

# The Greenroof School of Engineering, University of Auckland



## What is a greenroof?

Greenroofs are roofs that grow plants. The ancestor of modern greenroofs is the Scandinavian and Irish sod roof. Modern greenroofs include roof gardens and intensive greenroofs in which plants are grown either in irrigated containers or relatively deep substrate to provide attractive recreational space. Extensive greenroofs are lightweight and not usually walked on – they are much cheaper than intensive greenroofs because additional structural support, needed to hold up the roof, is minimised and maintenance is low.

Unlike conventional roofs, the greenroof plants and growing media provide benefits:

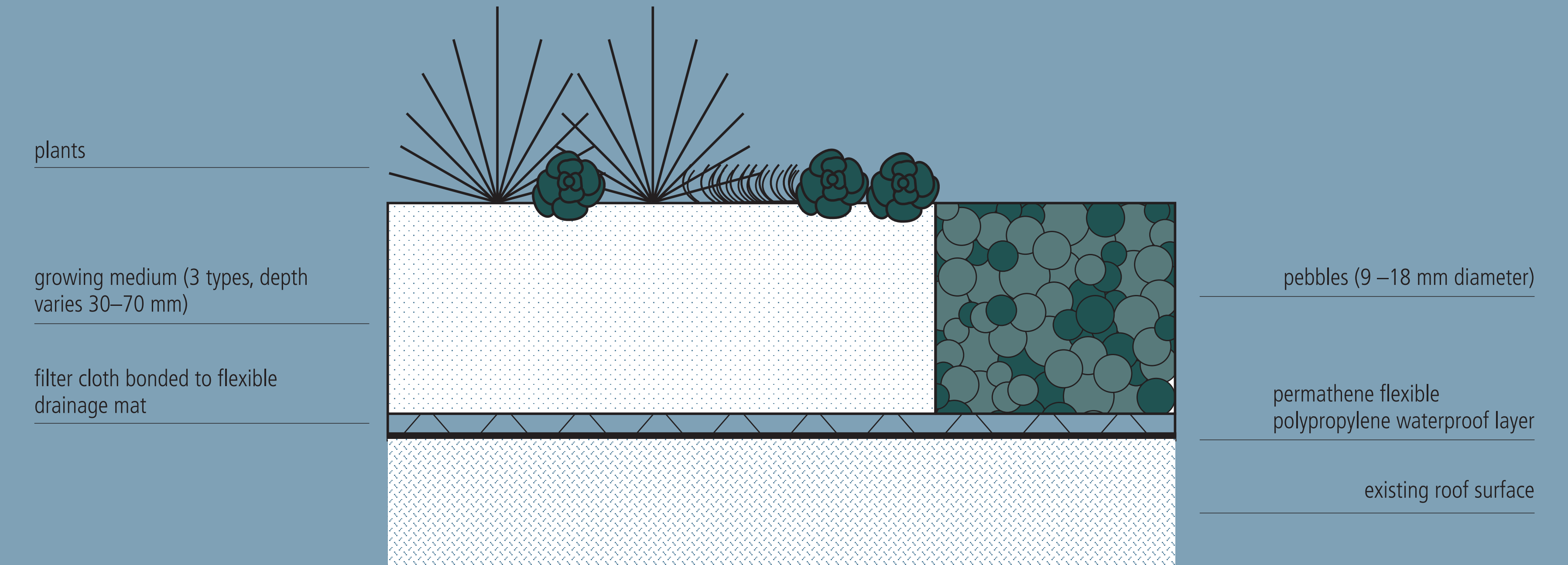
- stormwater reduction – the substrate acts like a sponge to absorb, delay, and slowly release stormwater
- moderation of the urban ‘heat island’ effect through lower heat absorbance and reduced reflectance
- cost savings by extending the underlying roof’s life and through insulation
- sound insulation
- habitat for insects, plants and birds
- filtering dust and pollutants from air passing through the plants
- aesthetic benefits from enhancing otherwise barren rooftops

Extensive greenroofs, used in Germany for 30 years or more, are undergoing a renaissance as cities seek to reduce their environmental footprints.

## Features of these extensive greenroofs

These trial plots are typical of modern extensive roofs – a drought-tolerant plant cover is growing in lightweight, thin (30 to 70mm deep) growing media on a plastic drainage sheet. The three substrates were chosen to balance low weight and high permeability (drainage) against moisture holding and cost. The lowest-weight and highest cost medium includes expanded clay imported from Germany (plots 2 and 5); the highest-weight and lowest-cost medium is local pumice and composted bark (plots 3 and 6). Each plot is planted with native herbs and grasses found in exposed, droughty places and exotic sedums which are the plant most commonly used overseas.

The greenroof was installed over 3 days in September 2006 as a retrofit of an existing roof, with no additional waterproofing or structural support needed – the heaviest plots weigh less than 100 kg/m<sup>2</sup> when saturated during a storm event.



## Native Plants



*Acaena microphylla*  
Bidibid



*Coprosma acerosa*  
Sand dune  
Coprosma



*Crassula seberiana*  
Austral stonecrop



*Disphyma australe*  
NZ iceplant



*Festuca coxii*  
Cox's fescue



*Leptinella pusilla*  
Shore cotula



*Libertia peregrmans*  
NZ iris



*Selliera radicans*  
Selliera

## Research

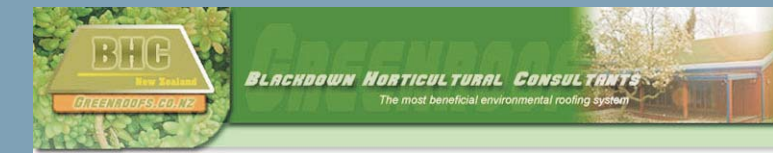
It is difficult to promote greenroofs for New Zealand commercial buildings without local cost/benefit information based on sites where these roofs can be seen, and without field-based information on local substrates and plants suitable for greenroofs. These trial roofs are designed to:

- Quantify the performance of three substrates and two substrate depths on the infiltration, detention and release of stormwater and their ability to sustain plant growth
- Identify the best plant species for greenroofs (survival and growth)
- Quantify the weed potential of the exotic sedums
- Identify what insects live on greenroofs

## Who is supporting this project?

- Auckland Regional Council
- University of Auckland
- Landcare Research and Foundation for Science Research and Technology through the Low Impact Urban Design Research Programme

The following companies provided their products and services



## Sedums



*Sedum album muralis*



*Sedum purpureum*



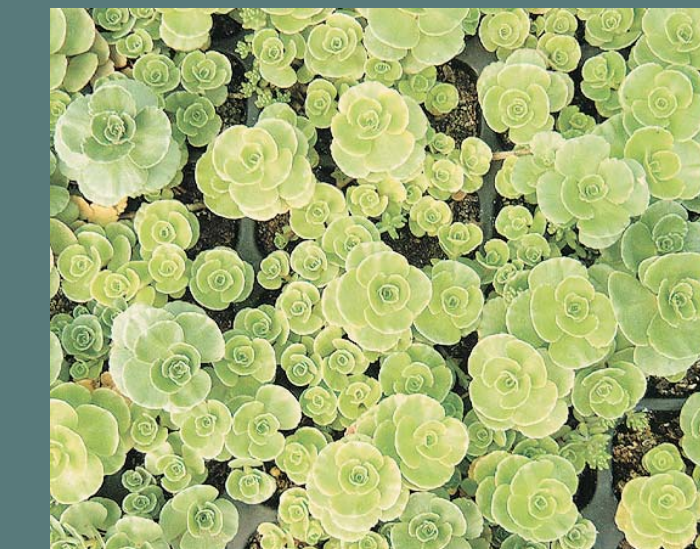
*Sedum reflex*



*Sedum sarmamentosum*



*Sedum pathulifolium*



*Sedum spurium*

## Trial roof key

- 9–18mm pebble drainage edging
- sedum mat (20mm depth)
- unvegetated
- planted with sedum plugs and/or native plants 18 plugs/m<sup>2</sup>

