BritishFlora

Planting the Seeds for a Greener Tomorrow

BritishFlora **BIODIVERSE GREENROOF INFORMATION**

Tel: 01684 212027 Fax: 01684 578424
E: info@britishflora.co.uk
W: www.britishflora.co.uk

Largest specialist grower & supplier of over 300 British native wildflowers, marginal & aquatic plants and seed with over 25 years experience

BritishFlora
The Bakery
The Old Vicarage
Hanley Castle
Worcestershire
WR8 0BJ

T: 01684 212027
F: 01684 578424
E: info@britishflora.co.uk
W: www.britishflora.co.uk

BritishFlora Sales and Advisory Team

Chris Baker **M: 07740 611810**
Managing Director
Senior Technical Advisor

Nick Baker **M: 07975 922222**
Sales Manager/Technical Advisor

Liz Powell **M: 07875 221409**
Ecologist/Consultant

Tori Evans
Accounts/Administration

Anna Taylor
Customer Relationship Manager

Welcome to BritishFlora's Green Roof Information Pack. We include all the information required to create a *bio-diverse green roof*, including species, ecological, and technical information with additional information on maintaining a green roof. Our **Bio-diverse Green Roof Species List** includes comprehensive information on each plant species with an illustration, flowering colour, height and flower period where appropriate. Information about *sedum roof supplies* from BritishFlora is available at the back of the brochure. Information on our tray and pot sizes is included to help with the task of making estimates for projects. Our sales and technical team are there to help with any further queries you may have.

BIODIVERSE GREEN ROOF SYSTEMS INFORMATION SHEET

BritishFlora provides a specialist design and installation service for biodiversity roofs including substrate and plant specification, plug planting, seeding and biodiversity features. We can also provide a maintenance and monitoring service integral to the establishment of a successful green roof.
BritishFlora are the largest supplier of native wild flowering plants in the UK and have developed a new range of wildflowers as plug plants and seed for biodiverse green roof applications, including green roof substrates.

Our Ecologists are Full Members of the Chartered Institute of Ecology and Environmental Management (CIEEM) and can advise on enhancing biodiversity on your green roof and attaining landscape and ecology credits for Code for Sustainable Homes (CfSH) and BREEAM. The following Information note is a brief outline of how to plan and design for a green roof system focusing on 'biodiverse' roof systems.

BENEFITS OF BIODIVERSE GREEN ROOF SYSTEMS:

- **Creates Habitat for threatened wildlife**
- **Contributes towards Local Biodiversity Action Plans**
- **Habitat Creation (brownfield sites/wildflower habitat)**
- **Improved Water Retention, Harvesting & Quality**
- **Improves Air Quality and Reduced Carbon Emissions**
- **Reduces Urban Heat Island Effect**
- **Creates Amenity Space & Wellbeing**
- **Aid to Planning & Sustainability (BREEAM, CfSH)**
- **Financial Benefits- Reduced Building Running Costs**

TERMINOLOGY AND GREEN ROOF TYPES

Green roof is the overall term for any vegetated roof system and there are a number of different types and terms used to describe these different systems. The substrate depth and type and the plant communities that can establish on these mediums define the type of green roof:

Intensive green roofs are also known as rooftop gardens and the vegetation is similar to ground level planting and can include anything from trees and shrubs to swimming pools and allotments. The substrate used ranges from 200mm to 400mm and has a higher organic content and a requirement for high loading capacity.

Sedum roofs are very shallow substrate, low nutrient roofs 20-60mm, the dominant plant cover is a drought tolerant species known as a stonecrop (*Sedum sp)*. These types of roofs have been shown to support less biodiversity and often include non-native plant species imported from overseas.

Extensive or Biodiverse roofs are shallow lightweight systems that can support a diverse assemblage of native wildflowers and grasses. The diversity of vegetation and substrates will create ecological habitats for wildlife and the substrate depth varies from 80-150mm.

DESIGN AND PLANNING

Involving Britishflora in the early stages of the green roof design process will ensure that the right green roof system is specified to meet the objectives of the project. Whether for credits for BREEAM or CfSH assessments, to meet local biodiversity targets or provide mitigation replacement habitat for brownfield sites BritishFlora can design and install the roof to meet these objectives.

A structural engineer and or architect must be involved in designing a green roof to calculate weight-loading capacities of the selected green roof system. BritishFlora works closely with these specialists to provide expert horticultural and ecological advice on native species planting, substrates and maintenance.

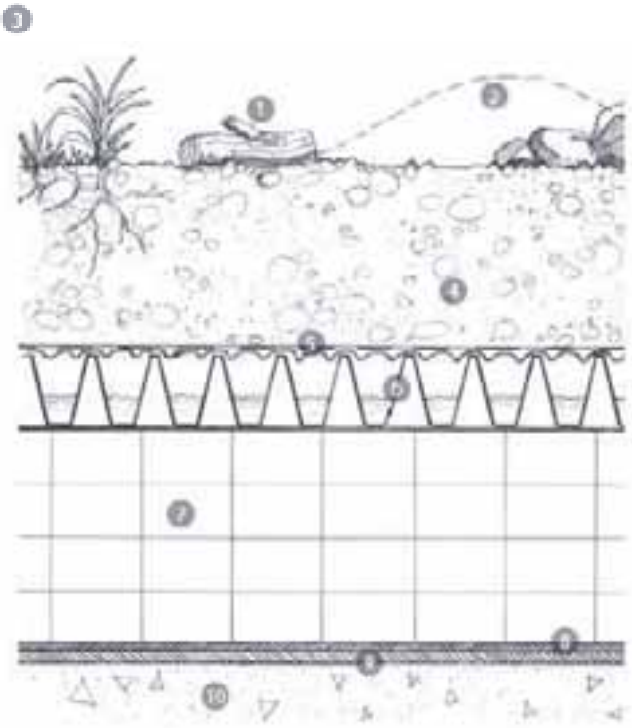
An assessment of the prevailing environmental conditions expected on the green roofs must be undertaken such as the prevailing wind direction and strength, average rainfall and shading to determine the vegetation suitable for the roof. Biodiverse roofs will often have a period of browning off during dry spells in the summer and therefore it is important to manage client expectations and determine the requirement for an aesthetic green roof versus a biodiverse roof. There are seasonal constraints when establishing vegetation on a green roof and therefore adequate planning is essential (see section on establishing vegetation below).

Weights and depths of substrates can vary and a suitably qualified structural engineer will need to be consulted on weight bearing loads of different roof designs. The Table below provides a guide to weight and depth of substrates in different green roof systems.

	Intensive Roof Loadings	Extensive/'Biodiverse' Roof loadings
Root barrier and drainage layer	57kg/m2	11kg/m2
Depth/Type of Substrate	200-400mm	80-150mm, 10-20% organic content
Plants	26kg/m2	Wildflowers 10kg/m2
Weight of substrate (saturated)	250kg/m2 (200mm depth)	96 kg/m^2 (80mm depth)
Maintenance	Permanent irrigation required	Periodic
Saturated Total roof loadings (Average typical roof)	333kg/m2	117kg/m2

GREEN ROOF LAYERS

Terrestrial plant communities require adequate water, nutrients, drainage and air circulating around the roots to survive and this is recreated in the green roofing engineered layering system, which follows current best practice. The waterproofing membrane is one of the most important factors to consider prior to installation and its integrity must be confirmed prior to installation of green roof system by a specialist waterproofing contractor. The root barrier membrane is a protective layer preventing any damage to the water proofing from plant roots. A drainage board provides water storage capacity and allows excess water to drain away and the filter fleece installed above the drainage board prevents substrate from entering the drainage board. Drainage outlets are also an important component of green roof systems and vegetation barriers composed of large pebbles will prevent vegetation growing beyond the desired areas.



1. Biodiversity elements- log and rock piles
2. Localised mounding up to 200mm depth
3. Wildflower planting
4. Extensive crushed brick substrate
5. Filter fleece
6. Drainage board
7. Insulation
8. Root barrier membrane
9. Waterproofing layer
10. Structural slab

SUBSTRATES FOR BIODIVERSE ROOFS

The substrate type and depth are the most important factor when determining what vegetation can establish on the green roof. Evidence has shown that substrates designed specifically for green roofing purposes than meet industry standards (FLL Guidelines and Green Roof Code of Best Practice 2011), perform better and have the following properties:

- Fire clay based\mineral substrate
- Circumneutral pH
- Lightweight
- Good drainage characteristics
- Porous (absorbs water)
- Low nutrient (10% organic content)
- Avoids compaction (large granular)

Biodiverse roofs should aim for a minimum substrate depth of 80mm that varies up to 200mm to create different microclimates where thinner areas will be less well vegetated and deeper areas will be able to hold more moisture creating structurally diverse vegetation.

PLANT SELECTION

It is recommended that UK Native, UK provenance plant species are used on biodiverse roofs as they are adapted to the local environment and have evolved with our native pollinators and wildlife providing more valuable foraging resources. The vegetation that will establish well in the dry, shallow soils and low nutrient environments on an extensive green roof are those species that occur in similar dry environments in nature. These are the drought tolerant plant species (Xerophytes) of dry grasslands, brownfield sites and coastal shingle occurring in the UK, which are habitats increasingly under threat. The table at the end of this document is a recommended list of UK Native plants that are proven to establish well on extensive/biodiverse roofs.

Viper's Bugloss

Recommended plants for biodiverse roofs include a mixture of annual, biennial and perennial wildflowers and grasses that are drought tolerant. Plants that self-seed readily such as kidney vetch (*Anthyllis vulneraria*) and viper's bugloss (*Echium vulgare*) are effective as they allow communities to re-establish after vegetation die back following periods of prolonged drought.

Plants with long flower tubes such as red clover (*Trifolium pretense*) and viper's bugloss provide valuable nectar sources for native long-tongued bumblebee species. Bird's-foot trefoil (*Lotus corniculatus*) is a larval food plant for many butterfly species. The white flowers of campion species such as bladder and sea campion (*Silene vulgaris/uniflora*) provide good nectar sources for moths, and the seed heads of many wildflowers provide potential refuge and overwintering sites for invertebrates. Composite flowers such as ox-eye daisy (*Leucanthemum vulgare*) and yarrow (*Achillea millefolium*) and hawkbits provide good nectar sources for more generalist pollinators such as flies, butterflies and beetles.

Planting a diverse mix of species will provide nectar and pollen from spring to autumn with plants such as wild pansy (*Viola tricolor*) and common daisy (*Bellis perennis*) flowering as early as March and Lady's bedstraw (*Galium verum*), scabious species and knapweeds flowering well into September.

Kidney Vetch

UK Native Biting stonecrop

Stonecrops (Sedum species) can be a valuable addition to a biodiverse roof but should not exceed 20% cover. They will readily provide vegetation cover in more exposed areas of shallower substrate and can aid the establishment of diverse wildflowers. White stonecrop (*Sedum album*) is the host plant of the leaf bug *Clamydatus evanescens*, which is a rare invertebrate (Red Data Book 3). Native Stonecrop's are recommended on Biodiverse Roofs as non-native species will not support the same wildlife diversity.

ESTABLISHING VEGETATION ON A GREEN ROOF

Our experience has shown that a combination of plug planting and seeding (with a specially devised seed carrier) is the most effective way to establish a biodiverse roof. However for a balanced view the pros and cons of the different planting methods are described below:

Natural Colonisation

It is not recommended to allow roofs to colonise naturally as this can take a long time, it relies on having a good seed source nearby and the bare substrate is likely to become colonized by undesirable weed species such as *Buddleja*. If the green roof is located in or near to an environmentally sensitive area and local provenance seed is required, seed should be collected by a specialist contractor such as BritishFlora from a local reserve and grown into plugs for the green roof or seed spread directly onto the roof (See other methods below).

Seeding with safety harness and landyard

Seeding

Seeding is a cost effective method to vegetate a green roof particularly suitable for larger roofs over 1500m^2. There is a wide choice of species available from seed and the installation is relatively straightforward involving hand broadcasting or over larger areas employing hydro-seeding methods or a mechanical spreader. With seeding only, the roof can take up to 2 years before it looks established and most perennial species will not flower until the second growing season and therefore it is recommended that seeding is always used in combination with plug planting. Additionally, it is recommended that an annual mix is sown with a perennial mix to provide colour in the first season. Substrates specifically designed for seeding are available that have a smaller particle size and higher organic content and should be spread as a top dressing on the main substrate.

Autumn sowing in August/September, depending on prevailing weather conditions, is recommended to ensure that seedlings will germinate in favorable conditions and be exposed to chilling to break dormancy. BritishFlora can advise on the timing, seeding rates, substrates, and seed carrier required to sow with a seed mix to ensure even and effective establishment of your green roof.

Plug planting

Fig.2. wildflower plug

Plug planting is an effective way of quickly establishing a green roof and a wide range of suitable drought tolerant species for green roofing are available from BritishFlora as plug plants. Extensive lightweight substrates between 80-150mm are suitable for wildflower plug plants, with some plants requiring deeper substrates than others (refer to plant species table at the end of the document). Ideally plug plants should be planted at the beginning or the end of the growing season (March/April, or September/October) to allow the plants to establish. BritishFlora can advise on planting densities, suitable substrates and additional growing materials that will ensure establishment of plug plant vegetation.

Optimum Combination for establishing biodiverse greenroof - Plug Planting and Seed

The optimum combination is to install plug plants with a seed mix to ensure successful establishment of biodiverse mix of wildflowers. Some species of wildflower are difficult to establish from seed i.e those that need vernalisation or do not withstand competition and therefore plug plants are preferable however and annuals are more successful from seed. Plug plants will help to stabilize the soil and prevent potential erosion of substrate and wildflower seed.

This combination will provide greater diversity of plants and improved short-term and long-term establishment of vegetation. It also ensures the client achieves their sustainability credits through biodiverse planting in the first year and avoids having to return to replant roofs that have failed through seeding alone.

Sedum and wildflower blankets or pre-established systems

A pre-established sedum or wildflower turf provides an instant effect but is not recommended for biodiverse roof applications. The plant mixes available are limited and grass species will dominate over wildflowers. In areas where a blanket is installed the substrate cannot be undulating and does not provide open areas for burrowing invertebrates or natural plant colonisation. This is also an expensive solution and daily irrigation of turf during establishment and dry spells is required to keep vegetation alive.

WILDLIFE ON BIODIVERSE ROOFS


Figure 1-1 Carder bee

Monitoring and research on biodiverse roofs has shown that these wildflower rich habitats can provide important wildlife stepping-stones for invertebrates and can provide foraging and nesting potential for birds and bats. They should not replace habitat at ground level but in a built-up environment providing habitat at roof level can be very beneficial for biodiversity.

The habitats provide important sites for invertebrate specialists of dry environments including a number of rare species and those of principle conservation importance such as the brown-banded carder bee (Bombus humilis), which feeds on the wildflower rich habitat of biodiverse green roofs.

The insect biomass on green roofs is dominated by diptera, the principle food source for bats and therefore can attract foraging bats, particularly if a number of roofs are in the same area. In conjunction with artificial roosting sites at roof level biodiverse roofs can provide suitable habitat for bats in urban areas as wildlife stepping stones.


Figure 1-2 Starling. © Les Springer

The seeds and invertebrate biomass present on the green roof (ground dwelling, flying and soil invertebrates such as earth worms and larvae) provide foraging for bird species. The old flower stems left in situ provide nesting material and nesting habitat can be provided on site at roof level through artificial nest boxes or within the building design. Perching provided at different heights can provide singing and hunting opportunities for priority species such as black redstart, *Phoenicurus ochruros*. The roof environment also provides habitat for other bird species of conservation concern such as starling, house sparrow, herring gull and ringed plover.

BIODIVERSITY FEATURES

A biodiverse roof should include a variety of substrate types and depths to increase the mosaic of habitat types, vegetation structure and provide different microclimates for invertebrate species. Ideally the extensive substrate depth should range between 80mm up to 200mm to allow for different plant communities to develop. For example kidney vetch will establish on the shallow substrates and taller perennials such as knapweeds will thrive on the deeper substrates up to 200mm.

Figure 1-3 Sand mound and crevice garden at Pier Walk, Greenwich Peninsula

Insect Habitat Tower on Green Roof

Other substrate types in addition to the extensive substrate can include sand mounds, pea gravel, shingle, pebbles, wood piles and boulders to provide damper areas and cover for ground dwelling invertebrates. Substrate features should be considered where loading capacity allows on the building (discuss with architect/engineer). Where wind erosion is a problem heavier substrates can be used effectively to weigh down the extensive substrate and allow plants to establish by creating sheltered areas behind stone piles.

Water features can also provide an invaluable habitat and can increase insect biomass and provide bathing opportunities for birds. Insect hotels can also provide additional habitat for priority invertebrate species and can be added after initial installation.

MAINTENANCE

Contrary to popular belief biodiverse roofs do require periodic maintenance throughout the lifecycle of the roof. The key maintenance period is up to 3 months after planting during the initial 'establishment period'. Irrigation is particularly important in the first 10 weeks during dry periods.

On roofs over 500m^2 an automated sprinkler or leaky pipe system should be considered to maintain plant health. For plug plants irrigation is required every 2-3 days to once a week during the establishment period but wildflower blankets require daily irrigation during dry spells. Green roofs are very nutrient poor environments and therefore the use of a slow release fertilizer

can be beneficial to plant establishment (we can advise on fertilizer makeup and application rates). After initial establishment further fertilization and watering should NOT be required but should be assessed by the maintenance contractor.

Ongoing maintenance on biodiverse roofs should include at least two annual visits by a suitably qualified specialist green roof maintenance contractor. BritishFlora can provide a full maintenance service to ensure your green roof performs to expectations. The tasks required in annual maintenance can include:

- Inspection of vegetation and reporting any problems on plant establishment
- Removal of unwanted weeds such as Buddleja, Canadian fleabane, sow-thistles and docks
- Clearance of drainage pits and vegetation barriers around perimeter
- Old seeds heads should be left to overwinter to provide foraging potential for birds and overwintering sites for invertebrates.
- Cutting of wildflower turf and removal of this vegetation may be required on turfed roofs or those with more vigorous grass growth
- Invertebrate/wildlife may be a requirement under BREAAM Landscape and Ecology Management Plans. This can provide invaluable information on green roof ecology and help inform future green roof design. Data should be shared with the local records centre.

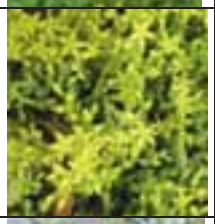
Plant and Seed Supply

BritishFlora are the largest suppliers of UK Native wildflowers in the U.K and are a recommended FloraLocale British Provenance nursery. We grow our plug plants in a 64cc jumbo plug (84 plants per tray) in green roof substrate, which are an optimum size for shallow substrates and easy to plant. The larger jumbo plug plants grown in green roof substrate* ensure that the plant will be acclimatized to green roof conditions and have robust root systems for quick establishment in green roof environments.

*Subject to availability

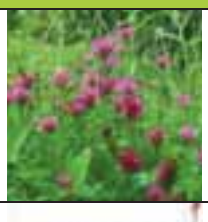
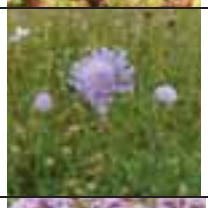
Table.2. Biodiverse UK Native Plant Mix for Green roofing

The following list of wildflowers is recommended for biodiverse roof applications and can be supplied by BritishFlora in plug plants or seed.

Common Plant Name	Scientific Plant Name		Comments
Agrimony	*Agrimonia eupatoria*		Tall perennial requiring deeper substrates 100-150mm. Suitable for shady areas. Flowering June to September.
Biting stonecrop	*Sedum acre*		Succulent plant suitable for very dry shallow substrates. Flowering June to August
Bladder campion	*Silene vulgaris*		Upright perennial on substrates 80-150mm. Nectar source for moths. Flowering period June to August.
Blue fleabane	*Erigeron acer*		Medium height self-seeding annual, can establish on very shallow substrates from 50-150mm depth. Later flowering July to August.
Buck's-horn plantain	*Plantago coronopus*		Can grow in very shallow substrate 10-100mm. Suitable for windy and coastal sites.
Centaury	*Centaurium erythraea*		Substrate depth of 80-150mm. Birds forage on seed heads. Flowering July to August.
Clustered bellflower	*Campanula glomerata*		Substrate depth of 80-150mm. Medium height perennial. Flowering June to October.

Common Plant Name	Scientific Plant Name		Comments
Common bird's- foot trefoil	*Lotus corniculatus*		Prostrate/creeping perennial. Substrate depth of 80-150mm. Good foraging for native bumblebees and larval foodplant for many butterflies. Flowering May to September
Common cat's-ear	*Hypochaeris radicata*		Medium height perennial. Substrate depth of 80-150mm. Good nectar source for generalist pollinators. Flowering June to September.
Common daisy	*Bellis perennis*		Low growing perennial suitable for substrate depth 80-150mm. Long flowering period from March to October.
Common knapweed	*Centaurea nigra*		100-150mm deeper substrate depth required, medium tall perennial. Very good nectar source for bumblebees. Flowering July to September.
Common poppy	*Papaver rhoeas*		Substrate depth of 50-100mm. Annual from seed, colour in the first year and self seeds thereafter. Good nectar source for generalist pollinators such as flies.
Common Sorrel	*Rumex acetosa*		Medium perennial, blush red throughout summer. Flowering May to June. Larval foodplant of orange tip butterfly. Substrate depth of 80-150mm.
Cornflower	*Centaurea cyanus*		Substrate depth of 50-100mm. Annual provides colour in first growing season and self seeds thereafter. Long flowering period May to October.
Cowslip	*Primula veris*		Medium height perennial. Substrate depth of 100-150mm. Spring flowering April to May.

Common Plant Name	Scientific Plant Name		Comments
Field scabious	*Knautia arvensis*		Deeper substrate 100-150mm. Good nectar source for pollinators. Later flowering July to September.
Glaucous sedge	*Carex flacca*		Structural semi-evergreen plant to provide cover in winter. Substrate depth of 80-150mm
Harebell	*Campanula rotundifolia*		Attractive perennial suitable for substrate depth 80-150mm. Later flowering period July to September.
Herb-Robert	*Geranium robertianum*		Substrate depth of 50-100mm. Suitable for shaded and exposed areas.
Kidney vetch	*Anthyllis vulneraria*		Clump forming prolific self-seeder is quick to establish. Substrate depth of 80-150mm. Nectar sources bees and butterfly larval foodplant (small blue)
Lady's Bedstraw	*Galium verum*		Substrate depth of 100-150mm, medium to tall perennial, slow growing. Flowering July to August. Larval foodplant for moth species.
Mouse-ear hawkweed	*Pilosella officinarum*		Low growing perennial substrate depth 80-150mm. Nectar source for generalist pollinators. Flowering period May to August.
Ox-eye Daisy	*Leucanthemum vulgare*		Substrate depth of 80-150mm. Medium height perennial, quickly establishes from seed. Long flowering period May to September.
Perforate St. John's-wort	*Hypericum perforatum*		Medium height perennial. Substrate depth of 80-150mm. Seed heads good foraging resource for bird species.

Common Plant Name	Scientific Plant Name		Comments
Red clover	*Trifolium pratense*		Low growing perennial, nectar source for long-tongued bumblebee species. Long flowering period May to September.
Ribwort plantain	*Plantago lanceolata*		Medium height perennial. Substrate depth of 80-150mm. Larval foodplant for fritillary butterflies.
Rock rose	*Helianthemum nummularium*		Substrate depth of 80-150mm, clump forming perennial. Very good nectar source for pollinators especially honey bees. Long flowering period May to September.
Rough hawkbit	*Leontodon hispidus*		Medium height perennial. Substrate depth of 80-150mm. Good nectar source for generalist pollinators. Flowering June to September.
Sea campion	*Silene uniflora*		Low growing prostrate perennial on shallow substrates 50-100mm. Nectar source for moths. Flowering period June to August.
Salad burnet	*Sanguisorba minor*		Medium height perennial. Substrate depth of 80-150mm. Very drought tolerant.
Scented mayweed	*Matricaria recutita*		Annual or perennial herb, slightly aromatic. Can exist on very thin substrates of 20mm-150mm. Flowering periods June to July.
Small scabious	*Scabiosa columbaria*		Medium height perennial. Substrate depth of 100-150mm. Good nectar source for many pollinators. Later flowering period July to September.
Thrift	*Armeria maritima spp maritima*		Very attractive clump forming plant suitable for exposed sites by the sea. 80-150mm substrate. Long flowering period April to October.

Common Plant Name	Scientific Plant Name		Comments
Thyme	*Thymus polytrichus*		Mat forming aromatic perennial. Good for high foot traffic areas and shallow substrates under 50mm. Good nectar source for pollinators. Flowering period May to August.
Viper's Bugloss	*Echium vulgare*		Tall biennial, self seeds and spreads and can grow on shallow substrates from 80mm. Good nectar resource for bumblebees. Flowering period June to September.
White Campion	*Silene latifolia*		Medium height perennial. Substrate depth of 80-150mm. Resource for foraging moths and night flying inverts and therefore attracts bats.
White Stonecrop	*Sedum alba*		Succulent plant suitable for very dry shallow substrates. White flowers. Flowering period June to August. Supports rare invertebrate sedum feeding bug *Clamydatus evanescens*.
Wild Basil	*Clinopodium vulgare*		Substrate depth of 80-150mm. Aromatic small perennial. Nectar source for moths. Flowering period July to September.
Wild Carrot	*Daucus carota*		Medium height biennial, deeper substrates 100-150mm. Nectar source for generalist pollinators such as beetles. Flowering period June to August.
Wild marjoram	*Origanum vulgare*		Aromatic attractive perennial. Substrate depth of 80-150mm. Nectar source for moths and bumblebees. Flowering period July to September.
Wild pansy/heart sease	*Viola tricolor*		Small annual or perennial, requires substrate depth of 50-150mm. Extended flowering period from March to October.

Common Plant Name	Scientific Plant Name		Comments
Wild strawberry	*Fragaria vesca*		Low growing creeping perennial suitable for shady areas. Produces small edible fruits. Flowering April-Jul
Yarrow	*Achillea millefolium*		Medium height perennial. Substrate depth of 80-150mm. Flowering period June to August. Nectar source for generalist pollinators.
Yellow toadflax	*Linaria vulgaris*		Medium height perennial. Substrate depth of 80-150mm. Host plant of toadflax brocade moth, a specialist of dry environments restricted to Southeast. Flowering period July to September.
Yellow-wort	*Blackstonia perfoliata*		Self seeding annual. Can grow on very shallow substrates from 50-150mm. Seeds provide suitable foraging for black redstarts, a species of principle importance and London BAP.

Further reading

Buglife (2012). Creating Green Roofs for Invertebrates. A Best practice Guide.

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Gedge, D., Dunnett, N. & Grant, G. & Jones, R. (2006) Living Roofs. English Nature, Peterborough

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Snodgrass E, Snodgrass L (2006). Green roof Plants. Timber Press, Portland, Oregon.

Website ref: http://www.lbp.org.uk/londonhabspp.html

http://www.fll.de (German guidelines for greenroofing)

Non- Biodiverse Green Roofs

British Flora has a policy to promote ***extensive or biodiverse roofs*** wherever possible. The diversity of vegetation and substrates is more desirable as it will create ecological habitats for wildlife. The substrate depth varies from 80 -150mm to support a range of sedum, wildflowers and grasses that naturally occur in the harsh environments associated with green roofs. However there are instances where bio-diversity is not supported due to certain structural limitations particularly in retrospective green roof projects. In these instances it is recognised that a sedum roof may be the only viable solution. It offers the advantages of being extremely low maintenance, drought tolerant and requires a very shallow substrate, just 20-60mm

Sedum Roofs

The sedum genus has been described as containing up to 600 species of leaf succulents that are found throughout the Northern Hemisphere, varying from annual and creeping herbs to shrubs. The plants have water-storing leaves. The flowers usually have five petals, seldom four or six. There are typically twice as many stamens as petals. Well known European Sedums are: ***Sedum acre, Sedum album, Sedum dasyphyllum, Sedum reflexum (also known as Sedum rupestre) and Sedum hispanicum***.

Sedum is a versatile plant for roofs or walls requiring a very shallow substrate. It is less likely to support a range of biodiversity and species used will often include non-native plants which in many cases are imported from overseas. These succulent plants are drought, wind and frost tolerant and will steadily colonize a roof area to provide an even vegetative cover over time. The dominant plant cover is a drought tolerant species known as a **stonecrop (*Sedum sp)*.**

Sedum Plugs

BritishFlora **sedum plugs are grown in a recycled crushed brick growing medium in a controlled environment to ensure strong and healthy plant growth.**

The plugs are 35cc and are grown and supplied in individual varieties in trays of 84.

For smaller orders – we can supply 2 varieties in a tray.

British Flora Sedum Supplies - *Sedum Plugs* – Available*

***Depending upon conditions and time of year, British Flora reserves the right to substitute species as available.**

Plant Name	Description
Sedum *acre* – "Golden Carpet"	A tufted perennial herb - Height 5 to 12 cm (2 to 5 in) tall. Much of the year the stems are short, semi prostrate and densely clad in leaves. Flowering time June and July.
Sedum *acre* – "Oktoberfest"	Fast growing light green foliage forms low carpet. Height 5 to 12 cm (2 to 5 in) tall. Creamy-white star shaped flowers in summer. Evergreen. Good lawn substitute, tolerates moderate foot traffic once established.
Sedum *album*	A typical stonecrop, with procumbent stems, sending up erect flowering stems to 20cm and many shorter sterile shoots. Leaves sometimes tinged reddish; flowers star-like, white or with a hint of pink.
Sedum *ellacombianum*	Sometimes sold as a variety of S. kamtschaticum, however ellacombianum is shorter, growing to only 6 inches, with a more compact form, unbranched stems and scalloped, not toothed edges on the leaves.
Sedum *floriferum* - 'Weihenstephaner Gold'	Foliage typically grows to 3-4" tall but spreads by trailing stems (to 12" long). Tiny, star-shaped, yellow flowers bloom in June-July. Also commonly called Kamschatka sedum or Kamschatka stonecrop. Species plants are native to Kamchatka, Siberia.
Sedum *forsterianum* ssp.*elegans* - "Silver Stone"	Trailing silvery plant purple-flushed in winter - grows up to 10cm
Sedum Hispanicum	**(Spanish Stonecrop)** This pale blue-green 1 inch tall, short-lived perennial herb is naturalised on walls, gravel pits and stony waste ground. A native of southern Europe.
Sedum *hybridium* - "Czars Gold"	"Czars Gold" forms a low carpet of narrow, scalloped green leaves, spreading to form a dense patch. Clusters of golden-yellow star flowers appear in summer. Evergreen, with good red to orange colour in fall and winter.
Sedum *kamtschaticum*	Large yellow flowers form a carpet in midsummer. Maintains its leaves at the beginning of the colder weather, turning pinkish to red before dropping its foliage in the coldest months.
Sedum montanum ssp. *orientale*	Year-round blue-green foliage. Appearance of a tiny conifer tree. The leaves take on purple to pink tones in the late autumn and through the winter. Yellow flowers appear on tall stalks in midsummer.
Sedum *oreganum*	Grows along the Pacific Coast of North America from Alaska to far northern California. Known by the common name **Oregon stonecrop**, About 7cm (3") high when flowering - appearance will depend greatly on conditions.
Sedum *pulchellum* - 'Sea Star'	A mat-forming perennial with short, overlapping stems bearing small, dark green needle-like leaves and covered in tiny pink flowers in late summer. Grows up to 10 cm.
Sedum *reflexum*	Sprawling stems and stiff foliage resembling spruce branches. Leaves are frequently blue-grey to grey but range to light greens and yellows; flowers are yellow. Typically up to 10 cm high.
Sedum *selskianum*	Native to the Amur River region of China and Russia. Forms a low rounded cushion or mound of narrow, hairy dark-green leaves. In late summer, taller red stems hold clusters of deep golden-yellow starry flowers that attract butterflies and bees.
Sedum *sexangulare*	Also known as *tasteless stonecrop*. Grows to about 15cm (about 5 in) tall - native to Europe and Asia. Blooms in June/July with yellow star shaped flowers that attract bees, bumblebees, hoverflies and other insects.
Sedum *spurium*	Herbaceous plant with alternate, simple leaves, on creeping stems. The flowers are pink, borne in spring through autumn. Also called "Dragons Blood".

BritishFlora PRODUCT NEWS

Aquaten - Engineered Solutions for Living Roofs

Aquaten Blue Green Roof is a geo-composite mesh containing AquaSAF absorbent polymer sandwiched between two layers of wickable geotextile. It is designed to reduce rainfall runoff and/or to provide a valuable reservoir or passive irrigation system for living roof plants.

Aquaten Blue Green Roof can be incorporated into:

- the designed build-up of a living roof system or a landscape design to support a natural and ecological urban habitat;
- retrofitted failing living roofs where lack of water has caused plant die back.

Traditional irrigation typically wastes 80% of the applied water, Aquaten Blue Green Roof has proprietary technology, AquaSAF, which is designed to hold over 2000% of its mass in water; this high absorbency provides two critical functions:

- Increases rainfall attenuation – reducing rainfall runoff
- Captures water to keep substrate hydrated for longer periods
- Ease of handling, quick and simple to install
- Reduces and eliminates the need for costly irrigation
- Prolongs periods between watering
- Reduces plant stress
- Reduces substrate thickness saving money
- Helps reduce urban flooding and peak runoff

The ability to hold more water means that Aquaten Blue Green Roof can reduce the traditional costs of construction through reduced labour and substrate requirements which ultimately reduce weight and logistics, therefore enabling a more scientific calculation of the build of Living Roofs.

> *"Throughout the world wherever I have spoken at conferences or worked, storing water on green roofs is a significant issue and one that drives green roof policies in many cities/regions of the globe. Maximising the ability of a green roof or any roof for it to reduce excess storm water run off is a key factor that constantly requires new innovative solutions. Furthermore, keeping green roof substrates moist during periods of* ***no rainfall,*** *giving vegetation access to water, and reducing plant stress is a major issue for the industry.*
>
> *The Aquaten product would appear to address some of those issues and ...I think that the product has many of the positive qualities needed to ensure that green roofs evolve in a changing climate and policy agenda."*

Dusty Gedge - Green roof industry spokesperson, leading designer/consultant, and current President of the EFB European Federation of Green Roofs (and Walls).

Contact BritishFlora for more information on this product

BritishFlora

Planting the Seeds for a Greener Tomorrow

Tel: 01684 212027 Fax: 01684 578424
E: info@britishflora.co.uk
W: www.britishflora.co.uk