Pollination ecosystem service support by sustainable urban drainage systems (SUDS)

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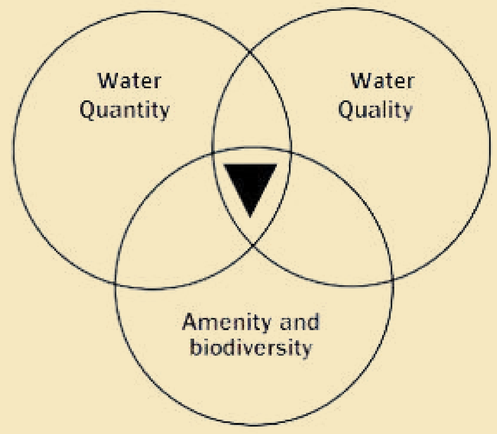
- Changes in land use and climate-induced shifts in phenology are the main drivers of pollinator declines globally[1].
- Besides being important pollinators, hoverflies (Syrphidae) provide additional ecosystem services: pest control, recycling of organic matter, long distance pollen transfer[2]. Hoverflies with aquatic larval stages (e.g. *Eristalis tenax*) are pollution and urbanisation tolerant[3].
- Sustainable Urban Drainage Systems (SUDS) are engineering solutions which mimic natural drainage systems, improve climate resilience and accumulate pollutants, but little research on biodiversity benefits[4].

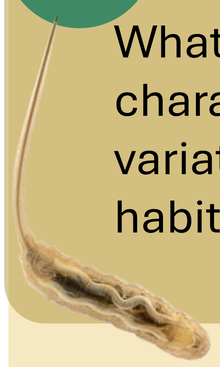
→ growing resource for urban biodiversity?[5] → habitat support for hoverflies?



The SUDS triangle.
From *Woods-Ballard et al. 2007*

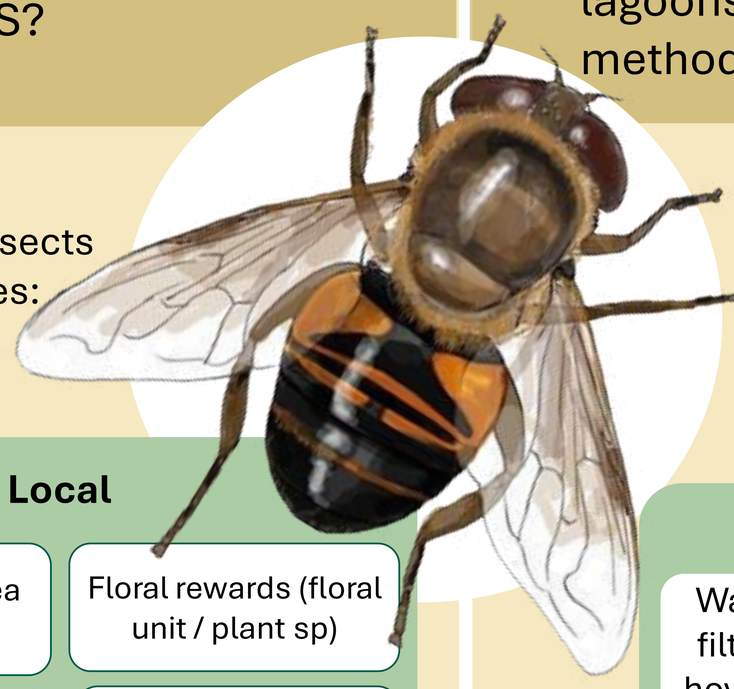
1 Question 1:

What features, including physico-chemical characteristics and surrounding vegetation, drive variation in hoverfly assemblages in urban habitats with and without SUDS?



Invertebrate sampling:
- Adult hoverflies: pan traps and transects
- Larvae and pupae of aquatic species: freshwater sampling

Environmental variables:



Landscape
- Distance to road (m)
- Distance to other SUDS (m)
- Land cover metric (%)
- Urban cover metric (%)

Local
- SUDS surface area (m^2)
- Floral rewards (floral unit / plant sp)
- Herbaceous plant richness
- SUDS % in shade
- Surface & submerged vegetation cover (%)
- Physico-chemical characteristics (water pH, conductivity, nutrient levels, dissolved oxygen)
- SUDS depth at arm's length (cm)

→ Hoverfly species richness ←

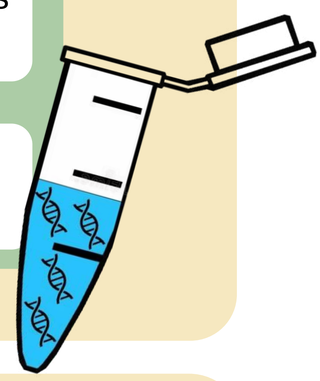
2 Question 2:

What is the relative efficacy of eDNA techniques for accurate assessments of hoverfly pollinator diversity in artificial egg laying sites (hoverfly lagoons) and SUDS compared to traditional methods?

- **Artificial egg laying sites (hoverfly lagoons)** to evaluate recruitment rates of aquatic hoverfly larvae to a site
- Sample larvae and allow them to pupate in the lab before identifying adults

eDNA techniques

Water collection and filtration during peak hoverfly larvae season → DNA extraction → In-silico primer testing for different hoverfly species → Amplify target species DNA (PCR, qPCR) → Sequencing → Bio-informatics



Pollinator Strategy for Scotland

Work with NatureScot to inform their policy for Green Infrastructure Strategic Intervention projects.

Urban conservation

Provide urban developers with targeted conservation measures for pollinators in urban greenspaces.

Connectivity corridors

Evaluate SUDS connectivity and incorporate them into habitat corridors for pollinators, similar to the Buglife B-lines scheme.

Further research

eDNA innovation for pollination research is crucial for urban biodiversity and ultimately for creating more resilient and sustainable cities.

References:
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