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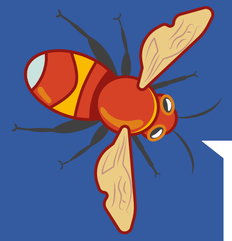

Biodiversity Buffet

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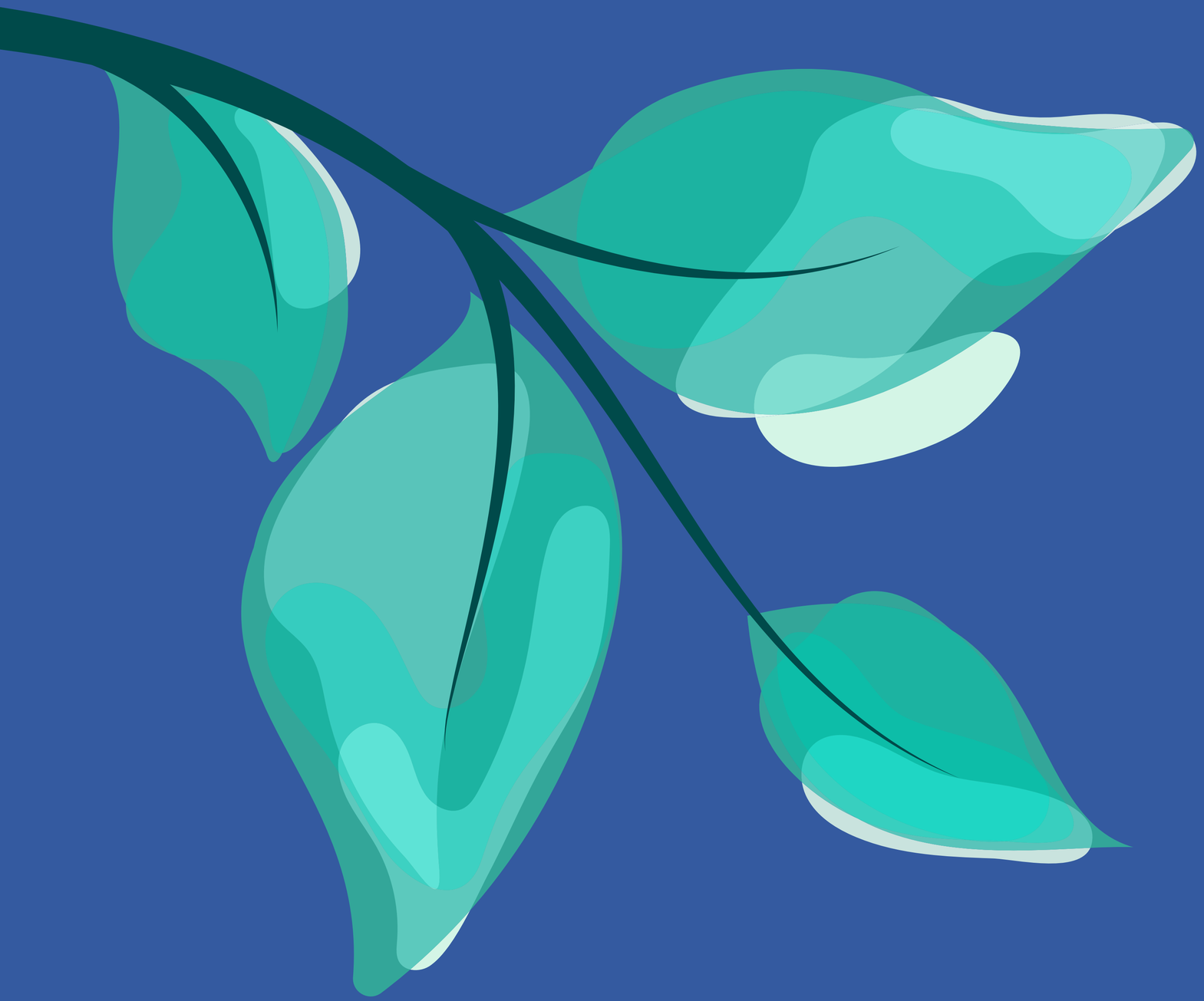


Grosvenor Property UK

‘Biodiversity buffet’ design guide

This document summarises the selection of biodiversity design interventions available for new development projects and as part of management changes/landscape improvement projects on existing assets.

Impact scale

All interventions are rated by their impact, delivery time, lifespan, upfront cost and maintenance cost. The table below defines these criteria.

Criteria	Definition
Impact (Low, Medium, High)	The level of biodiversity gain achieved from including this intervention. Low, measured as small wins that support existing biodiversity. Medium, measured as the improvement of site biodiversity beyond the site's baseline. High measured by significant improvements to biodiversity beyond the site's baseline and/or in the wider area of the site.
Delivery Time (Short, Medium, Long)	The timeline for delivery of the intervention. Short-term applies to interventions that can be added on in an ad-hoc way, requiring no permissions or structural impacts. Medium-term is 1-2 months with requirement for some permissions and/or small structural changes. Long-term is 2+ months requiring planning permissions and/or early inclusion in development plans and/or large structural impacts.
Lifespan (Temporary, Medium, Long)	How long the intervention is expected to last. Temporary is 1-2 years; medium term 2-5 years, long term 5+ years.
Upfront Cost (Low, Medium, High)	Estimated cost will depend on nature of site. A relative scale has been provided for comparison.
Maintenance (Low, Medium, High)	Estimated cost will depend on nature of site. A relative scale has been provided for comparison.

The table to the right summarises the interventions outlined within this guide, further split between size of intervention.

Click the link on the name of the intervention for a shortcut to this section.

Intervention	Impact*	Delivery Time	Lifespan	Cost	Maintenance Cost
Small – Medium Interventions					
Bird Boxes	Low	Short	Medium	Low	Low
Bat Boxes	Low	Short	Medium	Low	Low
Invertebrate Habitat	Low	Short	Short	Low - High	Low - Medium
Temporary Greening	Low	Short - Medium	Temporary	Low	Low
Window Boxes	Low	Short	Long	Low	Low
Street Trees	High	Medium	Long	Medium	Low
Street Level Planting Shrub and Herbaceous Planting**	Low - High	Short -Medium	Short - Medium	Low - Medium	Medium
Small Living Roof on Street Structures	Medium	Medium	Long	Low - Medium	Low
Large Interventions					
Living Roofs	High	Medium	Long	Medium- High	Low - Medium
Parklets	High	Medium	Long	High	Medium
Vertical Greening (climbers)	Low - Medium	Medium	Long	Medium	Medium
SuDS Features	High	Medium - Long	Long	Medium	Low - Medium

*See London Estate connectivity map. Impact may be higher where interventions are located in key connectivity opportunity areas.

**See Shrub and Herbaceous planting. Scale ratings dependent on size, location and nature of planting.

Key concepts of biodiversity design

Climate Resilience

Design interventions should be considerate of future climate risk. In particular, watering regimes and flood storage capacity should be considered and evidenced in the evolution of landscape designs. This should account for more frequent extreme weather events, including both intense rainfall and periods of drought. Landscaped areas which require high levels of irrigation, which are not fed by rainwater or grey water collected at site, should be discouraged. Planting which requires little irrigation, or which would be suitable for use in rain gardens where appropriate, should be chosen within detailed design.

Soil health should be considered, with minimal disturbance management considered optimal for reduction of carbon impact.

Connectivity

Landscaping design should consider the green/blue corridors being created/augmented.

Each development should establish how design interventions theoretically would allow for connectedness between GI assets, creating linear corridors which cross the portfolio/surrounding cityscape.

The London estate connectivity map should be consulted for the key location where interventions would be most beneficial.

Sustainable Material Use

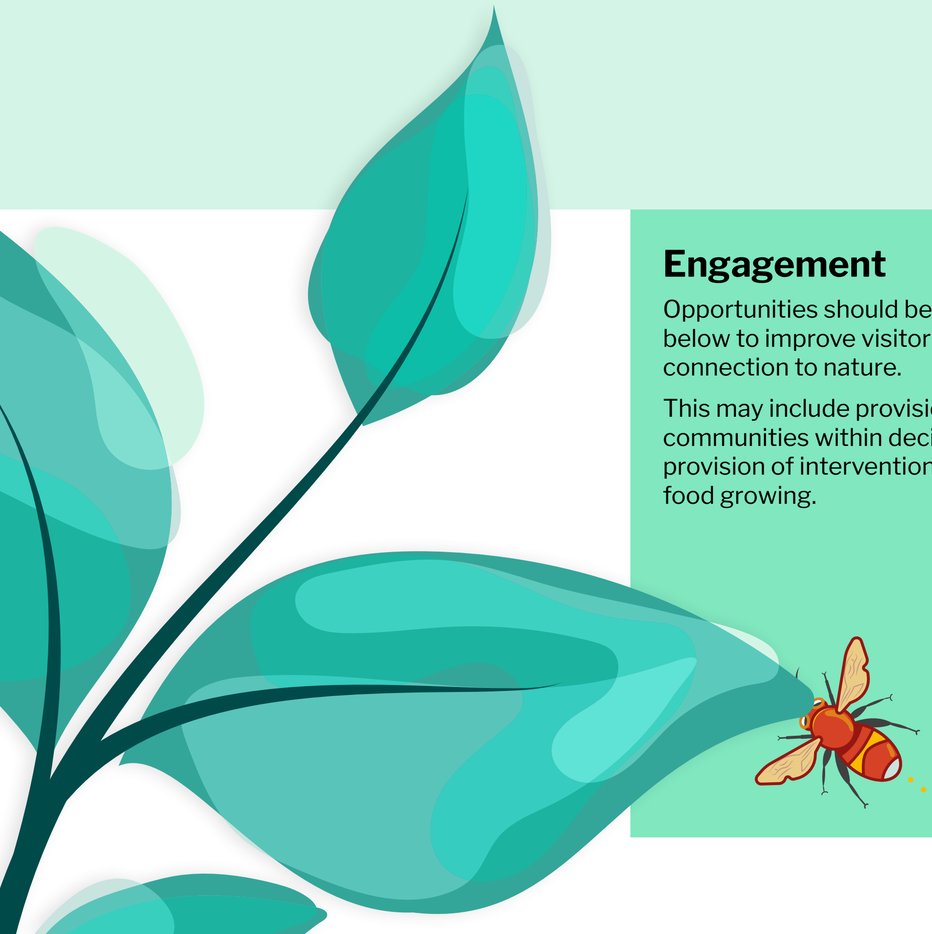
Sustainable materials should be used in the creation of invertebrate habitats and other landscaping features across the site. This includes the use of FSC/PEFC certified wood where appropriate.

Lighting Design

Lighting should be wildlife friendly. Generally, schemes should avoid unnecessary lighting and use low-UV component warm white LED bulbs which are downward facing with asymmetric beams, shielded from spill. Proposals should follow guidance provided by the Bat Conservation Trust and Institute of Lighting Professionals[1].

Horticultural Best Practice

No pesticide or herbicides should be used. Peat free and/or composts produced on site should be used throughout landscaping. Composting should be undertaken in all parks with leaf litter collected for compost/mulch creation. These measures should be embedded within management plans. Contractors should be made aware of these commitments when quoting for works and installing landscape features.



Engagement

Opportunities should be maximised for the interventions listed below to improve visitor or resident engagement with and connection to nature.

This may include provision of interpretation boards, involving communities within decision making or management activities or provision of interventions which encourage interaction such as food growing.

Temporary Greening

Temporary greening/biodiversity measures should be maximised. Interim greening can take many forms ranging from small pocket / skip / guerrilla gardens or planters through to large scale community gardens.

Consideration will need to be given to the cost of delivering the interim greening and management of the length of time the space is available. Temporary initiatives can be time consuming and expensive to deliver however the benefits are significant.

Schemes will require pro-active management. Careful consideration of the management practicalities and the cost of dis-mantling will need to be considered. At Kings Cross the interim skip garden has proven so popular it is set to become a permanent feature.

Measures should be designed for disassembly and/or adaptability, in line with circular economy principles, to avoid waste and minimise carbon footprint.

Temporary measures can be selected from all of the interventions described within the guide, although care should be taken should bird or bat boxes be temporarily installed to ensure disturbance of nesting/roosting birds and bats does not occur.

Living roofs

Alongside benefits for biodiversity, living roofs contribute to Urban Heat Island (UHI) cooling, increase the energy efficiency of buildings and PVs when integrated alongside panels, store rainfall and slow flow rates, reducing surface water pooling at street level, create rooftop amenity space, and contribute to localised air quality improvement.

The concept is to create an interconnected rooftop network of stepping stones through an area, providing opportunities for the movement of invertebrates and birds roof-to-roof, and between roofs and ground level habitats.

Two types of living roofs should be considered for new schemes: extensive, substrate-based biodiverse roofs with low nutrient substrates ranging between ~120-200mm; and intensive green roofs with a minimum of 300-450mm of soil to support herbaceous, shrub, and tree planting.

Figure 1.1 Example substrate types and planting variation on biodiverse living roofs

Extensive Biodiverse Roofs

Design

The following criteria must be followed in the design of extensive living roofs:

- Sedum mats and wildflower blankets should not be used.
- Every extensive living roof should be a substrate based biodiverse system planted with plugs and seeded with suitable species (see table 1.1).
- Seeds should be sown at a rate of 5g/m^2 with plugs planted at a density of 15-20/m2 with a minimum root ball of 25cm^3.
- Roof build up should meet requirements of the GRO Code 2014[2].
- At least three industry-standard substrate types should be used on roofs in order to replicate the variety of substrate types found on post-industrial sites. Particularly when roofs are overlooked, these should be 'patterned' to create habitat structure for invertebrates and aesthetic interest. Organic content should be kept below 20% in all substrates. The three substrate types should include:
  - A 'typical' biodiverse substrate designed for extensive living roofs, composed of recycled crushed brick, expanded clay shale and recycled organic content;
  - A sandy/ finer gravel substrate; and
  - Pebbles/Caledonia cobbles of roughly 40-120mm size mixed with the biodiverse roof substrate.
- Substrate depths should vary across rooftops between 120-200mm to ensure suitable retention of water and embed resilience for future climate risks, including longer and more frequent periods of drought.

Figure 1.2 Example sandy pile with cobbles and rope/cobble swirl

- Invertebrate habitat structure must be provided on every roof. Log piles, sandy piles, stone swirls, ephemeral water features, and rope coils should be integrated into the biodiverse roofs to provide aesthetic interest and also support biodiversity:
    - For log piles, wood from broadleaved trees such as oak and beech, and from fruiting trees such as apple and pear where possible should be used, at least 100mm in diameter with the bark still on. Logs in contact with the substrate will remain damp underneath, which is vital for many invertebrates such as woodlice. Logs should be placed both vertically and horizontally in clusters; vertical standing wood should be incorporated by submerging the logs into the full depth of the substrate, ideally in the deeper sections, again using a range of diameters and lengths. A minimum of two log pile should be installed per 100m^2 of roof.
    - Sandy piles should be compacted to form a sandcastle effect, and be 50cm high covering one square metre, with 30° angled sides. Rocks and stones may be placed on the surface to increase stability. A minimum of four sandy piles should be incorporated per 100m^2 of roof
    - Rope made from natural fibres should be used such as Manila rope which is suitable for general outdoor use. Manila rope is made from the leaves of the plant Musa textilis and will last up to 10 years, reducing maintenance requirements. The rope should be coiled in a spiral shape to cover an area of 1m^2; the rope should be coiled loosely to ensure suitable gaps are created for invertebrates. Pegs will need to be used to harness the rope to the roof and ensure that it cannot blow away. A minimum of two rope coils should be incorporated per 100m^2 of roof.
    - Water trays/pond liner which encourages pooling should be used in some areas to enable retention of water during wet weather, creating ephemeral wetland type areas on the roofs. Once the water levels in the water trays exceeds the capacity it will discharge from the rest of the roof as normal. A minimum of two water trays should be incorporated per 100m^2 of roof.
- Where possible living roofs should integrate blue roof systems. Integrated blue/green roof systems are available, which combine the benefits of both roof systems. Blue roofs work by reducing discharge of stormwater from otherwise impermeable surfaces. This increases the level of water retention at roof level. A biodiverse roof of any specification can be laid above a blue roof system.
- Rooftop water features and blue roofs should integrate ephemeral marshy species found in ground level planting.

Installation

Issues with living roofs most commonly occur because of poor installation. Only experienced, suitably qualified, and dedicated living roof providers should be used for the living roof installation. The provider should be given all plans relating to the design of specific roofs as well as this Design Guide document. Upon reviewing this document and prior to returning a tender the potential contractor should contact the project ecologist to discuss requirements.

An ecologist should be present during key stages of installation (e.g. during laying of invertebrate habitat features) to confirm compliance with design aspirations.

As per guidance in the GRO code, the following 4 steps should be followed prior to the planting of roofs:

i. Prior to installation of the planting, the substrate, drainage layer and any moisture mat should be saturated

ii. Pre-water the plants before removing them from their trays

iii. Insert plants and gently water them in

iv. Ensure that the substrate is irrigated for an initial period of 4-6 weeks to allow the plants to sufficiently establish themselves.

Maintenance and Monitoring

Extensive biodiverse roofs should require little maintenance following initial install and irrigation during establishment.

A single inspection should be undertaken annually. Drainage outlets should be inspected and cleared where necessary, nuisance species such as butterfly bush or Canadian fleabane should be removed.

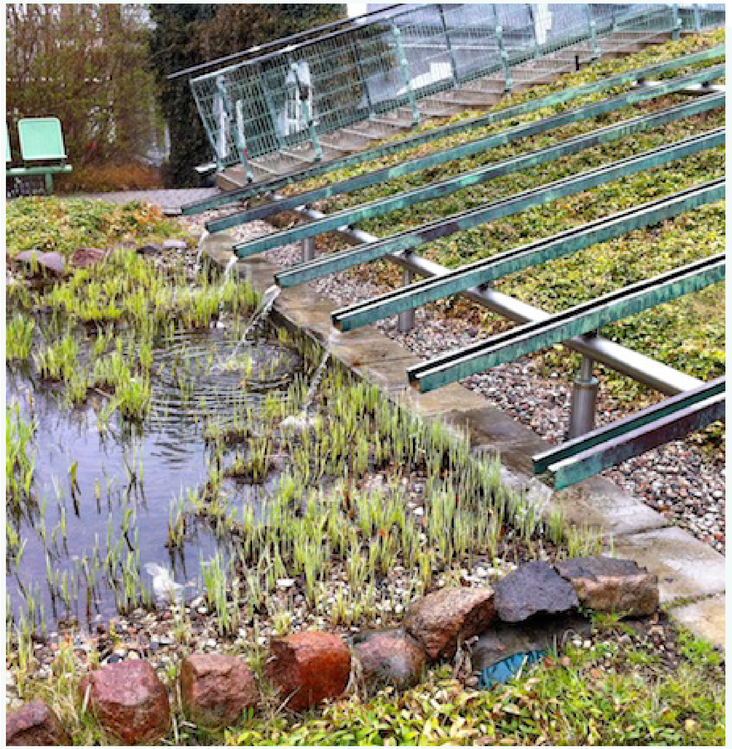


Figure 1.3 Example of wetland habitats on roof. Image credit: This Big City[3]

Fine to medium aggregate areas			
Common name	Scientific name	Common name	Scientific name
Yarrow	Achillea millefolium	Oxeye Daisy	Leucanthemum vulgare
Agrimony	Agrimonia eupatoria	Birdsfoot Trefoil	Lotus corniculatus
Kidney Vetch	Anthyllis vulneraria	Mellilots	Melilotus spp
Thrift	Armeria maritimis	Wild Marjoram	Origanum vulgare
Common daisy	Bellis perenis	Hoary Plantain	Plantago media
Common Knapweed	Centaurea nigra	Salad Burnet	Sanguisorba minor
Viper's Bugloss	Echium vulgare	Cowslip	Primula veris
Blue fleabane	Erigeron acer	Selfheal	Prunella vulgaris
Dropwort	Filipendula vulgaris	White stonecrop	Sedum album
Lady's Bedstraw	Galium verum	Bladder Campion	Silene vulgaris
Common Rock-rose	Helianthemum nummularium	Red clover	Trifolium pretense
Perforate St John's Wort	Hypericum perforatum	Dark Mullein	Verbascum nigrum
Common cat's-ear	Hypochaeris radicata	Wild pansy	Viola tricolor
Wild Candytuft	Iberis amara		
Field Scabious	Knautia arvensis		
Rough Hawkbit	Leontodon hispidus		

Free draining cobble dominated substrate	
Common name	Scientific name
Sea thrift	Armeria maritima
South American vervain	Verbena bonariensis
Great mullein	Verbascum thapsus
Yarrow	Achillea spp.
Lesser calamint	Calamintha nepeta
Common primrose	Primula vulgaris
Mother-of-Thyme	Thymus polytrichus
Small scabious	Scabiosa columbaria
Bugle	Ajuga reptans
Biting stonecrop	Sedum acre
Mexican fleabane	Erigeron karvinskianus
Maiden pink	Dianthus deltoides
Rock rose	Cistus x purpureus
Sticky catchfly	Silene viscaria
Common wallflower	Erysimum cheiri

Ephemeral wetland substrate	
Common name	Scientific name
Marsh bedstraw	Galium palustre
Water mint	Mentha aquatica
Soft rush	Juncus effuses
Water forget-me-not	Myosotis scorpiodes
Beaked sedge	Carex rostrate
Marsh cinquefoil	Comarum palustre
Meadowsweet	Filipendula ulmaria
Hemp agrimony	Eupatorium cannabinum
Cowslip	Primula veris
Devil's bit scabious	Succisa pretensis
Ragged robin	Lychnis flos-cuculi

Table 1.1 Table 1.1 Guide to suitable species for extensive biodiverse roofs. Species selection should reflect and mimic assemblages found on site, and/or wildflowers mixed with drought tolerant herbaceous species known to thrive on living roofs/exposed environments.

Intensive Green Roofs

Design

Planting strategies for intensive green roofs should follow the principles of the low-water brownfield ground-level planting in raised or integrated planters to create ecological and aesthetic consistency.

Irrigation systems should be primarily fed by non-potable water.

Installation

Intensive roof gardens should be installed by experienced landscaping contractors following detailed landscape and planting designs, to be produced following the above design aspiration guidelines. Key things to note during installation will be irrigation systems, weather conditions during planting (no planting during periods of extreme warm, cold, dry or wet weather).

Management and Monitoring

Roof gardens should be managed as per ground level landscapes. Irrigation systems should be regularly checked and monitored. Litter and nuisance weed species should be removed, with at least bi-annual checks by an experienced landscaping maintenance company.

Figure 1.4 Example intensive green roofs at 20 Triton Square (image credit: Architect's Journal) and University of Greenwich which integrate amenity use with drought tolerant/biodiversity friendly design

Street Level Structures

Where new bin stores, bus shelters, bike shelters or other small flat roofed structures are provided, these should have living roofs installed. Opportunities to retrofit roofs onto existing features should also be identified.

A biodiverse roof system favoured on these features. The principles described above for the extensive biodiverse roof design should be followed.. Such systems can be installed bespoke by the GBI landscaper team or through a specialist living roof provider.

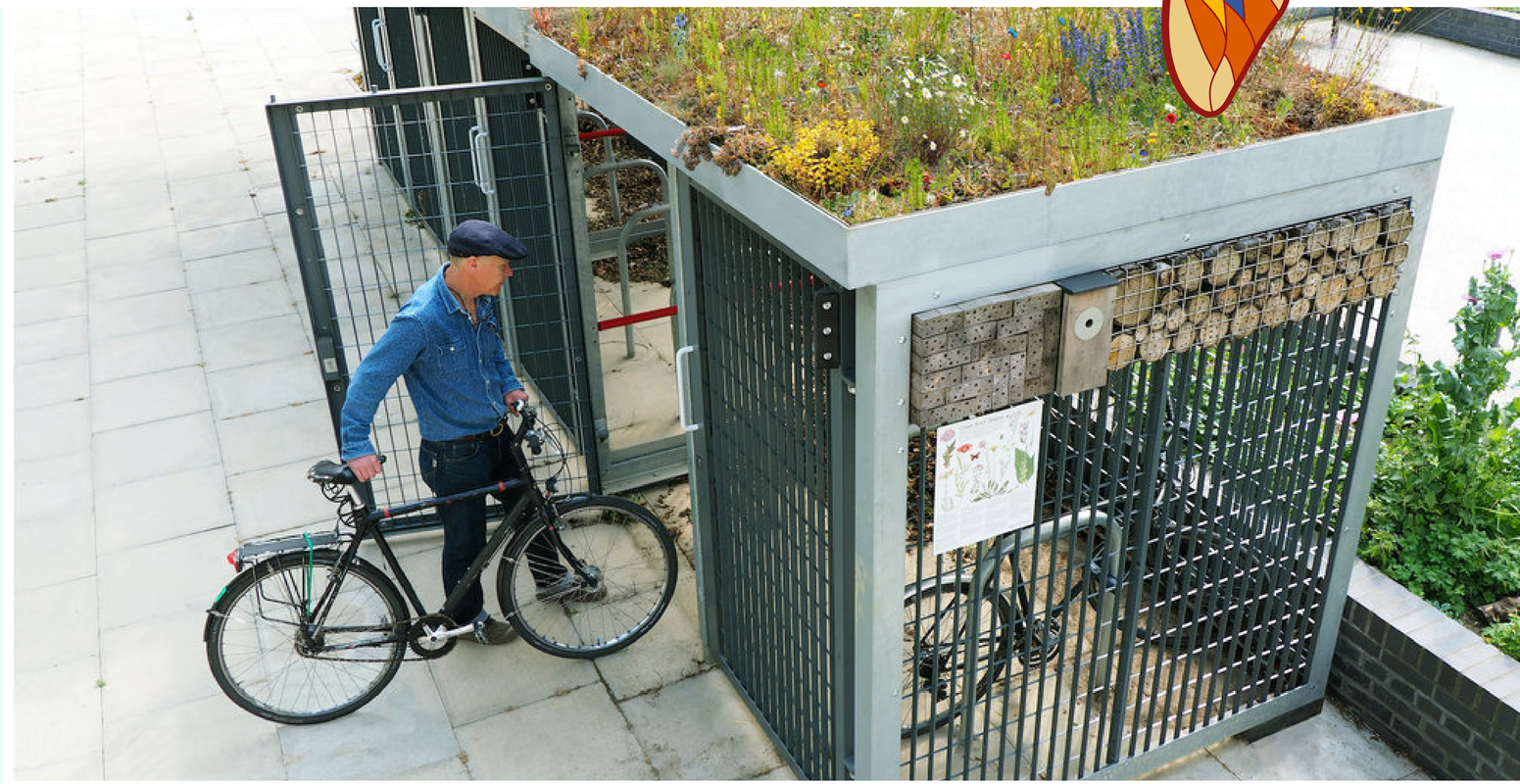


Figure 1.5 Bike shelter living roof (image credit: Green Roof Shelters)

Green Walls

Vertical greening should take the form of climbers/trellis systems. Modular systems can be costly and some require high water use. Climber/trellis systems can be cheaper however may take time to establish. Either system should use native species where possible that are of value for pollinators or herbivorous insects. Where possible these features should be installed to provide functional gains such as noise attenuation or air quality improvement.

Figure 1.6 Example Jackob Stainless Steel Trellis system (top) and MFO Zurich Park Hall (Image credits: Jackob (top) and Zuerich (bottom left))

Climbers/Trellis Systems

Design

The key elements which need to be considered in design are:

- Aspect - this influences watering requirement and species suitability. Commentary on suitability of aspect is provided in table 1.2 relating to species.
- Depth of growing medium in planters – sufficient depth should be provided allowing for root growth and water retention. Irrigation systems should be installed for periods of dry weather.
- Trellis type – tensioned wire systems should be favoured for their longevity and aesthetic appeal. These systems also tend to allow greater distance from the building, providing opportunities for wildlife and allowing easier maintenance and access to building facade.
- Intended height for growth – climbers will clearly take time to reach intended heights and coverage so areas subject to vertical greening should be realistic about the heights expected to be delivered by single plants. If significant heights are targeted, then subsequent suspended troughs could be provided up the trellis with additional climbing plants provided. The use of ‘patterned’ or aesthetically pleasing trellis systems could be considered so that aesthetic benefits are provided in the time taken for the climbers to reach maturity.
- Multiple species should be provided with identifiable ecological benefit for phytophagous or nectivorous invertebrates.

Installation

A specialist landscape supplier should be contacted to support delivery of this feature.

Management and Monitoring

Climber/trellis system living walls should require limited management beyond upkeep of irrigation, standard weed control and management of spreading growth over windows/doorways. Specialist landscaping management companies should be used.

Trellises will need on-going maintenance to ensure they continue to provide uniform coverage, if for example, using species such as honeysuckle, clematis or Jasmine, these can become bare at the plant base and bushy at height. May need additional low level shrub layer.

Common name	Scientific name	Aspect
Common Ivy	Hedera helix	Full sun/partial shade/ full shade (South, East, North or West facing)
Clematis species	Clematis sp.	Full sun or partial shade (South, West or East facing)
Honeysuckle	Lonicera sp.	Full sun or partial shade South, West or East facing)
Star Jasmine	Trachelospermum jasminoides	Full sun or partial shade (South, West or East facing)

Table 1.2 Suitable species for trellis systems

Modular Intensive Green Walls

Modular intensive green wall systems usually support irrigated ‘pockets’ of substrate or other growing media into which, usually evergreen perennials and fern species are planted. The opportunities for SuDS, aesthetic, cooling and air quality improvements should be maximised when considering the use of modular systems.

These systems can however require large volumes of water. These should ideally only be used where rainwater-fed or grey water irrigation systems can be put in place.

Furthermore, materials and requirements for plant replacement should be factored in to ensure that this truly is a sustainable GI design option.

Species selection should be considerate of aspect, exposure, proven ability to grow in living wall systems, value for air quality control, year round greening provision and value for biodiversity.

Design, installation and management details will need to be considered on a case by case basis dependent on chosen supplier. Access for maintenance should be considered in the design process. The need for on-going maintenance should also be considered; often suppliers will provide an on-going maintenance service.

This approach is not currently favoured although suitable systems which can evidence their sustainability credentials such as low embedded carbon and reliability may come onto the market during the lifetime of this Framework, so this form of vertical greening system should not be ruled out.

Figure 1.7 Biotecture living wall at Edgware Road station (image credit: Biotecture)

Common name	Scientific name	Aspect
Bugle	Ajuga reptans	Partial shade (north, west or east facing)
Sea thrift	Sea thrift	Full sun (south, north, west or east facing)
Hart's-tongue fern	Asplenium scolopendrium	Full sun/Partial shade (south, north, west or east facing)
Columbine	Aquilegia sp.	Full sun/Partial shade (south, north, west or east facing)
Bergenia	Bergenia sp.	Full sun/Partial shade (south, north, west or east facing)
Common box	Buxus simpervirens	Full sun/Partial shade (south, north, west or east facing)
Bellflowers	Campanula sp.	Full sun/Partial shade (south, north, west or east facing)
Foxglove	Digitalis purpurea	Full sun/Partial shade (south, west or east facing)
Echinops	Echinops sp.	Full sun/Partial shade (south, west or east facing)
Heath	Erica sp.	Full sun (south facing)
Fleabanes	Erigeron sp.	Full sun (south or west facing)
Wallflowers	Erysimum sp.	Full sun (south or west facing)
Redclaws	Escallonia sp.	Full sun/Partial shade (south, west or east facing)
Spurges	Euphorbia sp.	Dependent upon variety
Strawberries	Fragaria sp.	Full sun (south, west or east facing)
Fuchsia	Fuchsia riccartonii	Full sun/Partial shade (south, west or east facing)
Geraniums	Geranium sp.	Dependent upon variety
Water avens	Geum rivale	Full sun/Partial shade (south, west or east facing)
Ivy	Hedera sp.	Full sun/Partial shade (south, north, west or east facing)
Common bluebell	Hyacinthoides non-scripta	Partial shade (south, north, west or east facing)
Hyssop	Hyssopus officinalis	Full sun/Partial shade (south or west facing)
Iris	Iris sp.	Dependent upon variety
Lavender	Lavandula sp.	Full sun (east, west or south facing)
Lily turf	Liriope muscari	Partial shade/Full shade (north, east or west facing)
Spearmint	Mentha spicata	Full sun/Partial shade (south, north, west or east facing)
Oregano	Origanum vulgare	Full sun/Partial shade (south, north, west or east facing)
Primrose	Primula sp.	Full sun/Partial shade (south, north, west or east facing)
Self-heal	Prunella vulgaris	Full sun/Partial shade (south, west or east facing)
Rosemary	Rosmarinus officinalis	Full sun (south, west or east facing)
Sage	Salva sp.	Full sun/Partial shade (south, north, west or east facing)
Stonecrops	Sedum sp.	Full sun/Partial shade (south, west or east facing)
Thyme	Thymus sp.	Full sun (south, west or east facing)

Table 1.3 Suitable species for modular walls with biodiversity value

Landscaping

Trees

Design

Tree species should be selected for their value for wildlife, ability to withstand urban conditions and climate resilience. This may mean that the most appropriate species are largely non-native, although where possible/appropriate native species should be provided.

Guidance regarding species specification for provision of different Green Infrastructure components is provided in Trees & Design Action Group's Tree Species Selection for Green Infrastructure[4].

This guidance document should be used when selecting tree species. Appropriate specifications for tree pits etc should be informed by streetscape design. Further detail on tree species selection will be provided as designs progress.

Tree pits that improve water run-off quality and maximise water holding capacity and therefore act as effective SuDs are available.

Installation

This should be based on site specific requirements. Specialist advice must be sought.

Management and Monitoring

This should be based on site specific requirements. Specialist advice must be sought.

Shrub and Herbaceous Planting

Design

Shrub and herbaceous planting should be considerate of biodiversity value and climate resilience.

Planting may be in ground level beds, planters or pots, delivered as part of temporary street greening or within permanent schemes. This would include new Parklets.

Species selection should maximise abundance and diversity of pollinator friendly flora, informed by the RHS's Plants for Pollinators Lists[5] where specialist advice is not sought.

Parklets

Parklets should include additional features such as seating, bike parking, art and interpretation.

Each parklet project should be unique and individually designed to meet specific site requirements, e.g. across Mayfair and Belgravia. Their location must consider both their social purpose and suitability for biodiversity.

Plant species chosen should seek to provide year round structure and interest including a number of evergreen species and plants that retain their seed heads throughout the winter.

Parklets should be simple and straightforward to maintain encouraging businesses and/or the local community to take ownership.

Planting maintenance workshops should be encouraged to involve and educate the community on the maintenance of parklets.

Designs should consider the integration of areas of bare ground or sandy substrate to allow invertebrates to shelter, which can also double as design features or even natural play areas for children to explore.

Log piles, invertebrate habitat panels and features like stag beetle loggeries can also be integrated into park and public realm design (see Invertebrate Habitat Features section).

Window Boxes

Window boxes can be fitted to most buildings and balconies. They are suitable for all densities of housing. Traditionally window boxes have been planted every season to ensure they look neat all year round, however, more sustainable options should be considered, including provision of herbaceous perennials, wildflowers, and grasses.

Species of known value to pollinators should be included. Once the window boxes are in place they should not need replacing for many years but do require ongoing maintenance. Consideration of drought tolerance should be made when selecting species to limit watering requirements.

Installation

Bespoke based on site specific requirements. Specialist advice should be sought.

Management and Monitoring

Bespoke based on site specific requirements. Specialist advice should be sought.

Figure 1.8 Nigel Dunnett drought tolerant herbaceous perennial planting at the Barbican (image credit: Nigel Dunnet)

Herbaceous species	
Common name	**Scientific name**
Verbena species	Verbena sp.
Yarrow species	Achillea sp.
Lamiacea species	e.g. Stachys byzantine, Perovskia atriplicifolia, Nepeta sp., Salvia sp., Stachys sp., Lamiaceae sp.
Lavender	Lavandula angustifolia
Ground cover with Fabaceae species like clovers, bird's foot trefoils, vetches etc	Trifolium sp., Lotus corniculatus, Vicia sp.
Red campion	Silene dioica
Scabious species	Scabiosa sp.
Vipers bugloss	Echium vulgare
Thrift, yellow horned poppy and other coastal/shingle type species	Armeria maritima, Glaucium flavum
Ice plant	Hylotelephium spectabile
Red bartsia	Odontites vernus
Chives and aliums	Allium sp.
Euphorbia species	Euphorbia sp.
Structural grass species e.g. Hairy melic or blue oat grass	Melica ciliata, Helictotrichon sempervirens

Shrub and tree species	
Common name	**Scientific name**
Hebe	Hebe sp.
Juneberry	Amelanchier lamarkii
Goat willow	Salix caprea
Black Alder	Alnus glutinosa
European Gorse	Ulex europaeus
Silver Birch	Betula pendula
Dogwood (Cornus) species	Cornus sp.

Table 1.4 Example species for drought tolerant pollinator friendly planting

SuDS and Aquatic Habitats

Design

SuDS should be delivered at sites through various design measures, with most of the habitat typologies discussed above providing benefit for drainage and water storage. Additional SuDS features should be focused on the integration of rain gardens at street level, creating Blue Green Streets, for overland flow / storm water attenuation as well as improvement of water quality.

Species for rain gardens should be selected to handle greater periods of drought alongside submergence. Layout and species selection should favour smaller birds and invertebrates.

Open water habitats such as ponds and wetlands should be delivered wherever possible.

Site specific designs for such features should be considered on a case-by-case basis. Consideration of pollution filtration, appropriate species, requirements for water holding capacity etc.

Installation

Bespoke based on site specific requirements. Specialist advice should be sought.

Management and Monitoring

Bespoke based on site specific requirements. Specialist advice should be sought.

Grassland

Design

All areas of lawn grass should be species-rich even if maintained for amenity purposes. This should be achieved through laying of new species rich turf or through reseeded of grassland to improve diversity.

Wildfower Turf species rich lawn or equivalent should be specified in lieu of standard grass turf. In areas of high footfall or where vehicle access is required it may be necessary to specify a reinforced grass system to reduce wear and tear. Biodiverse lawns are treated in the same way as conventional lawns but can contain more than 20 different species, including flowering mixes.

Where appropriate, wildflower meadows should be created. This may be limited to parkland borders. Again, turf providers can provide instant diversity and establishment, or meadows can be created through seeding.

Installation

Bespoke based on site specific requirements. Specialist advice should be sought.

Management and monitoring

Bespoke based on site specific requirements. Specialist advice should be sought.

Habitat features

Habitat structure should be provided in the form of nesting boxes and design features. The table summarises minimum standards and quantum for these features which are discussed further in the text.

Installation

Bespoke based on site specific requirements. Specialist advice should be sought.

Management and monitoring

Maintenance is an often-overlooked aspect of artificial invertebrate nesting habitats. Bricks/ panels and features should be cleaned at the end of each summer where practical to do so.

Feature	Specification*	Comment
Living Roofs	Biodiverse roofs or intensive living roofs with pollinator friendly planting	To maximise building cover on available flat roofs
Landscaping	To have focus on climate resilient species which thrive in brownfield sites. Over 90% of species should have demonstratable value for wildlife.	'Mosaic' of habitats should be provided recreating habitat variability currently at site.
Bat Boxes	One large box (e.g. Habibat maternity[6]) and five small (e.g. Habibat 003[7]) per suitable façade. 50% of suitable trees to have bat box, e.g. Eco Bat Box[8]	Located away from direct illumination from street lights or windows at ~2-5m height from the ground, ideally overlooking potential foraging areas. Facing south or west.
Bird Boxes – House Sparrow	Three terraces (each with three chambers, making a total of 9 holes) to be grouped together on every suitable east facing façade. E.g Habibat terraced Sparrow Box	East facing or out of sunshine, at least 2m high, ideally facing over living roofs or landscaping
Bird Boxes – Swift	Five boxes per suitable façade. E.g. Habibat swift box[10]	East facing or out of sunshine, at least 5m high, ideally facing over living roofs or landscaping.
Bird Boxes – Black redstart	One open fronted box on 50% of biodiverse roof, e.g. Eco Open fronted Nest Box[1].	Hung from balustrades or other features overlooking living roof areas, ideally out of direct sunshine and east facing.
Bird Box – generalist	An even mix of open fronted[11] and 32mm hole boxes[12] hung from 25% of suitably sized trees.	Hung at least 2m in sheltered locations, ideally north facing.
Invertebrate Habitat - Bee Bricks	Five bee bricks made (e.g. the products by green and blue[13]) to be provided on every block where south facing elevations overlook landscaping. Where brick walls overlook living roofs then one brick to be provided per 2m of wall length.	n/a
Invertebrate Habitat – Stag Beetle Loggeries	A range of log sizes should be used from ~10cm up to ~40cm diameter. Approximately one third of the log should be buried in friable soils.	One loggery to be provided per suitable development.
Invertebrate Habitat - Other	Each development to have bespoke invertebrate habitat wall feature	

Table 1.5 Design principles and minimum requirement summary for habitat features

**Quantified unit number requirements relate only to new development. Management interventions for new assets should simply seek to maximise as much as possible.*

Invertebrate Habitat

Loggeries

Stag beetle loggeries should be provided in landscaped areas in semi-shaded conditions.

Whilst stag beetle loggeries are not generally purchased as off-the-shelf products, they can be easily made using untreated native hard and soft woods.

A range of log sizes should be used from ~10cm up to ~40cm diameter. Approximately one third of the log should be buried in friable soils.

Plants such as ferns, bulbs and other woodland understorey plants can be planted amongst the loggeries in dappled sunshine.

Installation

Bespoke based on site specific requirements. Specialist advice should be sought.

Management and monitoring

Maintenance is an often-overlooked aspect of artificial invertebrate nesting habitats. Bricks/ panels and features should be cleaned at the end of each summer where practical to do so.

Figure 1.9 Example stag beetle loggery in south London

Bee Bricks and blocks

Where brick cavity walls are incorporated on sites, bee bricks should be included at a rate of 5 bricks per suitable façade or every 2m when overlooking a living roof. These should be focused in sunny, exposed areas on southern aspects at a minimum height of 1m. They should only be incorporated near soft landscaping areas to provide nectar sources within close proximity. Entrance holes should be unobstructed. Other bee brick, posts and nest boxes should be provided amongst landscaped areas, on roof terraces and on living roofs.

Figure 1.10 Bee brick, blocks posts and boxes to be embedded and or attached to walls/included in landscaped areas

Habitat Panels

Invertebrate habitat panels should be included in sunny, south-facing areas within landscaped areas.

Panels should use untreated wood products which provide a range of opportunities for sheltering and nesting solitary bees and other invertebrates. They can be ‘designed’ or integrated with interpretation panels. Design of each panel should avoid providing opportunities for numerous taxa to minimise risk of parasitism.

Figure 1.11 Example habitat panels

Bird and bat boxes

Bat Boxes

Integrated bat boxes should be provided on all new schemes.

Boxes should be located away from direct illumination from streetlights or windows at ~2-5m height from the ground, ideally overlooking potential foraging areas.

Boxes should face south or west.

A selection of larger boxes which provide maternity or hibernation opportunities should be provided alongside boxes for summer roosting by crevice dwelling species.

Boxes should also be hung from 50% of suitably sized trees retained or planted at site.

Boxes and actions relating to mitigation for any existing roosts will be covered separately. Bespoke solutions will be required to address the presence of roosting bats if present.

Figure 1.12 Example bat boxes which can be integrated within brickwork with bespoke façade treatment to match building materials (left) and a Green and Blue urban bat box (right)

Figure 1.13 Example bat boxes to be hung from trees

Black Redstart

Nest boxes for black redstart should be provided on all living roofs. These should be deep open fronted boxes, hung ~2m from the roof level, facing north or east.

Figure 1.14 Example black redstart boxes

Swifts

Nesting opportunities for swifts should be provided on all new developments.

Swift boxes should be provided on all buildings. This are ideally installed beneath eaves on north or east facing aspects. Entrances should be free from clutter at least 5m height. Groups of 5 boxes should be provided together.

Figure 1.15 Swift emerging from integrated swift box which can have bespoke façade treatment (top), Green and Blue swift box (bottom left) and Genesis (bottom right)

House Sparrow

House sparrow terraces should be provided on northern aspects of all new schemes. These should comprise terraces with at least 2 nesting chambers per unit. Groups of three terraces should be provided together between 2-5m from the ground, ideally located under eaves. Boxes should be located away from balconies and windows, preferably overlooking landscaped areas.

Figure 1.16 Example habitat and Schwegler terraces with three nesting compartments. Three groups of these units should be provided together on 50% of suitable building blocks.

Generalist Bird Boxes

Bird boxes targeting common passerine species should be hung from 25% of suitable trees. These should be hung from north or easterly aspects at between 2-5m from the ground. There should be a 50:50 mix of open fronted and 32mm entrance hole boxes.

Figure 1.17 Example of suitable bird boxes to be hung from trees

Temporary greening measures

Temporary greening measures should be integrated within all construction sites and managed for the lifetime of the construction works.

Where possible and practical these measures should be designed for ease of disassembly and/or functional adaptability to ensure that the feature or constituent materials are reusable, able to be upcycled for use in the development scheme itself, or returned to the manufacturer, in line with circular economy principles.

Measures for consideration will rely on availability of space and construction approach. However, features to consider include:

- Vertical greening on site hoarding through use of modular systems or pre-grown trellis and climber systems;
- Vertical meadow systems, to be designed bespoke when appropriate;
- Provision of bird and bat boxes as per above specifications on projects which have long term construction compounds;
- Greening the roofs of any temporary flat roof structures such as cycle shelter or shipping container offices;
- Wildlife friendly planting in containers.

References

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[6] Example large integrated bat box – Habibat Maternity Roost Box (Greengage do not specifically endorse this product) http://www.habibat.co.uk/category/bat-boxes/habibat-maternity-roost-box

[7] Example small integrated bat box – Habibat 003 Box (Greengage do not specifically endorse this product) http://www.habibat.co.uk/category/bat-boxes/habibat-003-bat-box-range

[8] Example small bat box for tree – Eco Bat Box (Greengage do not specifically endorse this product) https://www.nhbs.com/eco-bat-box

[9] Example integrated house sparrow box – Habibat Terrace (Greengage do not specifically endorse this product) http://www.habibat.co.uk/category/bird-boxes/habibat-terraced-sparrow-box

[10] Example integrated swift box – Habibat Swift Box (Greengage do not specifically endorse this product) http://www.habibat.co.uk/category/bird-boxes/habibat-swift-box

[11] Example open fronted bird box box for tree – Vivara pro (Greengage do not specifically endorse this product) https://www.nhbs.com/vivara-pro-barcelona-woodstone-open-nest-box

[12] Example 32mm bird box for tree – Vivara pro (Greengage do not specifically endorse this product) https://www.nhbs.com/vivara-pro-seville-32mm-woodstone-nest-box

[13] Bee brick (Greengage do not specifically endorse this product) - https://www.greenandblue.co.uk/products/bee-brick


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