

## GARDENING IN A CHANGING CLIMATE

### Understanding the Impacts of a Changing Climate in and Around the Greenbelt

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The Greenbelt Foundation has partnered with the Royal Botanical Gardens to explore how climate change impacts gardening and plants, not only at the Royal Botanical Gardens but in your home garden as well. The Greenbelt is an important asset as we work together to mitigate and adapt to a changing climate. This paper is part of a series, exploring how our daily lives are impacted by climate change, and how the Greenbelt and you can support climate action in a number of important and interconnected ways.



Wrapped around the westernmost tip of Lake Ontario is an oasis of green quite unlike any other. Royal Botanical Gardens (RBG) encompasses 11 square kilometres (2,700 acres) of Carolinian forests, Niagara Escarpment cliffs, remnant prairies, shimmering wetlands, and some of Canada's most breathtaking gardens, right in the heart of the Greenbelt.

Known as Canada's plant biodiversity hotspot, RBG is home to more species of plants than any other area in the country. Its location in the middle of the Golden Horseshoe makes RBG a magnet for people as well, and each year over 645,000 visitors enjoy a variety of experiences, from enjoying almost 50 curated plant collections to taking part in education programs, art and music events, or hiking on 27 kilometres of trails.

Part of a world-wide network of botanical gardens, RBG brings people, plants and place together for the purpose of nurturing and preserving healthy growing life on our planet.

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Stewarding these resources is a monumental task at the best of times, but climate change is creating new challenges each year. Our small team of staff and dedicated volunteers are the ears and eyes monitoring these gardens and natural areas and we see first-hand the impact of climate-related stress, from trees thrown over or snapped by gale-force winds, to extreme heat and drought, and woodland plants disappearing under a sea of aggressive invasive species like Garlic Mustard and

Dog-strangling Vine. As a result, many native species are in decline, while some garden plants that were once borderline hardy here are now thriving without winter protection. Other garden favourites are demonstrating their invasive potential by elbowing their way into natural areas.

Another big challenge is the intense and rapid transition between seasons. Rather than slow, cool springs, the new normal includes unseasonably warm weather in early spring that pushes trees from dormancy to leaf-out over a very short period of time. Like being awakened from a deep slumber to immediately run a marathon, this places a lot of stress on trees and shrubs, and it also causes shifts in bloom timing that can put plants out of sync with their pollinators. While any of these stressors may not outright kill plants, their cumulative impact can weaken defenses, leaving many species vulnerable to disease or pests. System-wide stress can also open the door to the devastating effects of invasive species. Monitoring on our own properties turned up 10 new species in 2016-2017, all non-native, and some with invasive potential.

Impacts are being felt in plants across the Greenbelt already. A Canadian icon, Sugar Maple is one of many species that scientists know is vulnerable to a drier, warmer climate and therefore very likely disappear from the Greenbelt in this century. Our own maple bush, home to the first public maple program in the province, stopped operations years ago as a result of tree stress caused by several very dry summers along with the impacts of Gypsy Moth. This is a harbinger of what is to come as our climate warms. Trees that can't adapt, or whose seeds move slowly, will not be able to keep up with the changes, or compete against species whose seeds travel on the wind. See [planthardiness.gc.ca](http://planthardiness.gc.ca) for maps showing how the "climate envelope" of a variety of plants now found in our area is expected to change.



Gardeners know that plants are highly adapted to the climate of their native range, and that success in gardening depends on providing a plant species in your care with conditions like those found in that species' home. Plants from acidic soils on the Canadian Shield will languish in local gardens unless the soil is amended, and wetland plants need to be grown in conditions that would be deadly to a cactus. A gardener can move plants to more suitable spots, or purchase a better-adapted species,



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but wild species don't have the option of picking up their roots and relocating if conditions are changing faster than they can adapt or their seeds can travel. And what if the area that fits the new climate envelope of a species has inhospitable soils? Conditions are most definitely changing but the question is, how well can each plant species keep up?

While scientists agree that there is not a way we can stop climate change, for the sake of the planet (and our children and grandchildren) we all urgently need to make changes in our lives that will slow it down. And, we need to find ways to mitigate and adapt to the intensity and fluctuations that are on the way, regardless of what we do. An increase of 3°C in our average annual temperature will cause change and disruption, but the impacts of a 7.6°C increase will be devastating, and there are climate change models that suggest that the Lake Ontario watershed will end up somewhere between those numbers over the next 80 years.

It's easy to be overwhelmed by the cost and breadth of what needs to be done to reduce greenhouse gas emissions and there are many things we all can do to change our transportation, energy usage, and consumption patterns. Collectively, gardeners can both reduce their carbon footprint and play an important role in climate change adaptation and mitigation in their community! Gardening for environmental sustainability means considering the footprint and functionality of your garden and garden practices from the ground up – the abiotic, or non-living world of rock, soil, water (and hardscaping); and the biotic, or living world of plants and animals – from fungi and bacteria, to worms, ferns and flowers. You can make huge changes at once or start with small changes and keep the momentum going.

## EASY, SCALABLE CHANGES FOR YOUR OWN GARDEN

### ✓ Reduce Runoff

Climate change is already altering precipitation patterns. As we move forward, summers will be drier overall, and winters likely wetter, but more intense storms are definitely in the forecast. During torrential downpours, water runs off hard surfaces and overwhelms storm sewers to the point that they back up into sanitary sewers. As a result, raw sewage sometimes ends up in local waterways and lakes, as well as the basements of homes and businesses. Creating space on your property for water to infiltrate into the soil helps to relieve the burden on these overloaded sewers.

You can turn your property into part of your community's stormwater management infrastructure by looking for opportunities to replace cement or asphalt with permeable paving or decking that allows rain to soak into the soil. Green roofs are another way to absorb rain and reduce runoff, as are rain gardens (specially designed flowerbeds that are beautiful as well as functional). A rain garden is simply a depression dug into the ground and backfilled with porous material, then topped with soil and compost and planted with species that can tolerate both wet and dry conditions. Instead of flowing into the nearest sewer, runoff from walkways, patios and your disconnected downspouts is directed into the depression where it can pool and infiltrate into the soil over several hours. Check the web for online planning tools that provide detailed instructions, planting plans, plant lists and information on the size and capacity you'll need to manage your hard surfaces.

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### ✓ Don't Add Water

Treated water has an environmental footprint of its own, requiring chemicals and energy for pumping, filtration and treating. And those who rely on wells are already painfully aware of the fact that groundwater resources around the Greenbelt are being pumped out faster than they are being recharged, so conservation is critical. To reduce the overall demand for water, pick your plants wisely. Gardening for minimal water use, or xeriscaping, uses plants adapted to dry (xeric) habitat. Species native to the prairie habitat once found around the Greenbelt develop deep root systems suited to intermittent summer rain (and as a bonus, those deep root systems take up and store carbon from the air). You can also help soils hang on to water longer by adding compost or other organic material and topping them with mulch.

If you do need to water, minimize the use of potable water by collecting water in rain barrels — your plants will love you for it! And if you must water large areas, remember that much of the water sprayed from traditional sprinklers evaporates before touching the soil, so switch to drip irrigation (you won't need the eight kilometres of it RBG recently installed in our new Rose Garden!). While lawns don't have to be watered during droughts (they simply snooze until it rains, then green up again), urban trees do need regular watering out to the edge of the canopy line, using a drip hose.



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## ✔ Plant for Functionality

As our climate changes, all living things will either have to adapt to the resulting changes in their habitat or move (or die). Biodiversity needs our help, and the good news is that every garden can amp up its role in helping to provide food, water, shelter and space for other living things. The easiest place to start is a quick review of your plant palette. Take a close look at each species you currently have planted and ask yourself, will this plant support wildlife by providing shelter, or nectar and pollen for insects, or seeds and fruit for birds? Does it require minimal “inputs” of water and fertilizer? Is it invasive? Will it be susceptible to pests? Even something as simple as insecticidal soap will also kill non-targeted insects; while Japanese beetles may not be on your invite list for garden guests, lady beetles certainly should be.

Also consider if you have the right conditions for it, or is it likely to languish because of too much/not enough light or moisture? Has this young plant/seed been pre-treated with any type of neonicotinoid pesticide that might harm pollinators? Slowly edit out low-scoring species and replace them with those that give back to nature and extend the bloom season. Native plants are a go-to group to include in your garden, and you can further reduce your carbon footprint by growing vegetables. Even patio and balcony gardens can play a role, from hanging baskets featuring flowers for hummingbirds, bees and butterflies, to containers filled with salad greens and tomatoes. Regardless of where you garden, remember that from a biodiversity perspective, all plants are not created equal. Many garden plants are great for pollinators, but others are sterile hybrids; while they are all the rage from a low-maintenance perspective (many new varieties don't require dead-heading/pinching back), they have little to offer pollinators and beneficial insects, or birds.

## CONCLUSION

Gardening in the 20th century was largely about civic beautification, but gardening in the 21st century has a much more important role to play by helping to build community resilience and sustainability in rapidly changing times. Collectively, gardeners can have a huge ecological impact. Most of the land in our cities is privately owned, and the green infrastructure each of us creates on our property will link with other gardens to create corridors across our communities. Like urban river valleys, these can ultimately connect developed areas with greenspace in the Greenbelt to the benefit of both. Whether you grow vegetables, save seeds or help pollinators on your balcony/patio or rooftop garden, or green up your yard with rain gardens, xeriscapes, native species and habitat for birds and butterflies, you are making a difference. Simple modifications in your garden benefit everyone and will also inspire others, so pick up your trowel and spade and become a Greenbelt agent of change! Your grandchildren (and theirs) will thank you for it.

## ✔ Choose Trees for Your Grandchildren

By sharing their shade, trees reduce carbon emissions from heating and air conditioning and reduce the urban heat island effect — the heat that accumulates from sun-warmed asphalt and roofs in a city. They also help to reduce air pollution. Evergreens can also save on winter heating emissions by providing a windbreak. Well-chosen trees should live up to a century or more, so it's critical to keep a warm dry climate in mind when you are deciding which tree to plant as the “climate envelope” (the suitable range for temperature and precipitation) for all tree species is shifting northwards with rising temperatures. The Greenbelt is at the northern edge of the Carolinian Zone, and so dry-adapted Carolinian tree species may be the best choices that are available at present, as the range for many of these extends south well into the U.S.



### ABOUT THIS SERIES:

The Greenbelt Foundation partnered with experts to understand how climate change is affecting our daily lives, and ways that we can individually and collectively respond to these challenges. For other installments in the series, visit [www.greenbelt.ca/changing\\_climate](http://www.greenbelt.ca/changing_climate)