**Urban Trees Help Reduce Home Energy Costs**

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In front of my house, on the south side, between the sidewalk and the curb, stands an elm tree of 80 cm trunk diameter and some 25 m in height (see photo). I would estimate its age at about 80 yr, plus or minus 10 yr [by the way, you can't be sure of a tree's age simple by virtue of its size - there is too much variation in growth rates for such estimation; for confidence in aging a tree, you either need to know the year of planting or take a core from the stem and count the annual growth rings, neither of which I have pursued for this tree].

The tree's crown extends well overtop my house. It is in leaf from late May through late October, a period of about five months. During that period, the mid-day sun (when it actually shines in Halifax!!) does not really reach my house, except for small ephemeral dapples. If the tree were not there, my house would bake in the mid-day sun on cloudless days. I don't know how much warmer the house would be under this circumstance, but I'm sure it would be discernable.

The presence of the tree provides shade for my house exactly when and where I need it - on the south side during summer. This keeps the house cooler than it would otherwise be and obviates the need for air conditioning. If I did have an air conditioner, it would run less with the tree in place compared to no tree. So, by virtue of shading alone, well-placed trees of the right type (high, spreading crown) can reduce energy costs in summer.

There is another mechanism by which trees cool the city in summer and thus lower the need for air conditioning. This mechanism is less house-specific and more general to the neighbourhood, which is a good thing because some houses in a neighbourhood like mine actually do get the full summer sun on them. Every tree takes in water through the roots and expels water through the leaves - that's the main way that nutrients are transported from the soil to the tree's growing parts. That process is called transpiration. Evaporation is when there is rainwater on the leaves and it changes from liquid on the leaf to gas in the air. When water molecules evaporate or transpire (that is, they change state from liquid to gas) from trees, they actually cool their environment. That too reduces the amount of electricity-driven air conditioning needed in nearby buildings.

And then there's winter - can trees help in reducing heating costs? What if trees block low-angle sun from entering our windows and shining on dark interior surfaces which warm up when shone upon? Surely we want direct sunlight on our houses in winter, and trees can block that.

OK, but what about wind? Cold wind is capable of robbing us personally and also our houses of warmth. That's why on a cold and windy day in winter, we need to bundle up more to stay warm. To the degree that trees can block wind in the winter time and generate calmer air at ground level, then trees can be helpful in reducing the need for more energy to keep our houses comfortable inside. Evergreen trees are better at blocking wind (see the photo of the spruce trees beside the Staples store at Gottingen and Cogswell) than are deciduous trees because there is more plant mass in the winter air to absorb the wind energy, but leafless trees can still have a small effect. Here is a concluding statement from recent work of Giometto and others (2017) on tree effects on wind in Vancouver: “Within the urban canopy, the effects of trees are twofold: on one hand, they act as a direct momentum sink for the mean flow; on the other, they reduce downward turbulent transport of high-momentum fluid, significantly reducing the wind intensity at the heights where people live and buildings consume energy”.

Many of us who own a residence in Halifax are somewhat locked in to the tree canopy we currently have as well as the layout of the built infrastructure - the house, the driveway, the sidewalk, the street. However, if we do have opportunities to re-arrange the tree canopy around our homes, thinking about the energy implications of tree choice and placement is warranted (see the Toronto and Region Conservation publication below). When the big elm in front of my house dies or is too risky to leave standing, a young beech tree (now 8 m tall) just 4 m to the east of the elm is ready to take over the shade duties (look at the photo again to see the beech tree at about 3 m tall). Perfect placement of the beech would have been 4 m to the west, but alas, that’s where my driveway is. Perfect placement aside, I’m just happy to live in a neighbourhood loaded with trees. I often feel is if I live in the woods!

Further Reading

Giometto, M.G., A. Christen, P.E. Egli, M.F. Schmid, R.T. Took, N.C. Coops, and M.B. Parlange. 2017. Effects of trees on mean wind, turbulence and momentum exchange within and above a real urban environment. Advances in Water Resources 106:154-168.

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Palmer, L. 2017. Adding power to the value of trees. Nature Energy 2:17020.

Toronto and Region Conservation. [undated]. Landscaping to Conserve Energy. Toronto and Region Conservation, Downsview, ON. 4 pp.