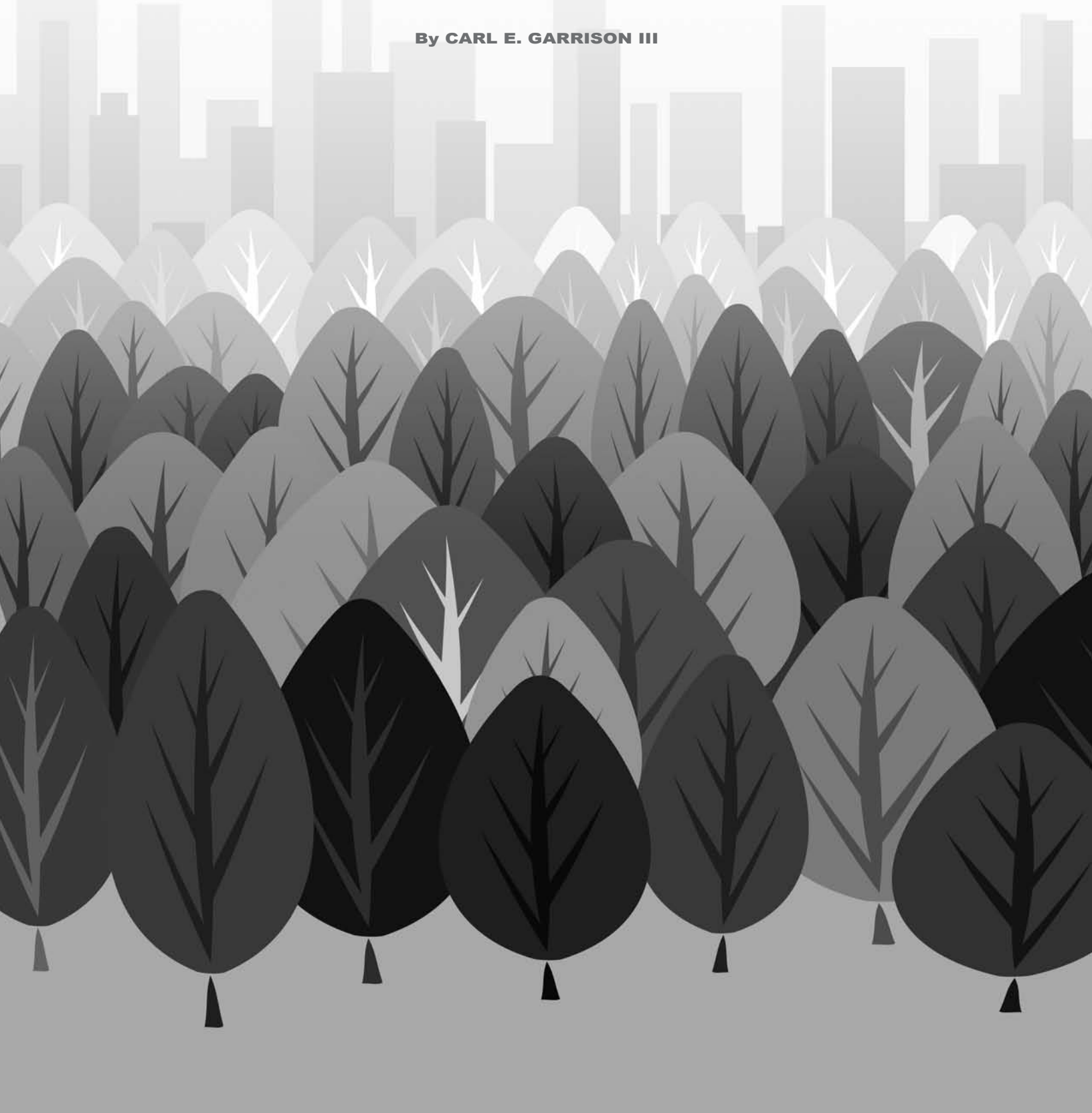
Urban forestry

It's all about trees in places where people live

By CARL E. GARRISON III



"I think that I shall never see A poem lovely as a tree …"

WE ALL REMEMBER the first two lines of Joyce Kilmer's poem and, for those of us who have chosen forestry as a profession, we live them every day. Yet, while the Virginia Department of Forestry is probably best known for ensuring Virginia's 15.7 million acres of rural forestland are healthy and a vibrant part of the economy ($27.5 billion in annual benefits to the Commonwealth), the agency also plays an important role with regards to the trees growing in our cities and towns.

Through its office of Urban and Community Forestry, the department supports dozens of projects each year that enhance the quality of life for millions of Virginians. These projects range from a small tree-planting initiative that helps prevent erosion along a river or stream to aiding in the design of streetscapes for an entire town. And the department has worked with more than 50 cities and towns to attain the much-coveted status known as Tree City USA – a national program that recognizes those localities that have truly embraced all that trees bring to their communities.

So, why do we pay so much attention to the trees in our cities and towns? Trees, especially in urban and suburban settings, offer much more than the aesthetic beauty Kilmer so eloquently captured in his most famous work. They provide a host of "ecosystem services," such as sequestering carbon, removing pollutants from drinking water and lowering energy costs – and the trees have been providing these services around the clock, year in and year out, for free.

Here are just some of the issues that confront cities and towns as the tree canopy declines:

Urban heat islands

Cities average 2 degrees to 10 degrees Fahrenheit warmer than their rural surroundings. This marked increase in city temperatures is known as urban heat island effect (UHI). The effect is largely due to replacing natural green infrastructure with concrete and gray infrastructure. Under sunlight, building rooftops and roads trap and release a large quantity of heat. Cities that have been paved over do not benefit from the natural cooling effect of vegetation.

Increased energy demand

As the air temperature rises, so does the demand for air-conditioning (AC). This leads to higher emissions from power plants, as well as increased smog formation, ground ozone and acid rain. In the United States, urban heat island effect is responsible for 5 percent to 10 percent of peak electric demand and as much as 20 percent of population-weighted smog concentrations in urban areas due to AC use alone. Today, the utility sector is already the largest single source of greenhouse gas emissions in the United States, producing approximately one-third of the country's emissions.

Trees enhance property values in neighborhoods and commercial districts.

In the U.S., significantly more energy is consumed in the summer for cooling than in the winter for heating. It is estimated that the rising temperatures caused by UHI will increase AC use by 3 percent to 8 percent more just to counterbalance UHI, and we'll need in excess of 20 million more barrels of oil – at a cost of $2 billion annually. Ironically, all of those fossil fuels that we burn to stay cooler could be warming the planet further through the emission of CO2 and NOx, thereby causing a cascading loop.

It's not, however, all doom and gloom. Trees are part of the solution to many of the environmental problems confronting municipalities.

Green roofs and tree canopy

Green roofs are ideal for urban settings in which high-density developments offer few opportunities for mitigating increasing electricity consumption. As air conditioners run longer, heat-related illnesses grow, and the rate at which ground level ozone forms increases. Like urban forests and reflective roofing surfaces, green roofs absorb and/or deflect solar radiation so that it does not produce heat.

One simple way to cool cities is to plant trees along sidewalks and turn rooftops into green roofs. The evapotranspiration from vegetation and natural absorption and reflection of solar radiation will cool a community by a few degrees in the summer. Studies suggest that if 10 percent of a city's roofs were green roofs, that the ambient temperature would be lowered between two degrees and four degrees Fahrenheit.

Increasing the amount of trees by even a small margin would help. The U.S. Forest Service has found increasing the urban tree canopy by just 1 percent would bring maximum mid-day city temperatures down between 0.07 degrees and 0.36 degrees Fahrenheit.

In dozens of cities and towns across the United States, increasing urban tree cover has generated $2 to $5 in savings for every dollar invested in tree planting. (According to the most recent urban forestry audit in

Joe Rossetti plants a hardwood tree as part of a riparian buffer planting in the City of Richmond's Bryan Park.

the City of Richmond, the city's trees generated an average return on investment of 36 percent.)

Trees lower temperatures through shade – the cooling effects of which can save millions of energy dollars. Even at the residential level, just three to four shade trees located strategically around a house can cut summer cooling costs between 30 percent and 50 percent.

Adverse health effects

Summer – and even spring – temperatures across the Commonwealth often exceed 90 degrees in many towns and cities. Heat exhaustion, especially in seniors, is growing as a cause of death. UHI only exacerbates these already high temperatures. On average, more U.S. deaths are attributed to high temperatures than to any other weather-related event. Ozone concentrations also increase with heat and can cause severe respiratory problems and death.

Cleaner air and water

Shade trees also produce significant clean air benefits. One hundred large trees remove about 200 pounds of particulate matter, 300 pounds of ozone and five tons of carbon dioxide from the air each year. And the Environmental Protection Agency has approved the planting of trees in several Virginia communities as a way to mitigate air pollution. Sadly, tree cover on private property and newly developed land has declined since the 1970s at the same time emissions from transportation and industry have been rising.

Being exposed to ozone can reduce breathing capacity; cause coughing and throat pain; irritate or injure lung lining; aggravate and increase instances of asthma, bronchitis and emphysema, and increase premature risk of death for people with heart and lung disease. Exposure to particulate matter has similar effects along with the addition of making heartbeats irregular and producing non-fatal heart attacks. It's been reported that illnesses related to air pollution cost the U.S. $150 billion annually, while 50,000 Americans die prematurely each year due to poor air quality.

Trees also filter pollutants from storm water runoff and do so at significant cost savings to communities. When the City of New York was faced with the prospect of building a $6 billion water treatment plant, it chose instead to bolster its forested buffers around the water reservoirs and achieved the same results while saving more than $4 billion in the process.

Cool cities: Plant a tree

Heat island mitigation is also an effective air pollution control strategy, more than paying for itself in cooling energy cost savings. The cooling energy savings in the U.S. from cool surfaces and shade trees, when fully implemented, is approximately $5 billion per year (about $100 per air-conditioned house). Another way to look at this is reducing air temperatures in Los Angeles by just three

Trees can help reduce the urban heat island effect that plagues developed communities in the hot summer months.

degrees would reduce urban smog exposure by roughly the same amount as removing all vehicle exhaust in the entire LA basin.

So, while Virginians and their fellow citizens across the nation want action – action that goes beyond buzzwords such as green and sustainable – to ensure real energy security, they need look no further than to our cities and towns. Healthy urban forests are crucial to helping our growing cities and towns address climate concerns; keep citizens healthy, and improve the quality of life generally. Yes, those lovely trees are the answer. VTC

About the author

Carl E. Garrison III has served as the State Forester for the Commonwealth of Virginia since 2004. As state forester, he is responsible for the administrative, policy, organizational development and operational areas associated with maintaining the value of the state's forest resource.

The 2007 Arbor Day ceremony in Winchester included the planting of a Kwanzan cherry tree in front of George Washington's survey office. Pictured (l-r) are Gerald R. Crowell, area forester with the Virginia Department of Forestry; Susan Carney, Tree Commission member; Milt McInturff, Tree Commission chair; Chris Scully (behind tree), Tree Commission member; Elizabeth Helm, mayor; and Patrick Farris, Tree Commission member (holding his son).