

Urban Landscape Ecology: the URGENT picture

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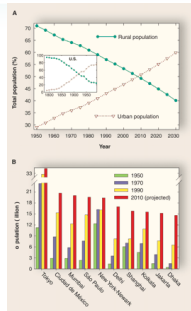


Talk Structure

- Context and the URGENT programme
- URGENT Science
 - Patches
 - Linear features
 - Waters
- Where did it get us?
- Was there life after URGENT?
- Where is it going now?

Urban ecology - Why bother?

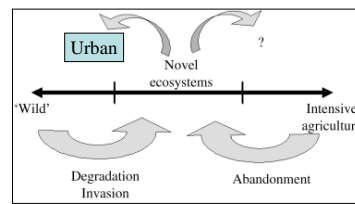
- Urban ecology was undergoing something of a global renaissance
- Concerns over the sustainability of urban environments
- Planning requirements/international law - the 'convention on Biodiversity'
- Lots of urban land around - majority of the population is centred on it (60% of global pop. In cities by 2005) and up to 80% by 2020.
- In the UK, we already have 90% of the population living in an urban area that only covers 10% of the country (DETR 2001)
- Growth mainly in cities > intensification -> compact cities



Context 1

Urban ecosystems as novel / emerging ecosystems

- Juxtaposition of habitats and > habitat heterogeneity
- New combinations of species



Hobbs et al. 2006 – Global. Ecol. Biogeog., 15, 1-7

Context 2

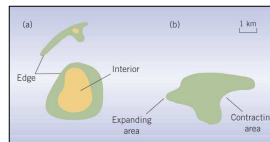
Urban Regeneration and the Environment (URGENT)



- ☐ NERC thematic grant
- ☐ Three phases
- ☐ Multidisciplinary

Context 4

Urban Landscape Ecology

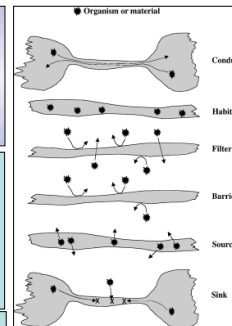


Patches have a range of properties:

- Isolation – distance from similar habitats (defined in many ways)
- Shape – often characterised in terms of perimeter/area ratios
- Size – a key variable (if you believe IBT)
- Location – where in the matrix they are found
- Habitat quality

Urgent Science 1

Hess 2001



Dynamics of urban species

Occupancy at a particular patch will be a function of the ecology of the species in relation to:

f Landscape + habitat

eg.

Size

Isolation

Connectedness

Location to similar habitat

eg.

Size

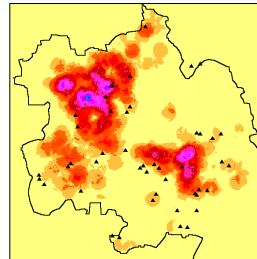
Vegetation

Habitat diversity

substrate

Urgent Science 2

Analysing landscape structure

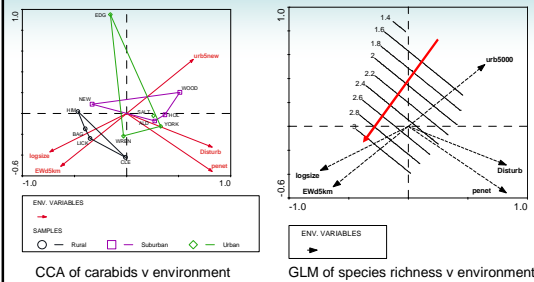


- W.Midlands boundary
- ▲ Derelict land study sites
- Low density derelict land
- High density derelict land

- Indices were developed to take account of the nature ('permeability') of the urban matrix around each site.

Urgent Science 3

Community patterns/structure in woodlands



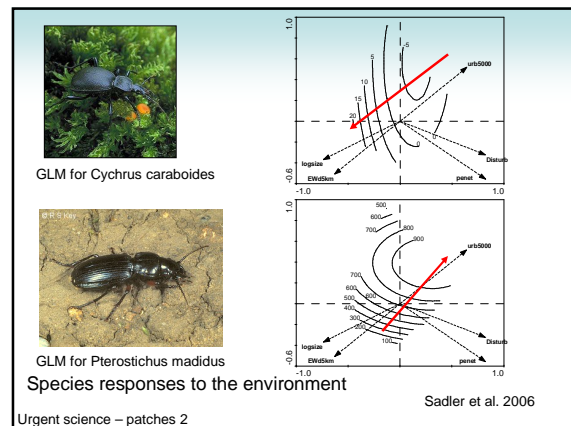
CCA of carabids v environment

GLM of species richness v environment

- Clear difference between rural and other sites
- Related to the environment

Urgent science – patches 1

Sadler et al. 2006



GLM for *Cychrus caraboides*

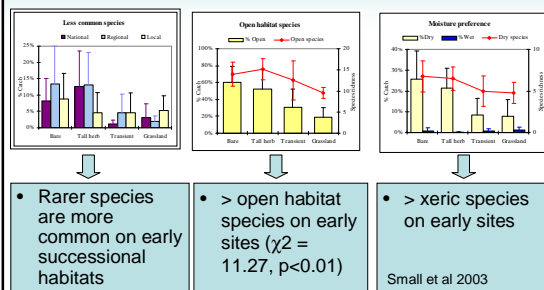
GLM for *Pterostichus madidus*

Species responses to the environment

Urgent science – patches 2

Sadler et al. 2006

Brownfield invertebrate ecology



- Rarer species are more common on early successional habitats

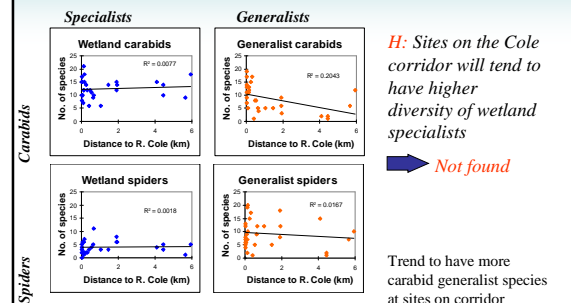
- > open habitat species on early sites ($\chi^2 = 11.27, p < 0.01$)

- > xeric species on early sites

Small et al 2003

Urgent science – patches 3

Corridor effects: wetland species richness

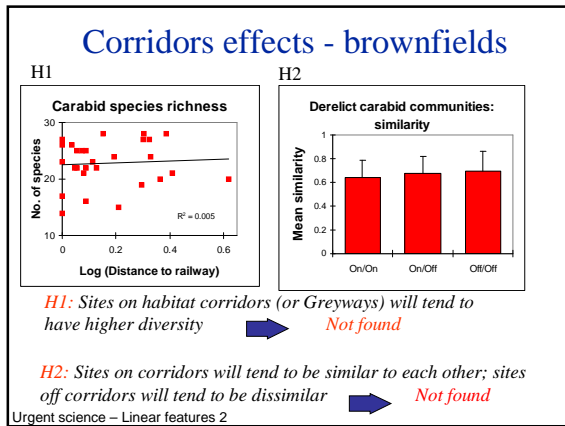


H: Sites on the Cole corridor will tend to have higher diversity of wetland specialists

➡ Not found

Trend to have more carabid generalist species at sites on corridor

Urgent science – Linear features 1

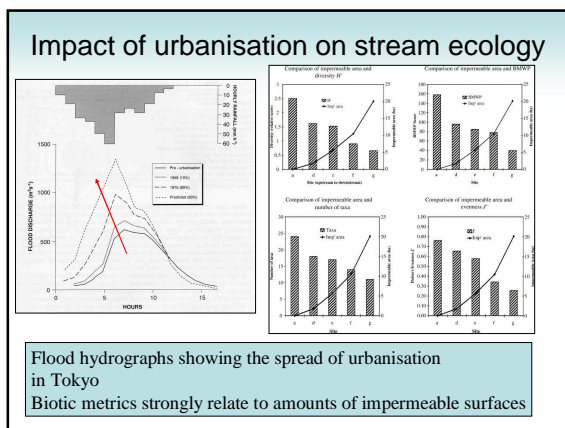


Freshwater ecology and urbanisation

- Hydrology – flashy regime
- Fluvial geomorphology – heavy engineering < mesohabitats
- Water quality – nutrients (sewage/runoff; pollutants)

Beavan et al. 2001
Lawler et al. 2006
Old et al. 2006

URGENT science – waters 1



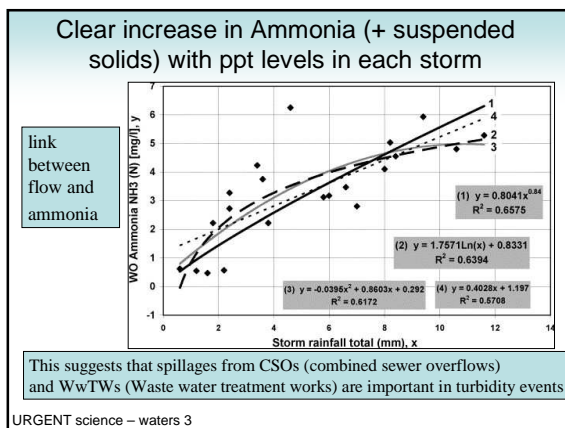
Biological quality of Bham's rivers

- Three 2 min replicate kick samples at 25 sites on the Rivers Tame, Rea, Cole and Blythe
- Samples taken on 4 occasions AUG & NOV 1998 and FEB & MAY 1999)
- Based on RIVPACS sampling protocol
- Paired samples from modified and less modified sites
- Experimental work using colonization samplers

Water quality is limiting not in stream physical habitat.....why?

Beavan et al. 2001

URGENT science – waters 2

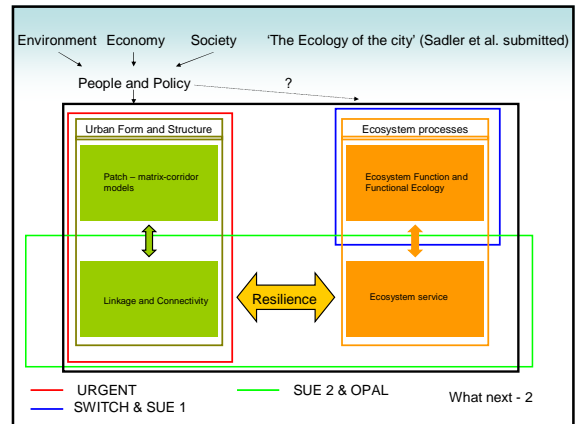


- ### Research outcomes
- Patch effects are species specific; but size is important
 - Landscape context was not important for most groups
 - For most of the groups we studied (empirically) there was little evidence for efficacy of corridors as conduits
 - Corridors are species specific– one size does not fit all
 - Corridors do provide habitat and it is the quality of this habitat which is of central importance to urban biodiversity
 - Habitat quality is the key (even for aquatic systems)
- Angold et al. 2006

What was missing?

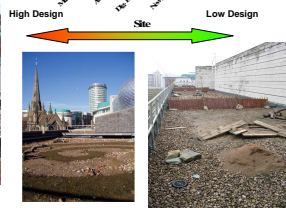
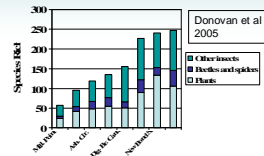
- Studies emphasised structural elements of landscape not functional or ecosystem attributes
- Rather too much emphasis on pattern not process – we did not measure the dynamics of movement
- Insufficient focus on matrix issues (e.g. permeability) and not enough on barriers, filters etc
- Need to understand development in relation to ecology

What next - 1



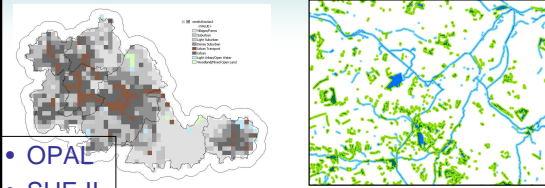
Building for biodiversity

- Switch
- SUE 1
- OPAL

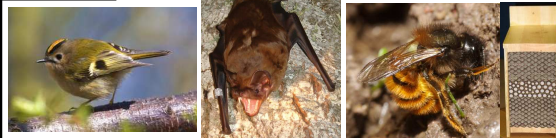


What next - 3

A focus on permeability and functional ecology



- OPAL
- SUE II



What next - 4