

How to: Make a Living Roof



Roofs can have great potential to be turned into spaces for wildlife, with a bit of imagination and effort. Planted “living” or “green” roofs intercept water and add insulation, keeping whatever is underneath warmer in winter and cooler in summer. However, they can add a lot of weight, so if you want to create a green roof on a building you live or work in, make sure to consult a professional structural engineer about the load-bearing capacity of your building before you start.



Photo: Climagrün



Photo: pnwra

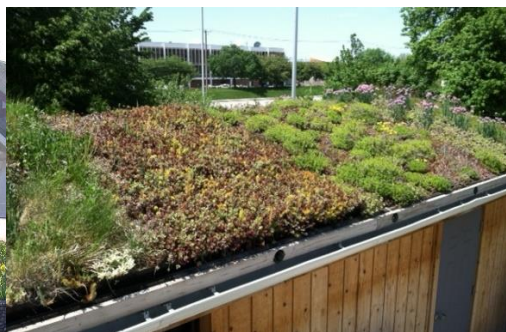


Photo: Newtben33 All via Wikimedia Commons

Any roof can be greened, but we suggest creating a living roof on simple buildings - such as a shed or garden structure. It is a good opportunity with a new architect-designed extension - where you can make sure the building can withstand the extra weight. Retrofitting a living roof to your home has serious risks, so we don't recommend considering doing this without professional help.

Target species:

Insects such as beetles and spiders will make their home on a green roof, and if you plant wildflowers or sedums, you'll attract many bees as well. Living roofs can support local or regional plant communities and vegetation types that might be endangered in the wild. Even a small living roof can provide a good feeding area for common garden birds such as blackbird, song thrush, robin and wren. Dry grassland roofs with plenty of seed plants will attract seed-eating birds such as goldfinch, linnet, greenfinch and chaffinch. Black redstart. Black redstarts have thrived in London as the result of inner-city green roofs.

How to do it

Shallow living roofs up to 10cm soil thickness are the most lightweight and easy to create and maintain. However, as the soil is shallow, they are a harsh environment for plants which will need to be hardy to withstand frost, wind and especially drought. Soil depths up to 20cm create a better environment and allow more plant species to flourish, but need a strong structure and are more likely to be colonised by “weeds”

Prepare the roof

- Flat or gently sloping roofs below 30° are suitable, steeper slopes need special measures to hold soil in place.

- Garden sheds are a good place to start but will need additional internal bracing to make the roof strong enough and do make sure the rest of the shed is still sound.
- Making a living roof involves putting down many layers. First, you'll need to install a waterproofing layer to the roof surface as your base layer, that is also resistant to plant roots. A butyl pond liner, or thick polythene sheet used for damp-proofing a floor are ideal, laid over in one piece, or with a minimum of 20cm overlap. This can be laid on top of an existing waterproof covering.
- There needs to be a drainage layer so that excess water can run off the roof. This used to be gravel, but this is heavy, and coir fibre is an alternative. You need a geotextile filter layer on that to keep back fine soil particles.
- Next comes a moisture blanket layer to help retain some water to keep the soil moist longer. You can buy commercial blankets which do not degrade, but cardboard or old blankets can be used to achieve the same effect.
- Specially made drainage and water storage membranes are available such as PermaSEAL® which also incorporate a filter layer and are lightweight and easy to use.
- On a sloping roof make sure there are drainage holes in the ridge at the bottom that keeps the soil from sliding off, and you may want to put in a gutter and downpipe.
- Finally, add soils and substrate as your top layer. The growing medium should be lightweight and free-draining, but able to retain moisture. Aggregates mixed with light sub-soils such as crushed porous brick and limestone chippings work well. A shallow sediment layer of up to 5cm can sustain simple sedum/moss communities, and a layer 5-10cm will be able to grow short wildflower meadows, low-growing, drought tolerant perennials, grasses and alpiners, and small bulbs.

Case study – Helen Bostock's eco-shed roof

This is a converted steel shipping container, clad with timber for appearance



The container (and dog)



Enclosing the roof



Adding drainage/water layer



Filter layer of geotextile



Soil ready for planting

Planting

- You can just leave the roof to colonise naturally by mosses and wind-blown seeds, but most people will want faster results. What you can expect to thrive depends on the depth of soil.

- For shallow soils up to 10cm deep, species of stonecrop or *Sedum* are recommended because these evergreen plants are very tough, drought resistant, and excellent for pollinators. You can buy these as seeds or plugs, and even as pre-planted mats to spread over the soil. There are four native *Sedum* species you can use: white stonecrop *Sedum album*, biting stonecrop *Sedum acre*, English stonecrop *Sedum anglicum*, and rock stonecrop *Sedum fosterianum*. Commercial sedum mats will contain other non-native species as well and are perfectly acceptable and very attractive when in flower.
- Deeper soils up to 20cm can sustain wild flowers and grasses, although in a dry summer they will brown-off unless regularly watered. You can buy native wildflower seed mixes specially designed for green roofs from several suppliers. Mediterranean-type herbs such as rosemary, sage and thymes can be tried, and spring flowering bulbs including crocus, dwarf iris and grape hyacinths. *Cyclamen* are surprisingly tough and could be tried for autumn colour. Native quaking grass *Briza media* and many coarse native grasses will grow on deeper soils (and colonise too) and you could try the attractive non-native *Pennisetum alopecuroides* and *Pennisetum rubrum* or pheasant grass *Stipa tenuissima*.

Case study: Helen Bostock's eco-shed roof



Seed mix used



2 months later



a year later

More ambitious green roofs

Establishing a retro-fit green roof on a building you live in is a serious and even risky project, and the structure of the building must be approved by a professional to have sufficient load-bearing capacity for all your layers with the added weight after saturation with water. Get a structural engineer to assess your building for you to ensure your green roof will be safe to install. Renewing of the roofing layer might also be necessary before installing any soil layers, so consult an expert to help you with this.

When calculating the weight of your finished living roof, always use the weight of substrates saturated with water, and take into account that as plants grow their weight will increase over time. Green roofs on new-build houses or extensions can be planned-in from the outset by your architect and will present fewer challenges. The Green Roof Organisation provides a detailed [Code of Practice for Green Roofs](#), with all the information you need to make a living roof.

How easy is it to do?

Hard - greening a roof is quite a big project depending on the soil depth and size of roof you are trying to green, but the results can be very rewarding.

How much will it cost?

It is possible to put together a small-scale living roof using materials available in most garden centres and hardware shops. You can enjoy having mosses and lichens growing on a lightweight building without *any* work or expense. Commercial systems generally cost about £50/m² for a thin lightweight sedum roof, and in excess of £200/m² for deeper roofs

How effective is it for the target species?

Even the basic sedum roof is very beneficial for many insects and spiders, and especially for pollinators. The conditions on a living roof (free draining with low fertility) are ideal for the creation of diverse and species-rich grassland plant communities. A wide range of flowering plant species will result in a longer overall flowering season, extending the period that insects can feed on from nectar sources on the roof. Late-flowering species are particularly effective for insects in this way.

Golden rules – what the science tells us

- Wildflowers and sedums can provide a valuable food source for pollinators during summer, and it is possible to plant annual species becoming scarce in the UK such as scarlet pimpernel, cornflower, corn marigold, corncockle, wild pansy and scentless mayweed.
- Green roofs have the potential to reduce the effects of urban heat island effect, where hard surfaces absorb and radiate the heat of the sun to create a hotter microclimate, by preventing solar radiation reaching the roof surface and cooling the surrounding air through evaporation of water from soil surfaces and leaves.
- Living roofs act as sponges, retaining water before allowing it to evaporate into the atmosphere. This can reduce the likelihood of local floods in heavy rain, so if used on many buildings can be a valuable flood prevention measure.
- Ordinary roofs gradually accumulate lichens and cushions of several species of moss. While these are not very spectacular, they will support a great variety of microscopic animal species, some of which (eg tardigrades) are able to withstand completely drying out. Moss and lichens cause absolutely no harm to the roof, so please resist clearing them off, as some unfortunately tidy-minded homeowners are persuaded to do.
- Research has shown that the higher above ground the green roof is located, the fewer beetle species they support. This means that a garden shed green roof 2m above the ground could be as useful for wildlife as a larger one on top of a tall building.
- A brown roof, where there is an un-planted substrate, will naturally vegetate over time through blown seeds and bird droppings. This is probably the best way to replicate the plant and invertebrate communities locally at ground level.

What to look for?

Sedum will flower in the summer and attract bees, butterflies and other insects. If you have seed-bearing wildflowers, they will attract seed eating birds if left uncut through autumn and winter. A sedum living roof will gradually develop into a more mixed community, as grasses and other plants self-seed, and over time the humus content of the substrate increases.

Things to be aware of

- You can water an accessible green roof during prolonged drought periods if you wish, especially if you are encouraging wildflowers.
- Carry out an annual check to make sure no tree seedlings have taken root, as they can puncture and damage your waterproofing layer.

Further information

Green Roof Organisation's [Code of Practice for Green Roofs](http://www.livingroofs.org/wp-content/uploads/2016/03/grocode2014.pdf). www.livingroofs.org/wp-content/uploads/2016/03/grocode2014.pdf

Natural England's [booklet](http://www.wlgf.org/ne30living_roofs%5B1%5D.pdf) on Living Roofs www.wlgf.org/ne30living_roofs%5B1%5D.pdf

For further information on living roofs and biodiversity, go to www.livingroofs.org or www.greenroofs.com

[PermaSeal](http://www.permagard.co.uk/permaSeal-20-green-roof-drainage-storage-membrane) drainage and water storage system www.permagard.co.uk/permaSeal-20-green-roof-drainage-storage-membrane

RHS [page on green roofs](http://www.rhs.org.uk/garden-features/green-roofs) www.rhs.org.uk/garden-features/green-roofs

Fun video on green roofs on [Utrecht bus stops](https://www.facebook.com/watch/?v=687159841745770) www.facebook.com/watch/?v=687159841745770

Books

Dunnet, N. Gedge, D. and Little, J. (2011) Small Green Roofs: Low-Tech Options for Homeowners Timber Press

Major science review of green roofs: Sutton R.K. ed. (2015) Green Roof Ecosystems., Ecological Studies 223 Springer