide as a leading expert within the field of urban forestry.

His new rule is simple: the 3-30-300 rule. According to Cecil, “This rule focuses on the crucial contributions of urban forests and other urban nature to our health and well-being. It also recognizes that we have to consider many different aspects of the urban forest in order to be successful. It also addresses the need for urban forests to percolate into our living environments. At the same time, it is straightforward to implement and monitor.”

Let’s break down the three components of this rule.

- **3 trees from every home:** The idea here is that all residents should be able to see at least three decent-sized trees from their homes. The importance of this has been underscored by the recent pandemic.
- **30% tree canopy cover in every neighborhood:** Given all the health benefits community trees provide, he sees this as a minimum and encourages cities to strive for more.
- **300 meters from the nearest park or green space:** This promotes recreational use of green space to improve mental and physical wellness. The European Regional Office of the World Health Organization also offers this 300-meter recommendation and outlines that the green space should be at least 1 hectare in size.

Each component of this rule is based on not only Cecil’s vast experience in the field of urban forestry but also a depth of research findings regarding urban trees. He firmly believes that “applying the 3-30-300 rule will improve and expand the local urban forest in many cities, and with that, promote health, well-being, and resilience.”

FOR MORE INFORMATION

For direct links to more information related to the contents of this issue, or to download a free PDF of this and past bulletins, please visit arborday.org/treecare.

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