

SCIENCE SPOTLIGHT

YOUR FRIENDLY, NEIGHBOURHOOD GREEN ROOFS

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Your Friendly, Neighbourhood Green Roofs

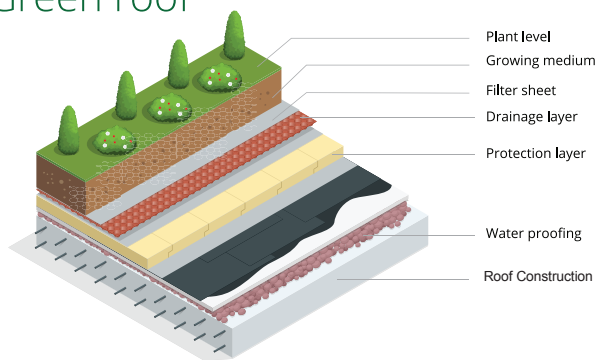
Origin Story:

WHAT IS A GREEN ROOF?

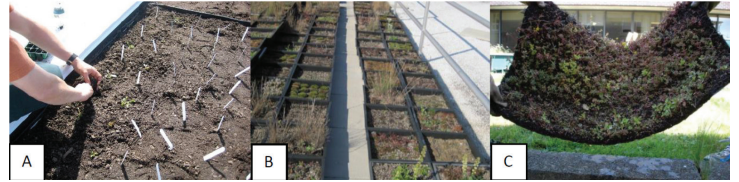
Cities face a number of climate challenges from stormwater runoff over hard surfaces like roofs or pavement, to rising temperatures and air pollution. Green roofs, or roofs with growing plants, can help manage those problems. The plants and soil store water and slow down runoff, they provide cooling shade, filter air, and look great while doing it. They can also make buildings more energy efficient by preventing the roof from getting too hot or cold, which in turn helps keep things at a comfortable temperature inside.

Green roofs are built up in layers, each with its own special purpose. The bottom three layers are roof construction, waterproofing, and protection layers. These protect the roof from soaked-up water and damage from the plant roots. Then there is a drainage layer and a filter sheet, that help guide extra water off the roof, a layer of soil called the growing medium, and finally the plant level.

Green roof



There are a few ways to install a green roof. Green roofs built to be part of the roof itself are called loose laid systems. Green roofs in the form of trays installed on top of the roof are known as modular systems. Plants can also be pre-grown in mats of soil and rolled out onto the roof.



Amy Heim, Stephanie Appleby, and Jeremy Lundholm, *Green Roof Thermal and Stormwater Performance Comparisons Between Native and Industry-Standard Plant Species* (Cities and the Environment, 2017), 1, fig. 1.

Can Native Plants be Used in Urban Green Roofs?

Most green roofs use *Sedum* plants from Europe and Asia, because they tolerate drought and extreme weather. With green roofs growing in popularity here in Canada and demand for using local plants rising, scientists from Halifax wanted to see if native Nova Scotian plants could compete with the old industry standard.

To test this, they seeded mats with ten native coastal plant species and mats with ten *Sedum* species. After allowing them to grow for a couple seasons, the now plant-covered mats were set up on roofs with sections of *Sedum*, sections of native plants, and one unplanted control section. Sensors in the soil measured temperature changes, and tipping buckets measured how much water ran off the green roof when it rained.

The researchers found that native coastal plants could be used in Nova Scotian green roofs just as effectively as *Sedum* plants. The native plants held just as much water as the *Sedum* plants, which helps reduce roof water runoff during storms. The temperature of the native plants' soil was not as stable as the *Sedum* plants' soil, meaning it was not as efficient at keeping the building cool. However, in their study mats, there were fewer native plants growing per area than *Sedum* plants, suggesting native plants could eventually become even better at retaining water and heat if they continue to grow and thrive.

Making our cities more climate resilient is an important step towards keeping our communities safe in the future. By testing native plants in green roofs, these researchers are helping to meet the growing green roof demand and inspiring more research into how green roofs can help protect against climate change.



Time for **GENACTION!**

Try this at Home: **GROW IT YOURSELF**

Make your own model green roof with just a few easy steps.

1. Put a plate down on the windowsill for a waterproof layer.
2. Cut off the top half of an egg carton and set it on the plate. This is your roof barrier.
3. Put a layer of pebbles in the top half of the egg carton. This is your drainage layer.
4. In the bottom half of the egg carton, poke a little hole in each egg cell and fill it about halfway with garden soil. This is your growing medium. Put it on top of the pebbles.
5. Place your seeds on the soil and add a little more soil on top. Water gently every few days, just enough to keep the soil moist. Source your seeds responsibly: find a nursery near you that grows native plants for seeds, to be mindful of over-harvesting from the wild.
6. Watch your seedlings grow into your vegetation layer!

Climate Action: **URBAN BIODIVERSITY**

Green roofs help promote biodiversity in cities. Biodiversity refers to the variety of living things found in a habitat. The wider variety of plants, animals, fungi, and microorganisms found in a region, the higher the biodiversity. High biodiversity can help ecosystems adapt to issues that threaten them, such as climate change. You can help promote biodiversity in your own backyard! Ask your parents to help you make your home friendly to wildlife with a few tips.

- Wait to clean up your lawn in the spring! Lots of pollinators hibernate under the leaf litter, and they are more likely to survive if they are not disturbed.

- Plant a variety of flowers, shrubs, and grasses, and make sure they are native to Nova Scotia. Try to have different colours and shapes in your garden. Check [CanPlant](#) website for suggestions, or the [Freshwater Alliance](#) website for their list of top ten native maritime plants.
- Grow fruits, vegetables, and herbs! They feed you, and they feed the wildlife, too. Chives are a great choice! They are very hardy and grow naturally on the East Coast. Plus, pollinators love them, and they taste great with lots of meals.

MEET OUR LOCAL SCIENCE HEROES:



Amy Heim is working on her Ph.D., focusing on how to improve green roofs, and how urbanism impacts humans and the environment.



Stephanie Appleby-Jones studied different fertilizers including kelp and mushrooms for green roofs.



Dr. Jeremy Lundholm studies plant communities and plant diversity.

Climate Change

Past, Present, and Future

Earth is the only planet in the solar system known to support life. What makes our home so special? Earth has an atmosphere, a layer of gases between our planet and space. Some of these gases, like carbon dioxide, are called **greenhouse gases**. They are crucial parts of our atmosphere; they trap in the heat of the sun, similar to how heat is trapped in a greenhouse, or in a car on a hot day. This process, called the **greenhouse effect**, keeps Earth's temperature warm enough for living things to thrive.

The sun's rays hit our round, tilted planet unevenly. This uneven heating of Earth's surface leads to differences in temperature, which drives weather patterns. We call the patterns in temperature and weather over long periods of time **climate**. Different parts of the world have vastly different climates; it depends on how much heat they receive, as well as what landscape features are nearby. Water, mountains, ocean currents, and forests all impact our climate. In turn, living things around the world have adapted to the climate they live in.

Something, though, is changing. Over the past two hundred years, humans have been burning fossil fuels, such as coal and oil, to make energy to power our daily lives. Fossil fuels are made from decomposed plant matter and microscopic life millions of years old. This matter is full of carbon, and, burning it releases, or emits, billions of tonnes of **carbon dioxide** gas into the atmosphere every year. When too much carbon dioxide is emitted, the delicate balance of greenhouse gases maintaining

Earth's climate is upset. More and more heat is trapped, causing the planet to warm. Weather patterns change, water levels rise, storms get worse.

Climate has changed many times throughout Earth's history, from ice ages to periods much hotter than today. So why is this time any different? Scientists agree on two things. One, temperatures are rising faster than they ever have in documented climate history. Two, this climate change is driven by human activities, due primarily to greenhouse gas emissions.

Climate change is already impacting people's ways of life all over the world. Powerful storms, droughts, forest fires, and floods are threatening people's access to food, water, and safe homes.

The most important step we can take to prevent serious climate change is to reduce greenhouse gas emissions. Incredibly brave and caring people around the world are finding new ways to reduce emissions and make our communities climate resilient every single day. And you can join them! These Science Spotlights are here to help us learn more about climate change and how you can take action.

Our Commitment to the Decolonization of Science

Institutions of GenAction initiative respect and affirm the inherent and Treaty Rights of all Indigenous Peoples across what we now know as Canada. We give thanks to the Indigenous Peoples who care for this land since time immemorial and pay respect to their traditions and ways of knowing. We acknowledge their many contributions to innovations in Science, Technology, Engineering, and Mathematics, past and present, and are committed to deepening engagement and collaborating with Indigenous Peoples as partners in order to advance truth and reconciliation and the decolonization of science.

