



Liverpool
City Council



UNIVERSITY OF
LIVERPOOL



Liverpool UK

Liverpool City Council
The Mersey Forest
The University of Liverpool



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 730426



Agenda

1. Urban GreenUP Overview
2. General tree planting schemes
3. Case Study Tree Sustainable Urban Drainage Scheme
4. The Pollinator Project



Horizon 2020 URBAN GreenUP

www.urbangreenup.eu

- c. 14 million+ Euro research based bid between UK, Spain and Turkey
- c. 4 million Euros awarded to Liverpool as one of 3 Front runner cities

Liverpool Partners:

Liverpool City Council

The University of Liverpool

The Mersey Forest

5 global follower cities and a network of affiliated cities

Trial and monitor the retrofitting of a range of Nature Based Solutions in the city between June 2017 – May 2023.

Monitoring environmental, social and economic benefits





Amenity spaces



Infill in verges



Housing organisations



Parks – orchards and extended planting

Trees in Hard Landscapes

Major Highways Schemes



'Filter' trees with 82m²
permeable paved area



'Shade' and 'cooling' trees with
80m² permeable paved area

Maintenance by contractor and then city council

Trees in Hard Landscapes - Smaller Schemes



Removal of concrete 'parking' space



Trees and pollinator planting



Stafford Street in the Fabric District Before and After



Trees in Hard Landscapes Stafford Street Feedback

**STAFFORD
STREET** L3

GREENING THE FABRIC DISTRICT



82% of businesses say that greening the area has benefited their business to some or a great extent

▲ 94%

Local residents rate the appearance of their area nearly twice as highly post-greening

92%

say that planting street trees makes the area look better and attracts people and businesses

68%

68% feel that having trees planted locally encourages them to spend more time outdoors.

52%

of businesses say that the most important benefit of greening is increased footfall (up 83% on the pre-planting response)

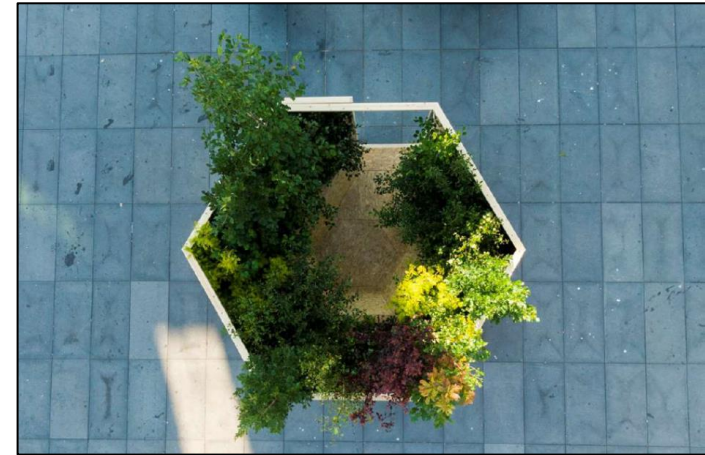
33%

of new cyclists said a key reason they started cycling was because their route to work/college is now more attractive.



Mobile Forest

Launched June 2019
by Sir William Worsley
DEFRA Tree Champion



Some Benefits:

Environmental:

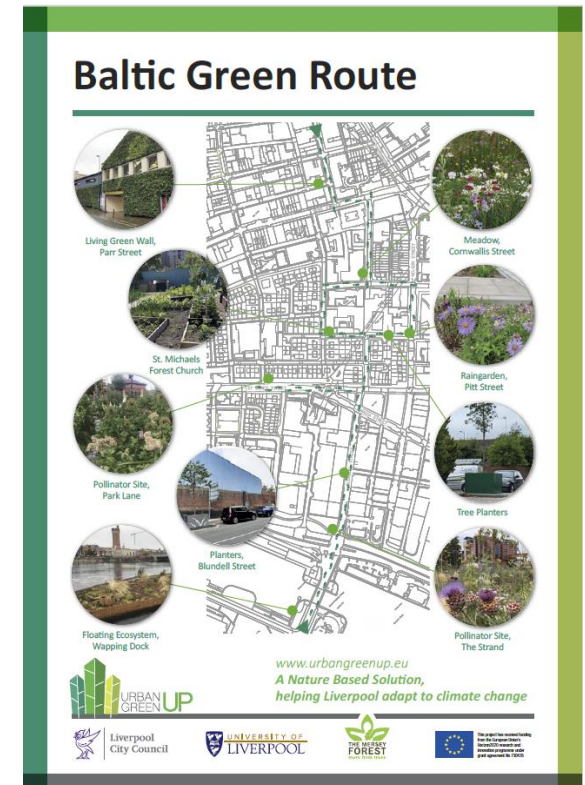
- Carbon storage of 32.8tCO₂e in total for all trees
- Air surface temperature reduction of between 5.5°C - 7.5°C
- Water slowed (modelled)
- Air quality improvements (modelled)
- Habitat provision

Social

- 13.9% increase in walking levels (shade and cooling trees)
- 26 lives saved/year from increased walking and cycling activity
- 77% participants valued GI as very positive for mental health
- Trees helped to form parts of new city Green routes
- Collectively 8,861 houses and 15,257 people benefitting

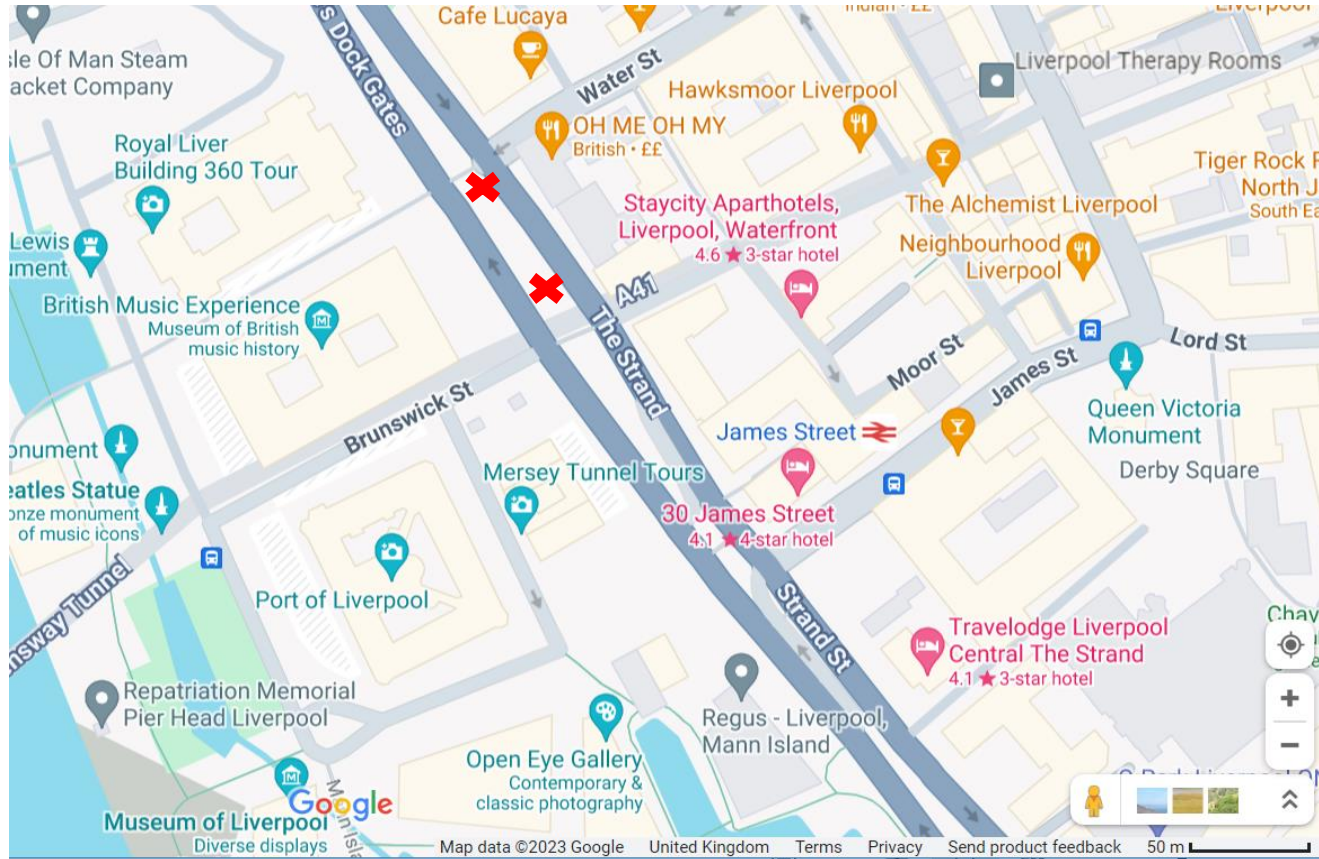
Economic

- 1362 kWh/year, 681kg CO₂ not emitted and £34,357 saved from effects of shading/evapotranspiration.



Urban Catchment Forestry

Location: Google map co-ordinates 53.405904, -2.994418, The Strand, Liverpool, November 2023.



- To include 14 SuDs trees in the central reservation of a major city highway. ✘
- To test a silva cell framework (to facilitate the passage of utilities across the site), provide greater soil volume and protect surface tree roots.
- To reduce and improve the quality of carriageway surface water run off to drain via the SuDs trees.



Strand City Centre Connectivity Scheme

The Original Vision and Opportunity

£18m+ Highways led programme

Safer pedestrian and cycle routes with 1.2km cycleway

Improved public spaces with 150+ trees

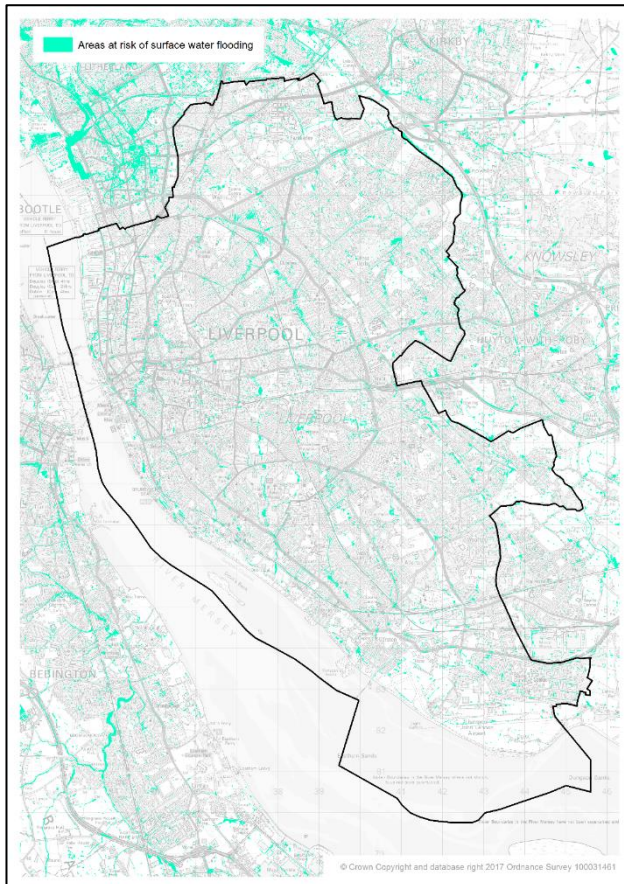




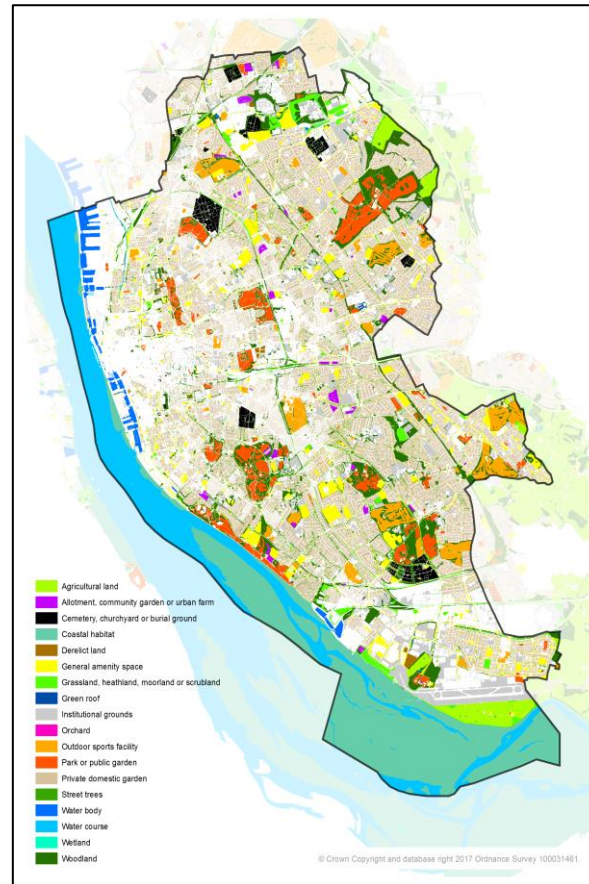
GIS mapping for NBS site selection

- A local recognised need
- Located within the project demo areas
- Deliverable within project timescales and constraints

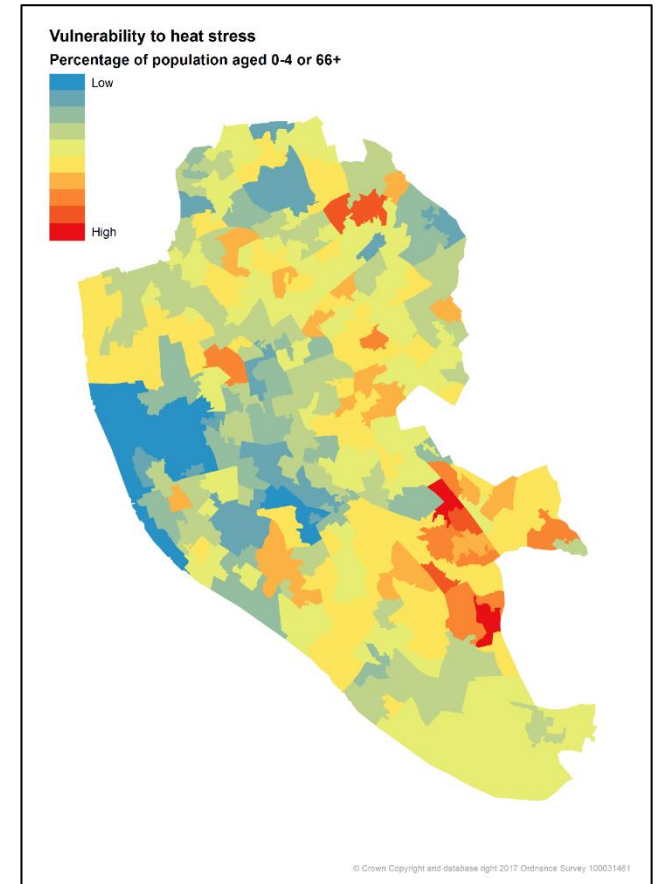
Surface water flooding



Green infrastructure typology



Vulnerability to heat stress



SuDS Opportunity

Central reservation location outside key city buildings

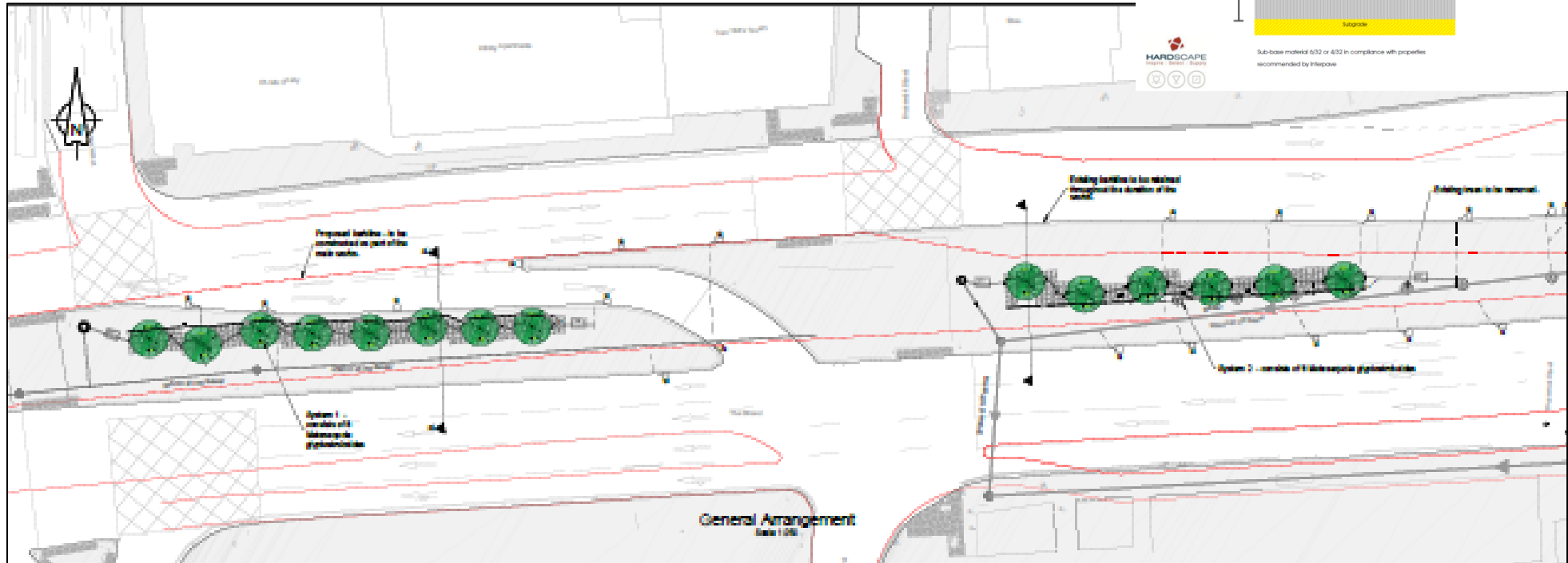
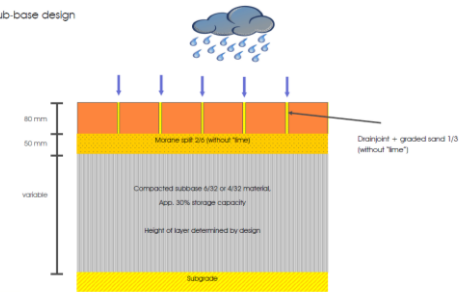
8 linked trees in tree pits to be monitored for water quality and flow

6 adjacent control SuD trees and 6 additional SuD trees

Opportunity to test soil moisture sensors

£300K contribution to trees, civis including permeable paving

Drainjoint sub-base design



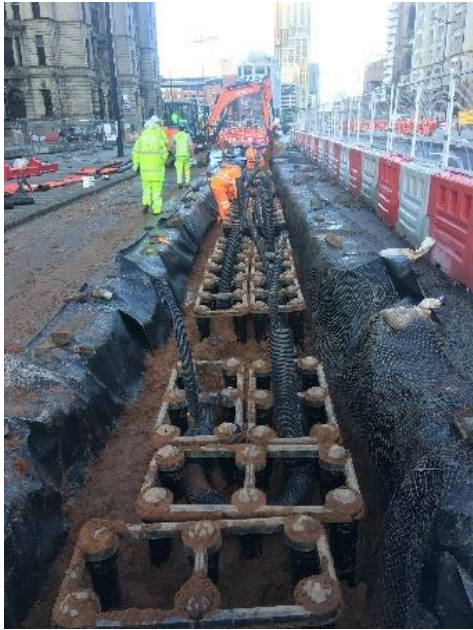


Choice of SuDS Tree

Dawn Redwood

Metasequoia glyptostroboides

- Fast growing
- Large specimen at maturity (25-60m)
- Tough tree, grows well on most soils
- Likes damp soil
- Can withstand air pollution
- Recognised useful urban tree
- No lateral branches over roads
- No large leaves to fall and block gutters
- All year round interest and structure
- Tolerant to low levels of salt



Deeproot Silva Cell Tree Pit

Various size capacity for linked cells (9m³ soil)

Can withstand vehicles (protects roots)

Unstructured soils with correct pH

Services/Utilities protected through chambers

Trees: *Metasequoia glyptostroboides*

Planted in silva cells

Total length of SuDS run 174.9m

Total catchment area of 765m²

Average volume of soil/tree 18.5m³

Expected benefits

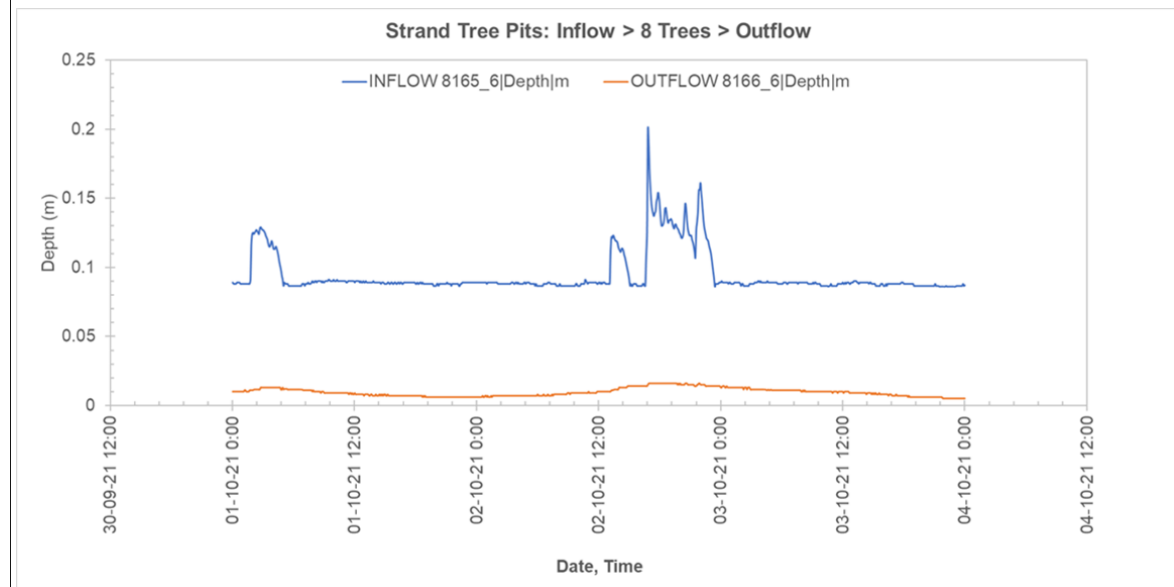
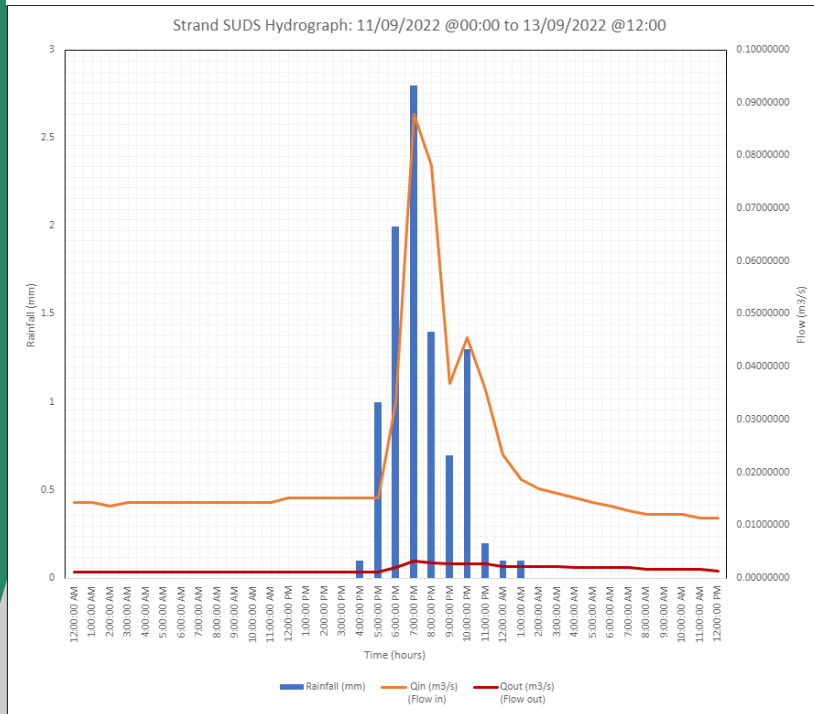
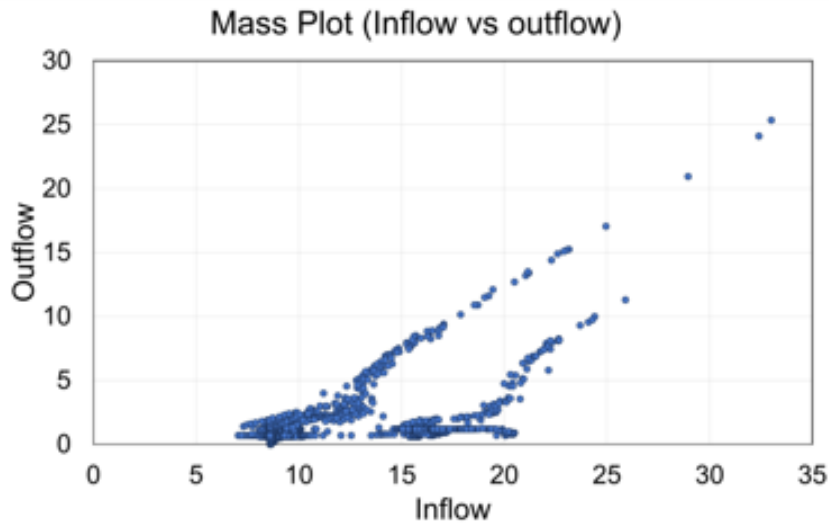
- Slow the flow
- Reduce final discharge volume
- Improve discharge water quality
- Add shade/cooling/biodiversity
- Filter trees for air quality



Benefits:

Reduced Water Flow and Volume

Decrease in water flow and volume to drain; indicated by hydrograph plots and inflow versus outflow plots





Benefits: Improved Water Quality



- Improved water quality with variable reductions in metal contamination for chromium, copper, cobalt, iron, manganese, nickel, lead and zinc with an average combined reduction in metals of 13%
- Reduction in suspended solids of 74%
- Elevated ammonium levels corresponded to an increase in the amount of organic matter decomposition, associated with gully cleaning operations
- Salinity levels remained high due to the exposed coastal location and winter salt spreading in icy weather



Other Benefits:

Environmental

- Improved air quality: reductions in particulate matter PM_{2.5} and PM₁₀
- Increased shade and cooling (reductions of up to 7.5°C air surface temperatures for nearby trees). Variable data for SuDS trees.
- Enhanced biodiversity through habitat added (visual observations but not quantified)
- Additional carbon stored (13.4tC) and sequestered (0.13tCO₂e), modelled data
- Soil Life Sensors (moisture, pH, conductivity, temperature, oxygen)





Other Benefits:

Social

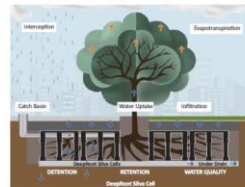
- 454 houses and 670 residents benefitting from an improved greenspace view
- (GI VAL model using building numbers, census data and 500m buffer area)
- Educational and interpretive signage.

Economic

- Potential savings from reduced stormwater entering the water treatment systems

Tree Sustainable Urban Drainage System (SuDS), The Strand

These trees are part of a sustainable urban drainage system installed through the EU funded URBAN GREEN UP research project on adapting to climate change. The Dawn Redwood (*Metasequoia glyptostroboides*) trees in the central reservation provide an innovative Nature Based Solution, to reduce the risk of local surface water flooding.



The trees are in soil-filled pits and linked, in series, under the paving. During periods of wet weather, excess surface water from the highway flows through the tree soil pits and root systems. The trees and soil collectively retain and filter the water, slowing and reducing the flow to drain as well as improving the final discharge water quality.

This SuDS system, together with other complementary tree planting in the wider scheme, collectively provide a number of additional environmental benefits. These include the provision of shade, cooling and habitat areas together with the storage of carbon. In addition, the trees contribute to improving local air quality through filtering and trapping fine airborne particulate matter and producing oxygen.



www.urbangreenup.eu
A Nature Based Solution, helping Liverpool adapt to climate change



Liverpool City Council



ameyconsulting

GRAHAM



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The Pollinators Project



elainecresswll

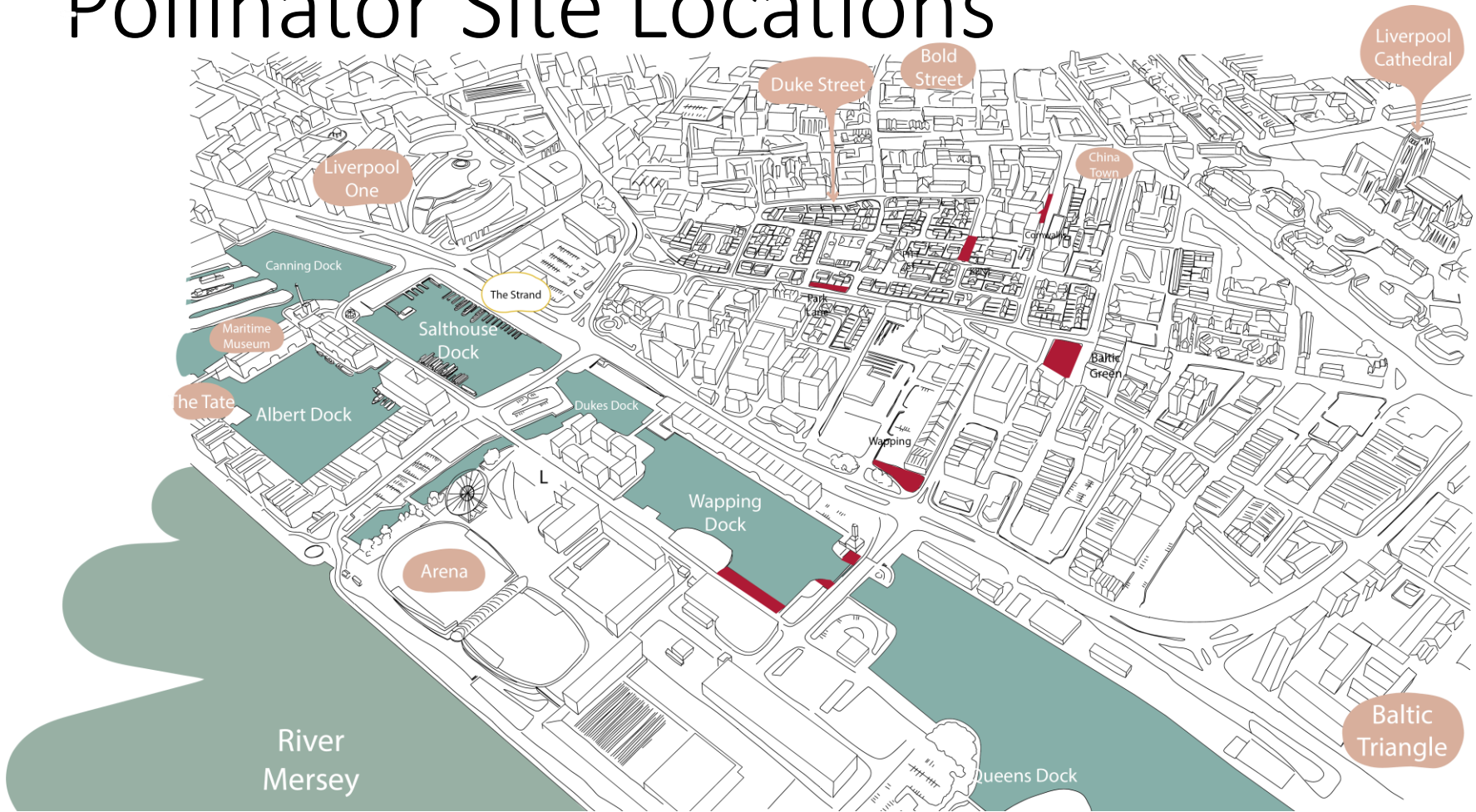


elaine-cresswell

Pollinator Planting Sites



Pollinator Site Locations



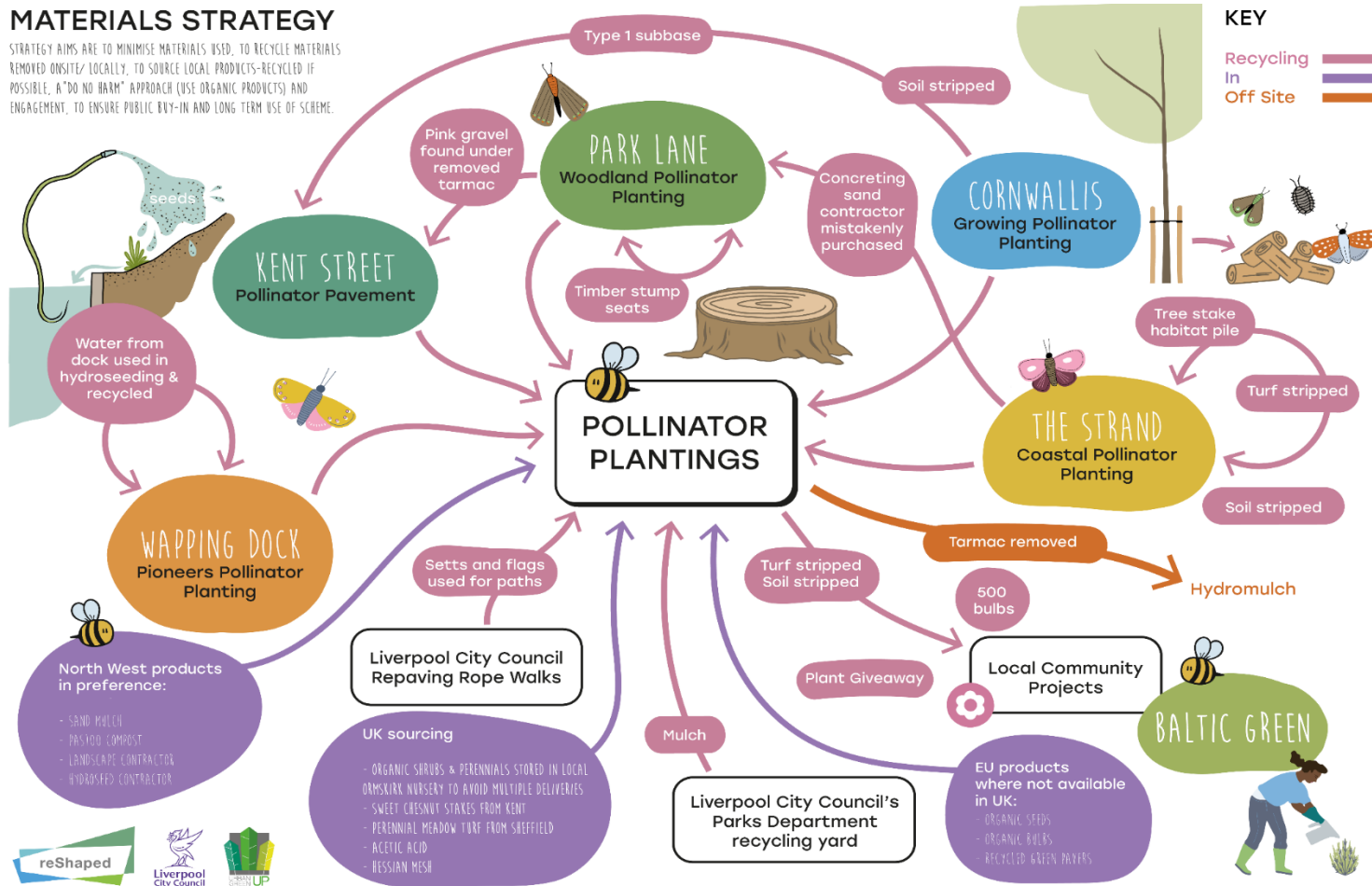
Pollinator Wildlife Corridors



No Chemical and Low Carbon Strategy

MATERIALS STRATEGY

STRATEGY AIMS ARE TO MINIMISE MATERIALS USED, TO RECYCLE MATERIALS REMOVED ONSITE/ LOCALLY, TO SOURCE LOCAL PRODUCTS-RECYCLED IF POSSIBLE, A "DO NO HARM" APPROACH (USE ORGANIC PRODUCTS) AND ENGAGEMENT, TO ENSURE PUBLIC BUY-IN AND LONG TERM USE OF SCHEME.



The Strand Pollinator Verge Before



Baseline

No Chemical and Low Carbon Strategy



No Chemical and Low Carbon Strategy



Sunflower



Diverse meadow from weed seed bank

No Chemical and Low Carbon Strategy



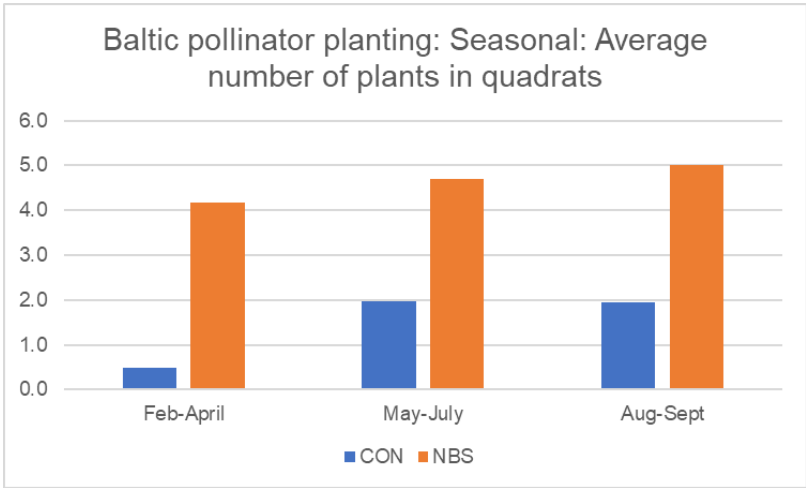
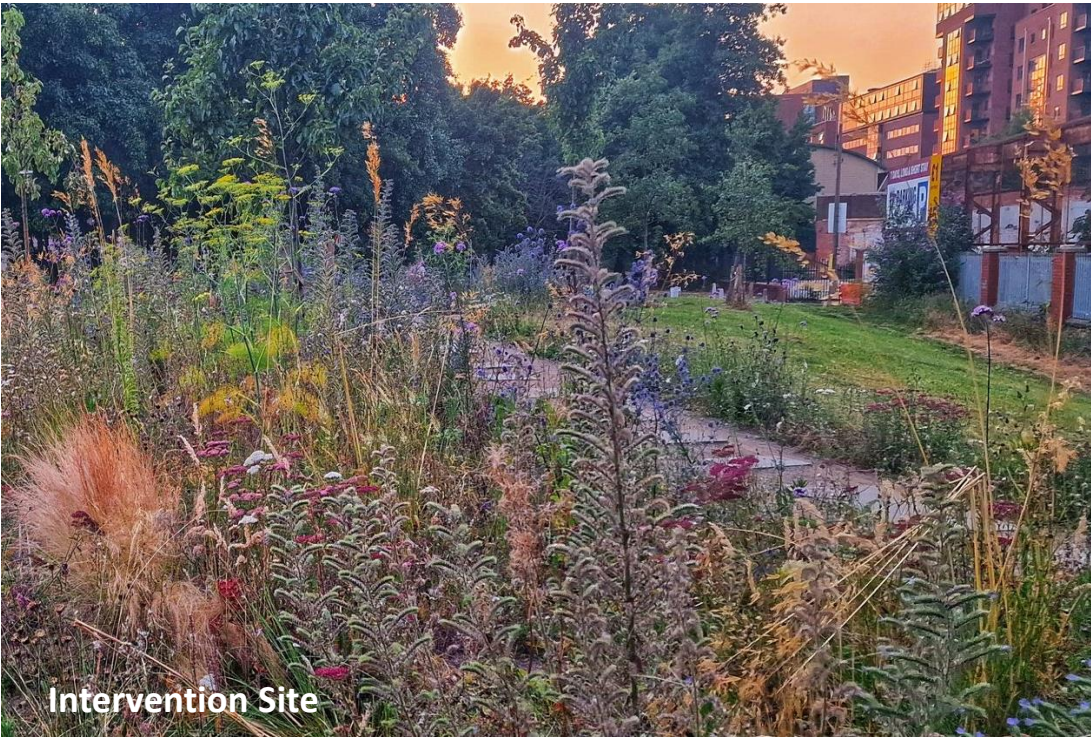
No Chemical and Low Carbon Strategy



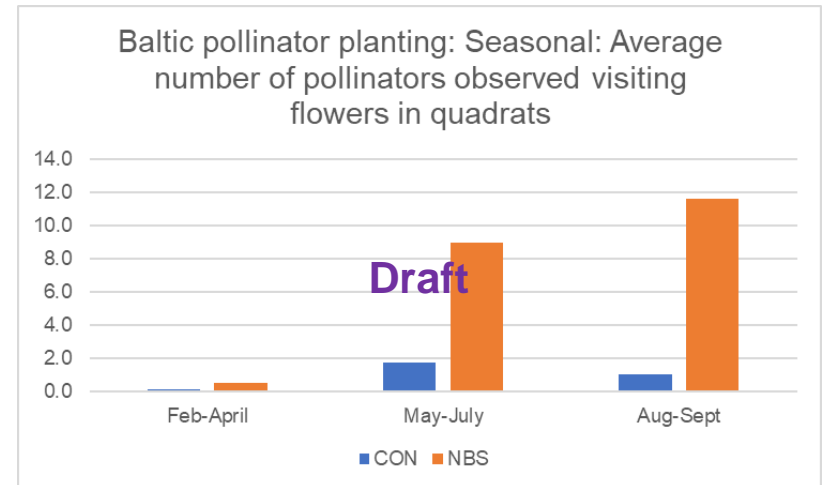
Monitoring Method



Intervention and Control Sites

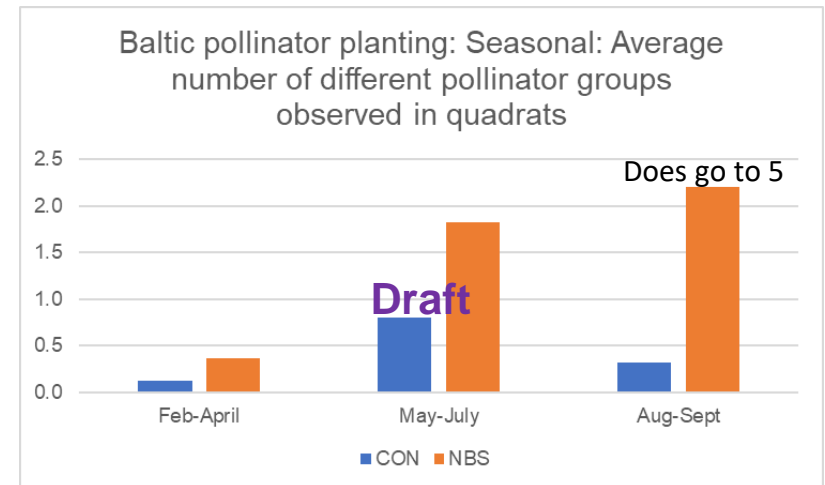


Pollinator Numbers



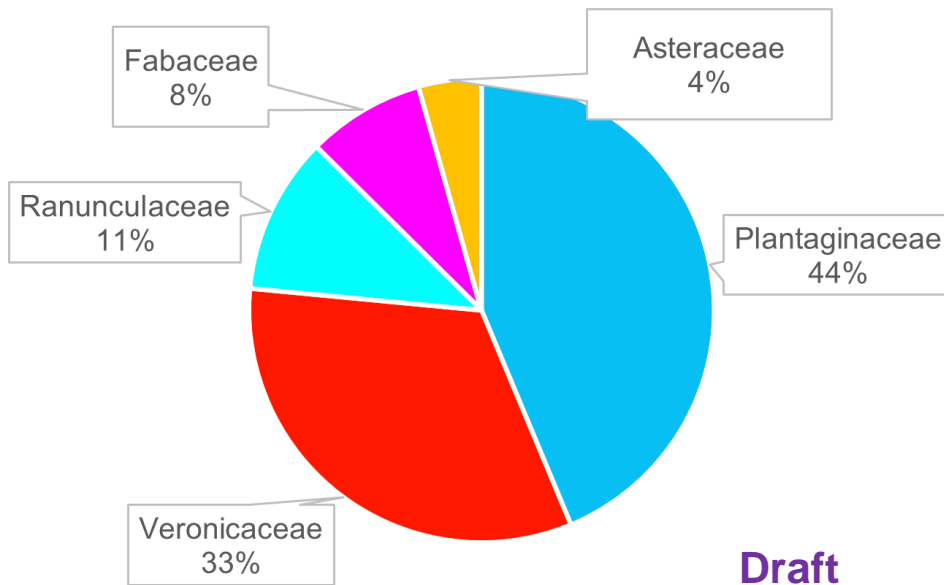
Pollinator Diversity

” Its crawling and buzzing!”



Associations: Control Site

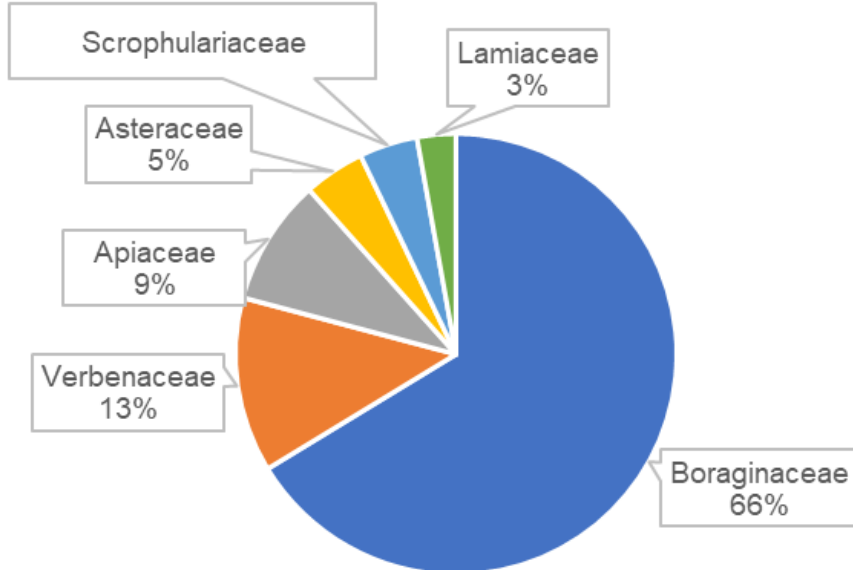
Plant families associated with pollinators on control:
Strand POLL



Associations: Intervention Site

” Its crawling and buzzing!”

Plant families associated with pollinators on pollinator planting:
Strand POLL



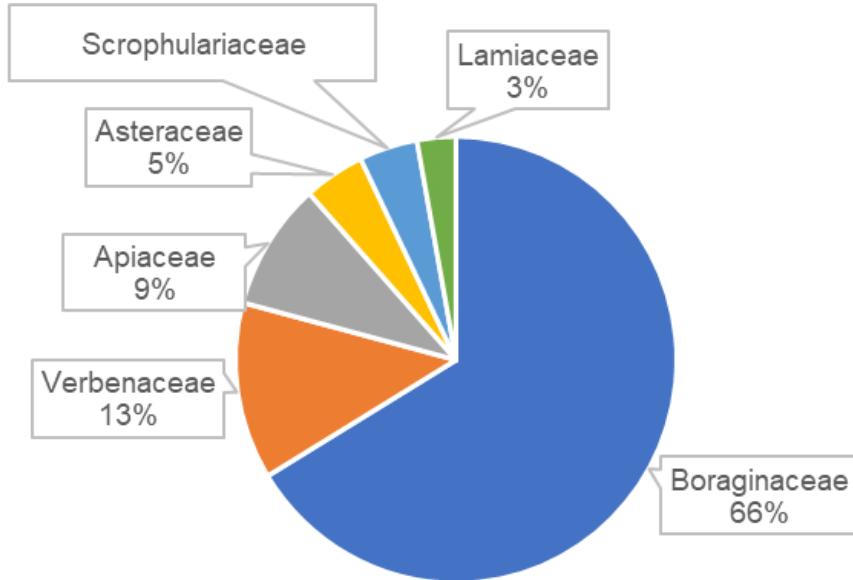
Draft



Associations: Seasonality

” Its crawling
and buzzing!”

Plant families associated with pollinators on pollinator planting:
Strand POLL



Draft



Beyond Urban GreenUP

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