

# KINGSTON

Using the urban forest to mitigate the urban heat island effect

*By Sophie Guilbault*

## THE SCIENCE

Extreme heat events are expected to become more frequent and severe because of climate change. The consequences associated with these events tend to be exacerbated by a phenomenon called the urban heat island (UHI) effect. The UHI effect happens when an urban area becomes warmer than its rural surroundings. As cities develop, the landscape is often transformed from vegetated surfaces to higher ratios of buildings and paved surfaces, resulting in greater heat retention. These changes tend to increase the temperature of urban areas significantly and create an “island” of higher air temperatures estimated to be 1°C to 3°C warmer than surrounding areas. In the evening, the difference between urban and rural temperatures can be as high as 12°C, as the UHI effect also results in reduced night-time cooling.

There are various ways communities can mitigate the impact of the UHI effect. For instance, they might choose to use cool surface materials, such as reflective roofs or cool pavement, which help reflect solar energy away from buildings or paved surfaces. Another approach that can be taken is to increase tree and vegetative cover. Vegetated spaces can increase the comfort of pedestrians by providing shade and can contribute to reducing high summer temperatures through evapotranspiration.

## THE TRIGGER

Official community plans contain guiding principles that define and orient the development of municipalities. These plans represent the foundation of the planning process and are essential tools for managing future urban growth. In 2010, the City of Kingston chose to use its official plan as a tool to improve the urban forest and green spaces within the city. While the city's decision to invest in the maintenance of an abundant tree cover in urban areas was influenced primarily by the loss of forest coverage within the urban boundary, adapting to extreme heat events quickly became an added benefit of the initiative. UHI considerations were also integrated into the development of Kingston's Urban Forest Management Plan. “We felt like we needed an overarching plan that would address various tree-related issues, including the mitigation of urban heat islands,” said Damon Wells, Director of Public Works for the City of Kingston.

## THE APPROACH

In 2009, it was estimated that Kingston's urban forest occupied 21 percent of the urban area, which is comparable to many cities in Canada. When the city's official plan was amended in 2010, an urban tree canopy target of 30 percent was included, which follows the recommended guidelines set by Environment Canada. Further policies were implemented simultaneously into the official plan to support this greening initiative. For instance, the official plan states that “community based initiatives such as community gardens and other forms of urban agriculture, and reforestation projects are permitted in all land use designations, subject to site by site evaluation.” In addition, the plan acknowledges the importance of preserving mature trees to the greatest extent possible when developing new lands.



**Figure 14:** *In Kingston, trees were planted to provide shade for people waiting for their bus.*  
(Source: Adobe Stock Photo)

Prior to the publication of the 2012 Community Official Plan, the City of Kingston developed an Urban Forest Management Plan in 2011, which established guidelines and actions to ensure the long-term preservation of the city's urban forest through sustainable practices. The Urban Forest Management Plan provides a framework for monitoring progress toward established urban forest goals.

The UHI effect tends to increase tree water requirements as the amount of water transpired by trees in urban settings almost always exceeds the quantity contributed by rainfall. Therefore, a Drought Protection Strategy was developed by the city to help the urban forest become more drought tolerant. During a drought, a Tree Watering Alert is activated to solicit the help of residents to ensure that public trees are watered and kept healthy.

## THE OUTCOME

It is estimated that every tree planted by the City of Kingston provides over \$67 in net environmental benefits every year by reducing building energy use, improving air quality, and storing carbon. It is therefore estimated that the 28,000 trees that now form Kingston's urban forest provide \$1.87 million in environmental benefits

annually. While urban trees contribute to moderate the urban heat island effect, they also provide other significant co-benefits for the city. The urban forest can provide shade for buildings in the summer; filter and reduce the amount of stormwater runoff, provide bank stabilization along open watercourses, and create natural wind breaks.

Following the implementation of the Urban Forest Master Plan, Kingston recognized the pending threat of the Emerald Ash Borer, an insect that kills ash trees, and developed a mitigation strategy to minimize the loss of trees. As part of this strategy, the city developed an urban tree inventory including the GPS location, size and condition rating of each municipal urban tree. This tool became key in addressing the Emerald Ash Borer impact but will also assist with further implementation of the Urban Forest Master Plan.

Other initiatives were developed within the city to maximize the potential of the urban forest. For example, Royal Bank of Canada and the Kresge Foundation provided donations to support tree planting at hot locations along Kingston's commuter bus routes. The shade can be particularly important to transit riders during hot summer days.

## **A WORD FROM KINGSTON**

When asked what advice he would give to other municipalities interested in implementing a similar initiative, Damon Wells highlighted the importance of engaging the public in the development of greening initiatives. "By doing this, the members of the public became more supportive of the program and we were also able to gather great ideas from them," said Mr. Wells. Another thing that contributed to the success of Kingston's Urban Forest Management Plan was the creation of a tree advisory board in which various professionals and representatives from the local conservation authority and Parks Canada reviewed the various stages of the development of the plan.