

Green Roof Benefits

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Green roofs offer many public, private, and design-based benefits.

Public Benefits

Aesthetic Improvement

- Urban greening has long been promoted as an easy and effective strategy for beautifying the built environment and increasing investment opportunity.

Waste Diversion

Green roofs can contribute to landfill diversion by:

- Prolonging the life of waterproofing membranes, reducing associated waste
- The use of recycled materials in the growing medium
- Prolonging the service life of heating, ventilation, and HVAC systems through decreased use

Stormwater Management

- With green roofs, water is stored by the substrate and then taken up by the plants from where it is returned to the atmosphere through transpiration and evaporation.
- In summer, depending on the plants and depth of growing medium, green roofs retain 70-90% of the precipitation that falls on them; in winter they retain between 25-40%. For example, a grass roof with a 4-20 cm (1.6 – 7.9 inches) layer of growing medium can hold 10-15 cm (3.9 – 5.9 inches) of water.
- Green roofs not only retain rainwater, but also moderate the temperature of the water and act as natural filters for any of the water that happens to run off.
- Green roofs reduce the amount of stormwater runoff and also delay the time at which runoff occurs, resulting in decreased stress on sewer systems at peak flow periods.
- More on the stormwater management benefits of green roofs can be found in GRHC's half-day course: [Integrated Water Management for Buildings and Sites](#).

Moderation of Urban Heat Island Effect

- Through the daily dew and evaporation cycle, plants on vertical and horizontal surfaces are able to cool cities during hot summer months and reduce the Urban Heat Island (UHI) effect. The light absorbed by vegetation would otherwise be converted into heat energy.
- UHI is also mitigated by the covering some of the hottest surfaces in the urban environment – black rooftops.
- Green roofs can also help reduce the distribution of dust and particulate matter throughout the city, as well as the production of smog. This can play a role in reducing greenhouse gas emissions and adapting urban areas to a future climate with warmer summers.

Improved Air Quality

- The plants on green roofs can capture airborne pollutants and atmospheric deposition.
- They can also filter noxious gases.
- The temperature moderating effects of green roofs can reduce demand on power plants, and potentially decrease the amount of CO₂ and other polluting by-products being released into the air.

New Amenity Spaces

Green roofs help to reach the principles of smart growth and positively affect the urban environment by increasing amenity and green space and reducing community resistance to infill projects. Green roofs can serve a number of functions and uses, including:

- Community gardens (e.g. local food production or co-ops)
- Commercial space (e.g. display areas and restaurant terraces)
- Recreational space (e.g. lawn bowling and children's playgrounds)



Herb Garden on Fairmount Waterfront Hotel, Vancouver, BC.

Local Job Creation

- The growth of green roof and wall market gives new job opportunities related to manufacturing, plant growth, design, installation, and maintenance.
- American Rivers suggests that a USD \$10B investment could create 190,000 jobs by building 48.5 billion-square-feet of green roof area, or just one percent of the United States' roof space in every community over 50,000 in population.
- There is significant potential for new growth in dense urban areas that were previously unusable.

Private Benefits

Energy Efficiency

- The greater insulation offered by green roofs can reduce the amount of energy needed to moderate the temperature of a building, as roofs are the site of the greatest heat loss in the winter and the hottest temperatures in the summer.
- For example, research published by the National Research Council of Canada found that an extensive green roof reduced the daily energy demand for air conditioning in the summer by over 75% (Liu 2003).
- The [Green Roof Energy Calculator](#) co-developed by GRHC with the University of Toronto and Portland State University allows you to compare the annual energy performance of a building with a vegetative green roof to the same building with either a conventional roof or a highly reflective roof.

Increased Roofing Membrane Durability

- The presence of a green roof decreases the exposure of waterproofing membranes to large temperature fluctuations, that can cause micro-tearing, and ultraviolet radiation.

Fire Retardation

- Green roofs have a much lower burning heat load (the heat generated when a substance burns) than do conventional roofs (Köhler 2004). GRHC has co-developed [Fire Design Standards](#) with SPRI (approved by ANSI) that ensure that green roofs offer fire protection and follow local fire codes.

Reduction of Electromagnetic Radiation

- The risk posed by electromagnetic radiation (from wireless devices and mobile communication) to human health is still a question for debate. Nevertheless, green roofs are capable of reducing electromagnetic radiation penetration by 99.4% (Herman 2003).

Noise Reduction

- Green roofs have excellent noise attenuation, especially for low frequency sounds. An extensive green roof can reduce sound from outside by 40 decibels, while an intensive one can reduce sound by 46-50 decibels (Peck et al. 1999).

Marketing

- Green roofs can increase a building's marketability. They are an easily identifiable symbol of the green building movement and can act as an incentive to those interested in the multiple benefits offered by green roofs.
- Green roofs, as part of the green building movement, have been identified as facilitating (Wilson 2005):
 - Sales
 - Lease outs
 - Increased property value due to increased efficiency
 - Easier employee recruiting
 - Lower employee and tenant turnover

Design-Specific Benefits

Increased Biodiversity

- Green roofs can sustain a variety of plants and invertebrates, and provide a habitat for various bird species. By acting as a stepping stone habitat for migrating species they can link species together that would otherwise be fragmented.
- Increasing biodiversity can positively affect three realms:
 1. Ecosystem: Diverse ecosystems are better able to maintain high levels of productivity during periods of environmental variation than those with fewer species
 2. Economic: Stabilized ecosystems ensure the delivery of ecological goods (e.g. food, construction materials, and medicinal plants) and services (e.g. maintain hydrological cycles, cleanse water and air, and store and cycle nutrients)
 3. Social: Visual and environmental diversity can have positive impacts on community and psychological well-being

Improved Health and Well-Being

- The reduced pollution and increased water quality that green roofs bring can decrease demands for health care
- Green roofs can serve as community hubs, increasing social cohesion, sense of community, and public safety.

Urban Agriculture

- Using green roofs as the site for an urban agriculture project can reduce a community's urban footprint through the creation of a local food system.
- These projects can serve as a source of community empowerment, give increased feelings of self-reliance, and improve levels of nutrition.
- More information on urban agriculture can be found in GRHC's half-day course: [Introduction to Rooftop Urban Agriculture.](#)

Educational Opportunities

- Green roofs on educational facilities can provide an easily accessible sight to teach students and visitors about biology, green roof technology, and the benefits of green roofs.
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