Applying Bird Survey Datasets and Models to Planning and Landscape Design

Gavin Siriwardena & Kate Plummer

(with thanks to Daria Dadam & Simon Gillings)

BRITISH TRUST FOR ORNITHOLOGY

gavin.siriwardena@bto.org

BTO
Looking out for birds

www.bto.org

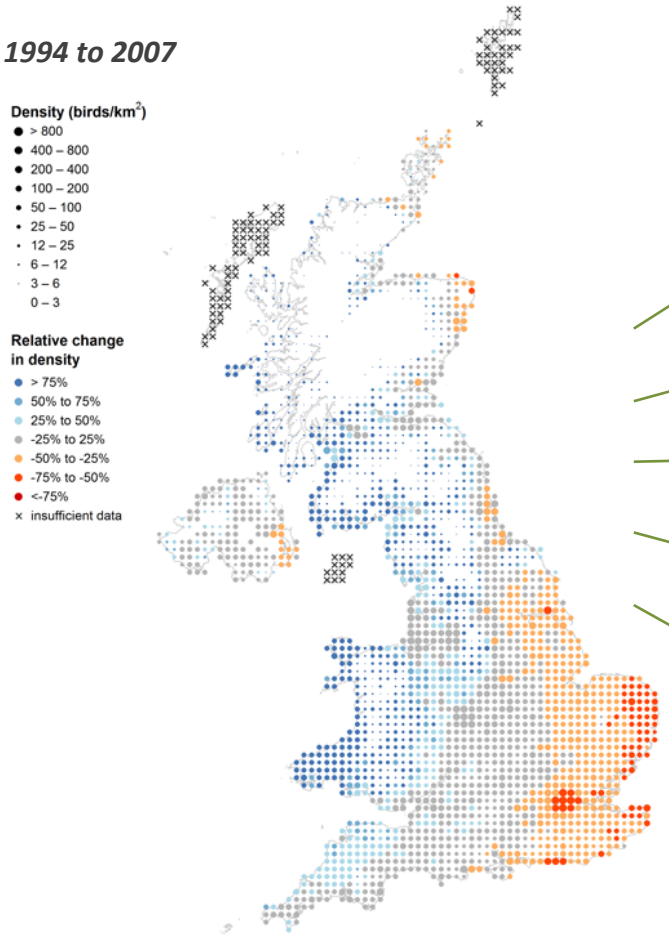
Photo © BTO

BTO

Looking out for birds

- Combine professional and citizen science
- Examining wildlife population changes
- 40,000 volunteers
- Collect/manage/analyse BIG ecological datasets

House Sparrow population change 1994 to 2007



Conservation bodies

Government

Environmental policy

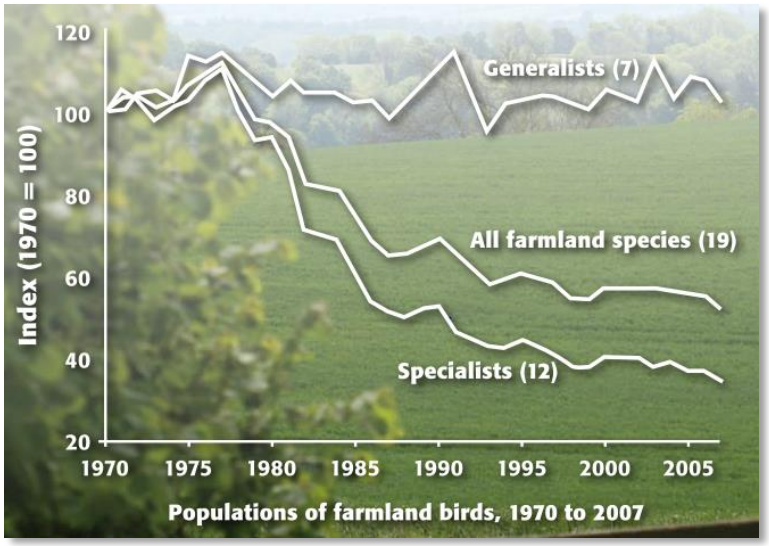
General public

Peer-reviewed science

BTO
Looking out for birds

- Combine professional and citizen science
- Examining wildlife population changes
- 40,000 volunteers
- Collect/manage/analyse BIG ecological datasets

Farmland bird declines



Trend analyses

Demographic & habitat analyses

IDENTIFY ISSUE

DIAGNOSE CAUSES

POLICY

MONITOR EFFECTS

DESIGN SOLUTIONS

AES evaluation

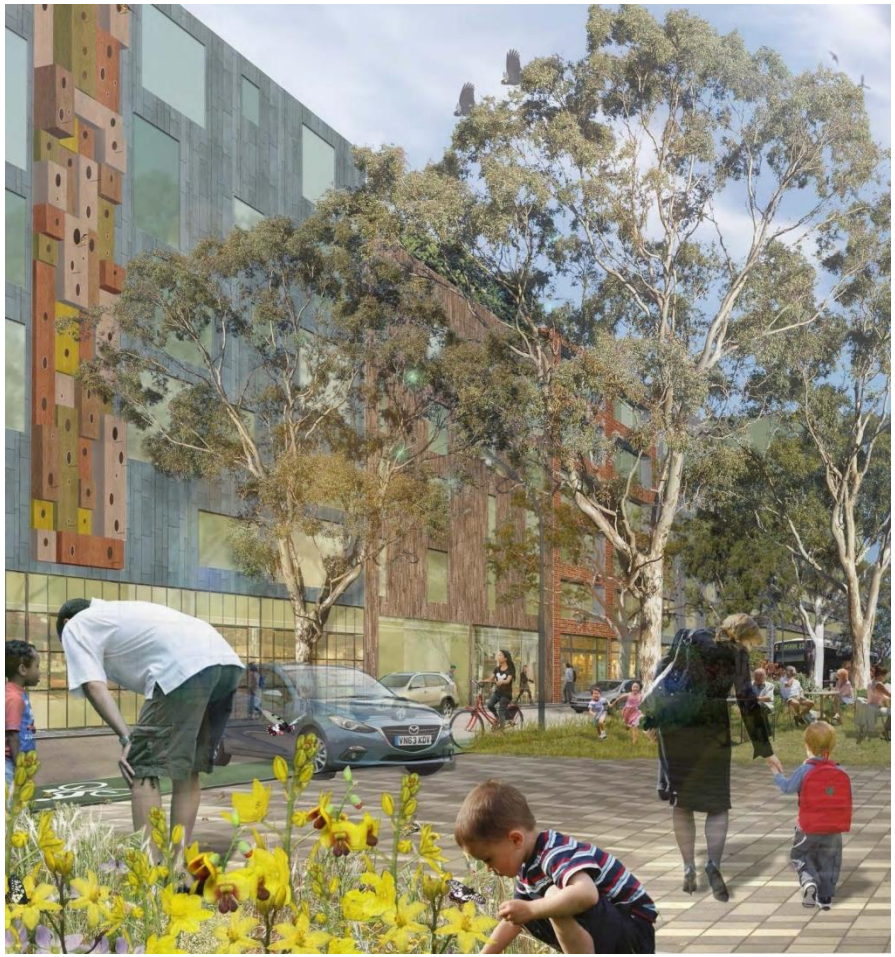
Field experiments

NOW APPLYING TO KEY ISSUES IN THE URBAN CONTEXT…

Common birds in the built environment

BTO monitoring schemes provide relevant data from the garden scale to the national scale

Rapid urban expansion is a major threat to biodiversity



BUT…

also an opportunity for biodiversity-sensitive urban design

BIODIVERSITY-SENSITIVE URBAN DESIGN

How to do it??... 1. Use qualitative principles and species ecologies, retro-fitting/greenwashing?

Trees/hedges are good for birds…

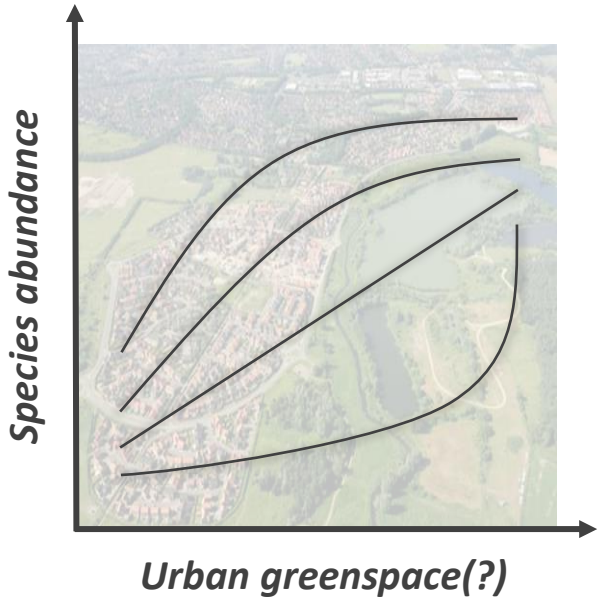
Ponds are good for amphibians…

BTO
Looking out for birds

BIODIVERSITY-SENSITIVE URBAN DESIGN

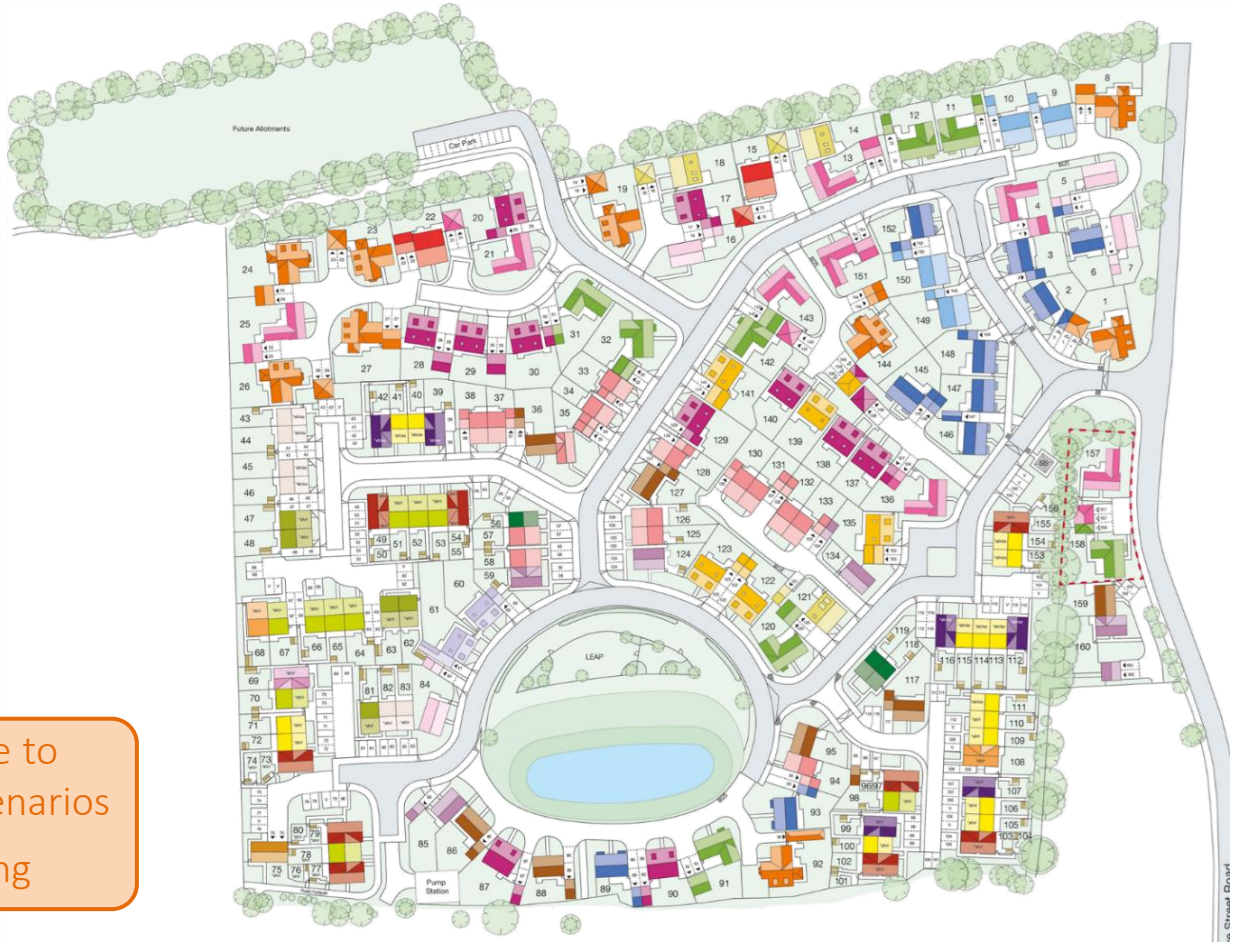
How to do it??... 1. Use qualitative principles and species ecologies, retro-fitting/greenwashing?

Better to... 2. Incorporate quantitative knowledge about birds into decision-making: measurement and prediction of change – where are relative benefits?



Predict bird response to future development scenarios

→ Simulation testing



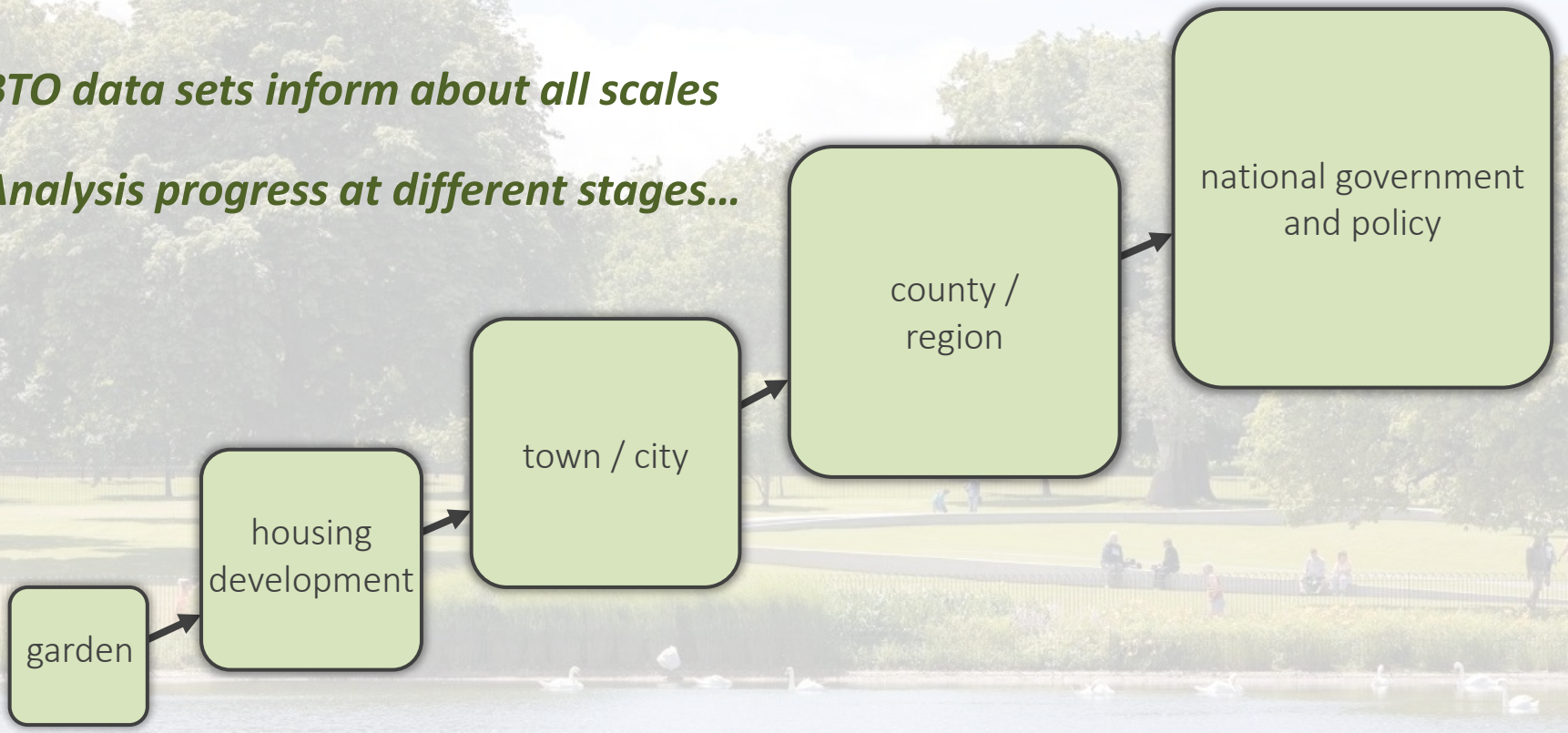
BTO Looking out for birds

BIODIVERSITY-SENSITIVE URBAN DESIGN

Decisions are made at multiple scales…

BTO data sets inform about all scales

Analysis progress at different stages…

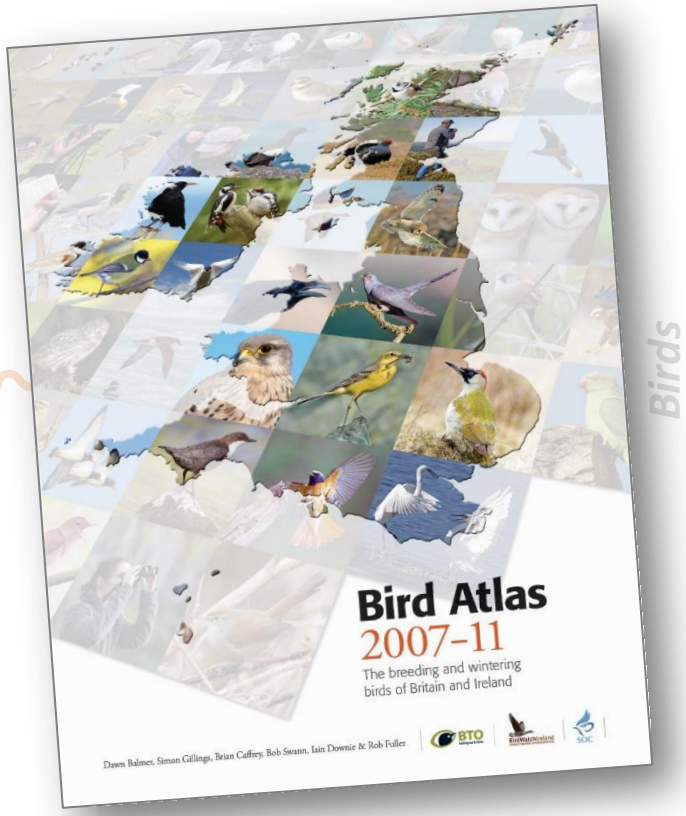


Where to position new developments?

BTO
Looking out for birds

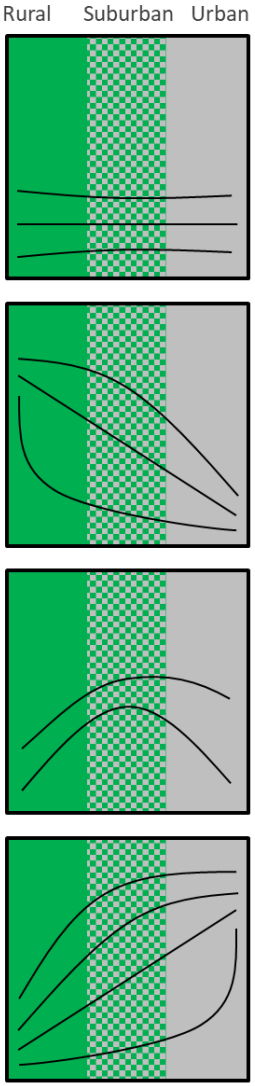
POSITIONING OF NEW DEVELOPMENTS

1. Where do different species occur?
2. How are they affected by patterns of urbanisation?



BTO
Looking out for birds

POSITIONING OF NEW DEVELOPMENTS



Tolerant
Status is invariant to the state of urbanisation. Often rare everywhere.

→ **4 species (3%)**

Urban avoider
Status declines with increasing urbanisation. Decline can be rapid for highly sensitive species.

→ **79 species (57%)**

Suburban adapter
Status peaks at intermediate levels of development.

→ **21 species (15%)**

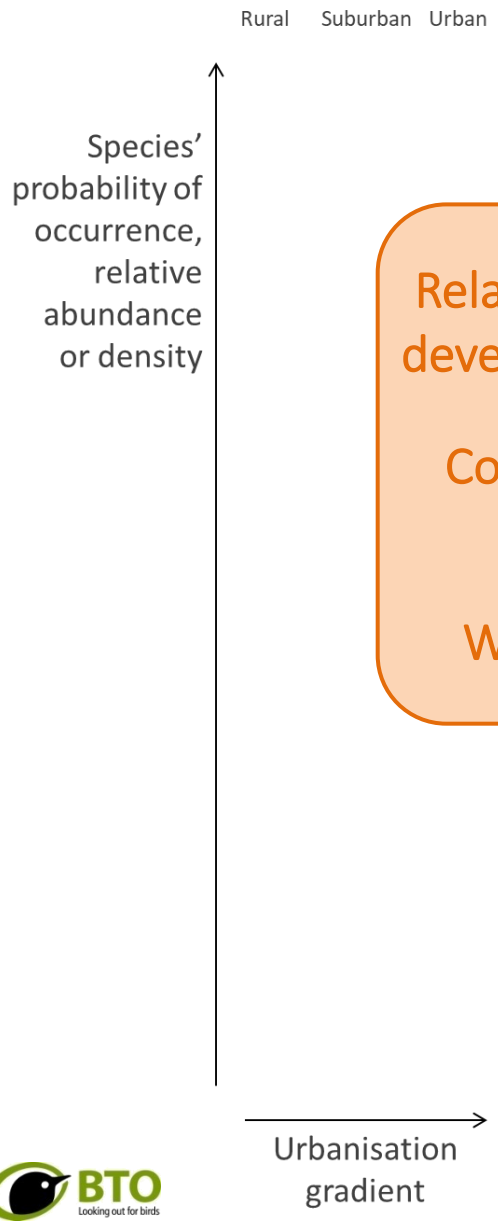
Urban adapter
Status increases with urbanisation; may be stable across intermediate to high levels of development.

→ **35 species (25%)**

Gillings, S. (2019). *Urban Ecosystems*, 22: 1007–1017.

BTO
Looking out for birds

POSITIONING OF NEW DEVELOPMENTS



4 species (3%)

Relationships predict birds likely to be found with developments of different types in different places

Communities will feature tolerant and adapter species – which we can manage for

Which species may be the planners' choice…

es (57%)

ies (15%)

35 species (25%)

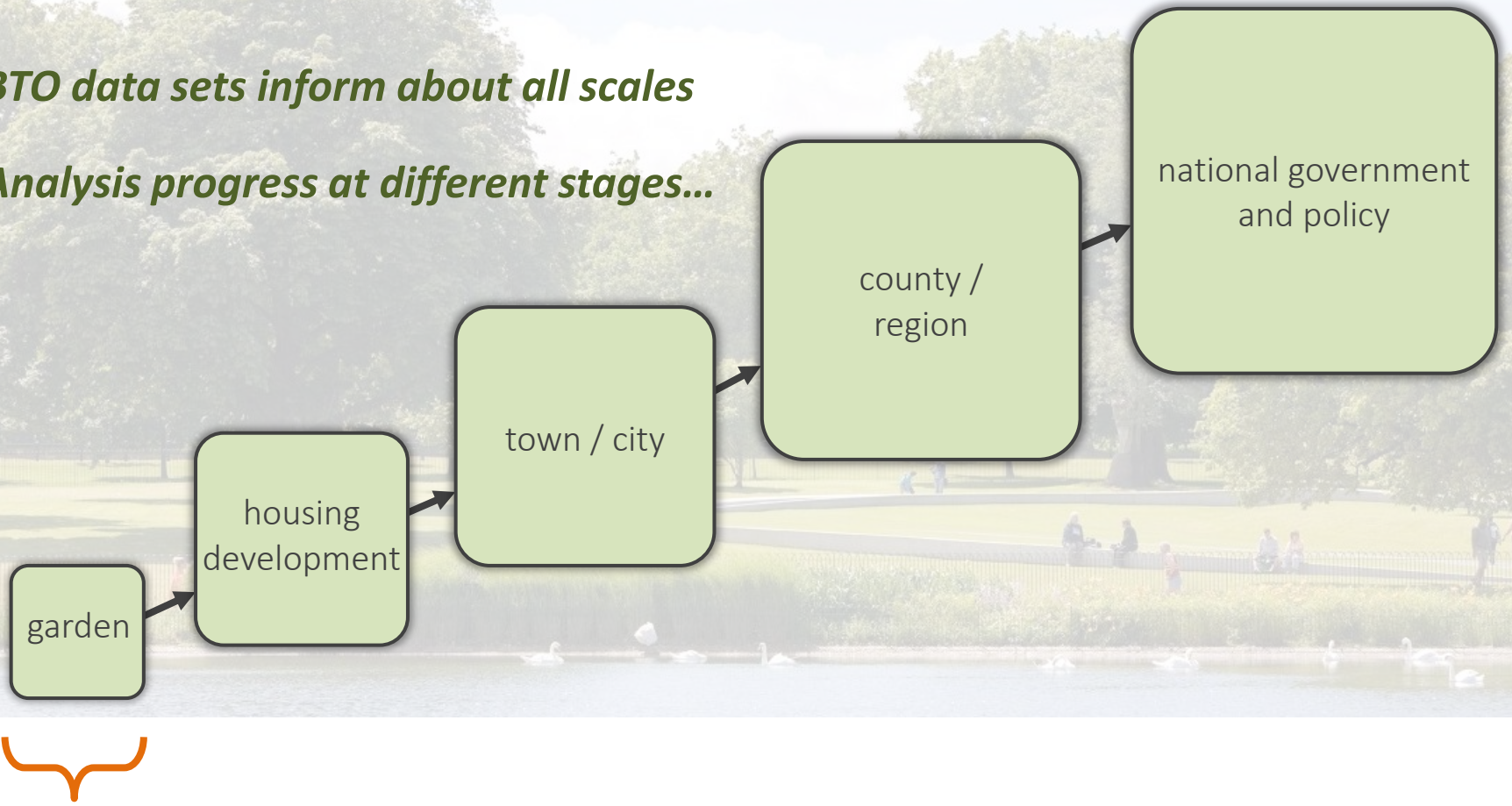
Gillings, S. (2019). *Urban Ecosystems*, 22: 1007–1017.

BIODIVERSITY-SENSITIVE URBAN DESIGN

Decisions are made at multiple scales…

BTO data sets inform about all scales

Analysis progress at different stages…



How do people's decisions affect wildlife?
Effects of garden structure and location?

BTO
Looking out for birds

MANAGEMENT IN GARDENS

BTO Garden BirdWatch

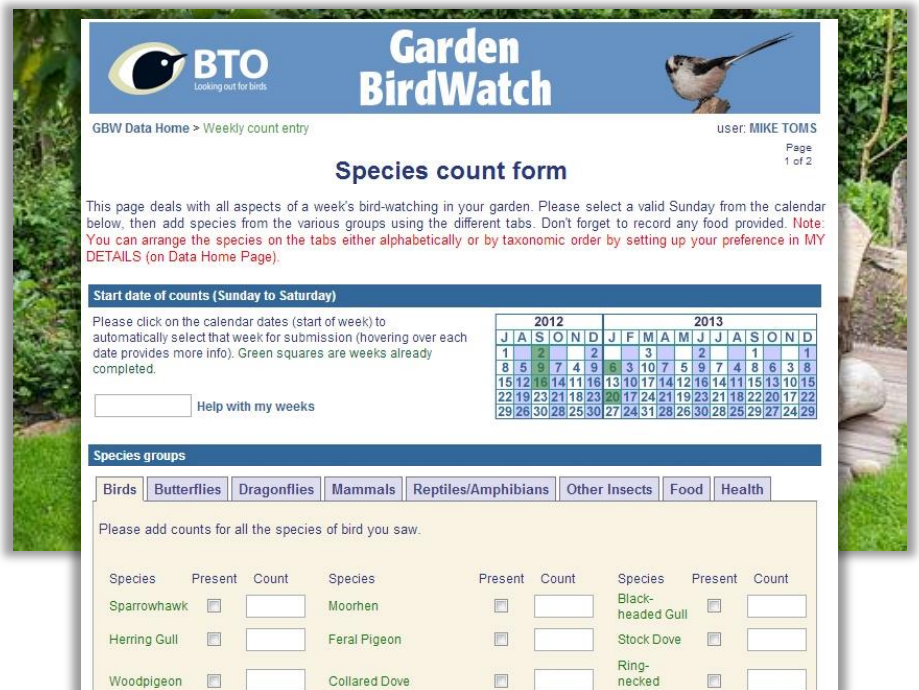
- Focus on gardens, year-round
- Long-running (since 1995) (*7.3 million records!*)

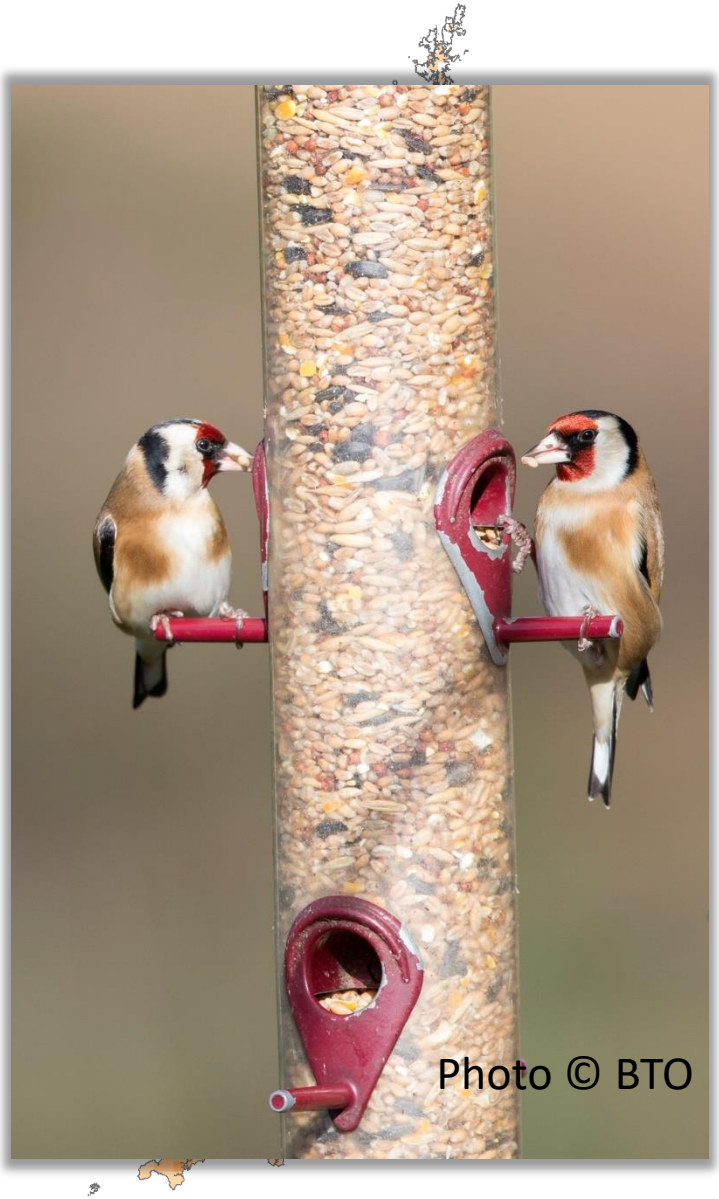
BTO
Looking out for birds

MANAGEMENT IN GARDENS

BTO Garden BirdWatch

- Focus on gardens, year-round
- Long-running (since 1995) (*7.3 million records!*)
- Observers throughout the UK
- Record of garden features & feeding



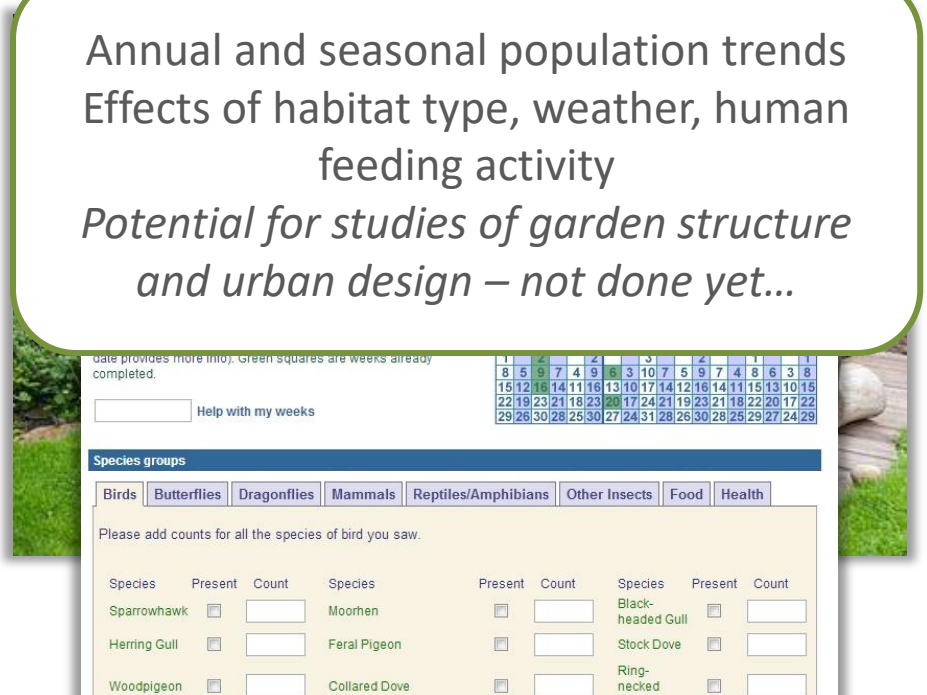


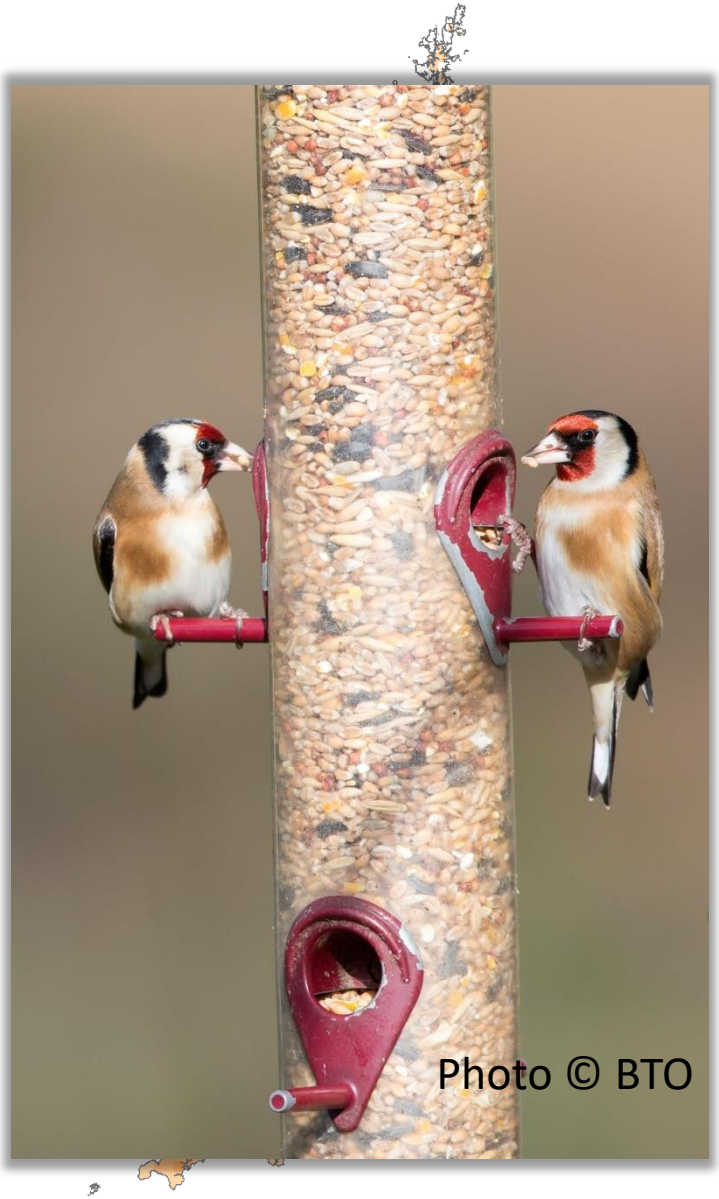
MANAGEMENT IN GARDENS

BTO Garden BirdWatch

- Focus on gardens, year-round
- Long-running (since 1995) (*7.3 million records!*)
- Observers throughout the UK
- Record of garden features & feeding

Annual and seasonal population trends
Effects of habitat type, weather, human feeding activity
Potential for studies of garden structure and urban design – not done yet…



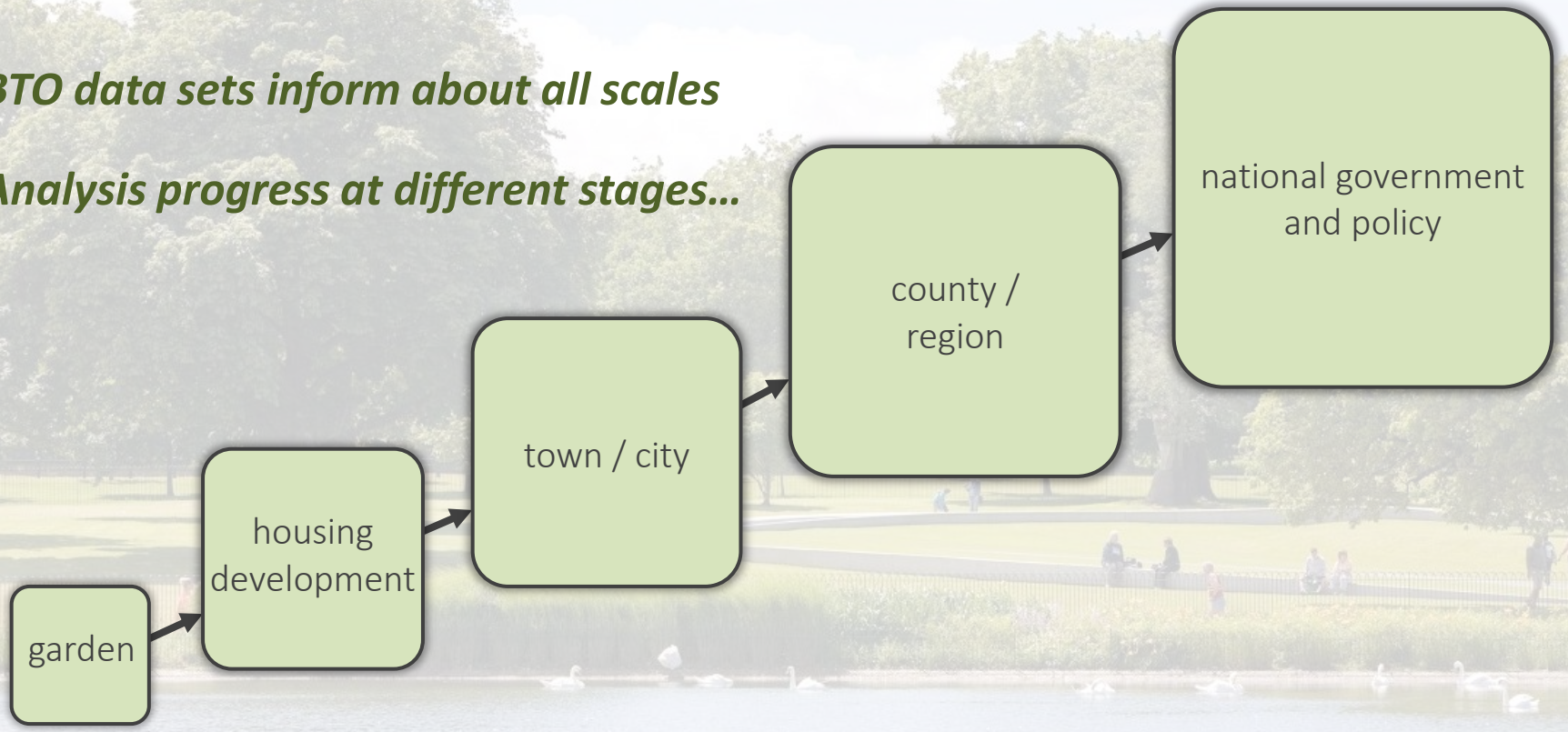


BIODIVERSITY-SENSITIVE URBAN DESIGN

Decisions are made at multiple scales…

BTO data sets inform about all scales

Analysis progress at different stages…

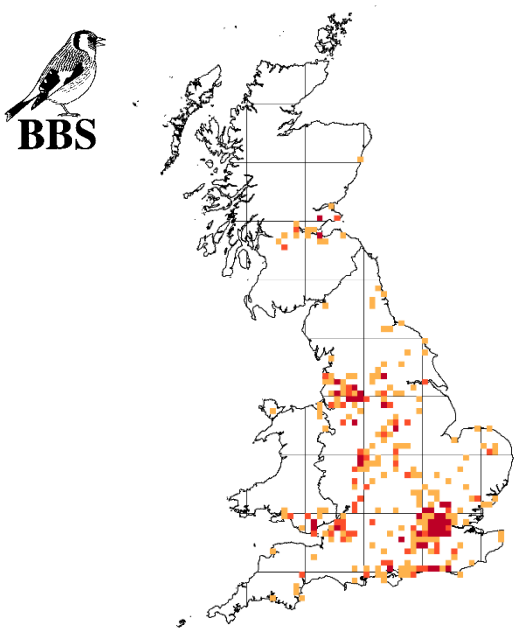


How to design urban landscapes for birds (and biodiversity in general)?

BTO
Looking out for birds

URBAN DESIGN FOR BIRDS

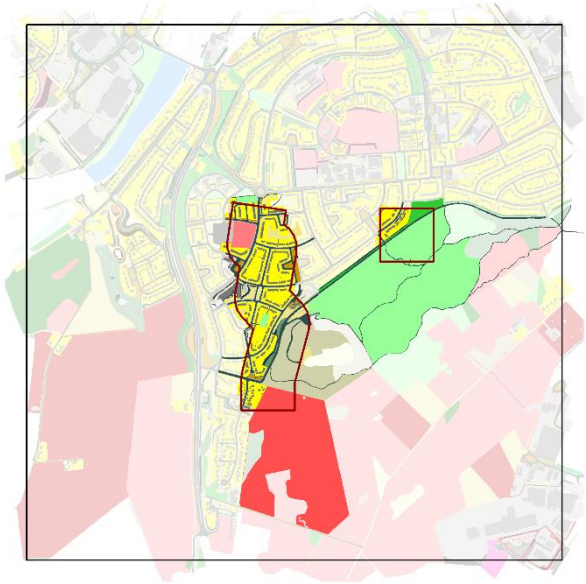
Bird abundance – using Breeding Bird Survey



- National monitoring scheme
- 482 ‘urban sites’ in 1km squares
- 58 common bird species
- Analogous analyses of data for Luton/Bedford/Milton Keynes

~

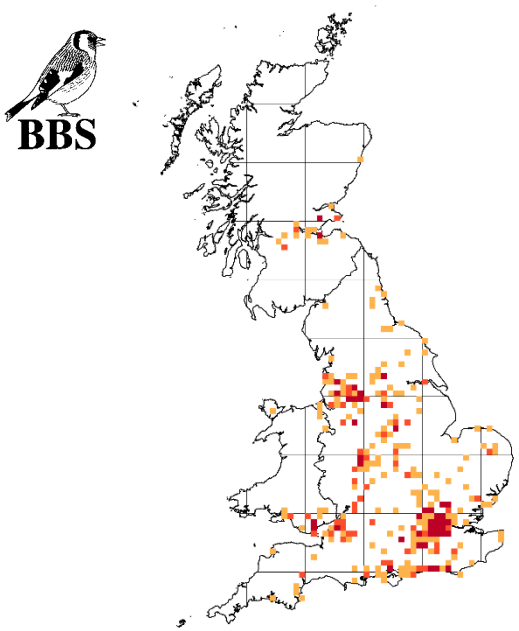
Urban landscape pattern – using OS MasterMap



- 38 urban form metrics
- Habitat cover, patch densities, patch sizes, connectivity…

URBAN DESIGN FOR BIRDS

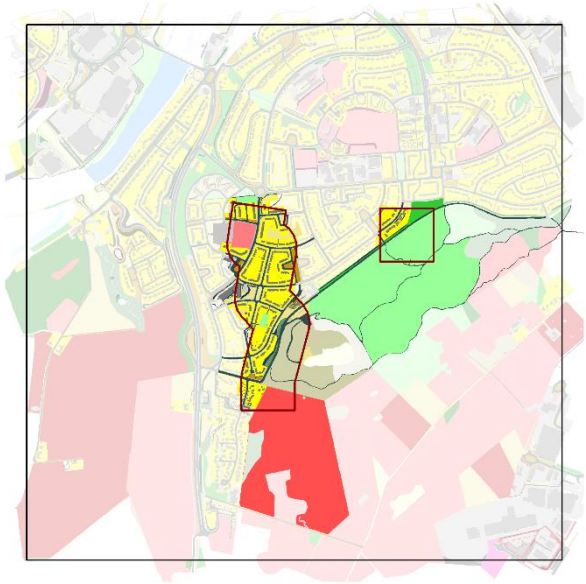
Bird abundance – using Breeding Bird Survey



- National monitoring scheme
- 482 'urba
- 58 comm
- Analogous
  Luton/Bedford/Milton Keynes

~

Urban landscape pattern – using OS MasterMap



- 38 urban form metrics
- densities,
- vity…

(1) Important factors for each species
(2) Best models to predict each species
(3) Quantify net effects of development scenarios

RESULTS

Patterns of response by species

Variable predictive power

Strongest for:

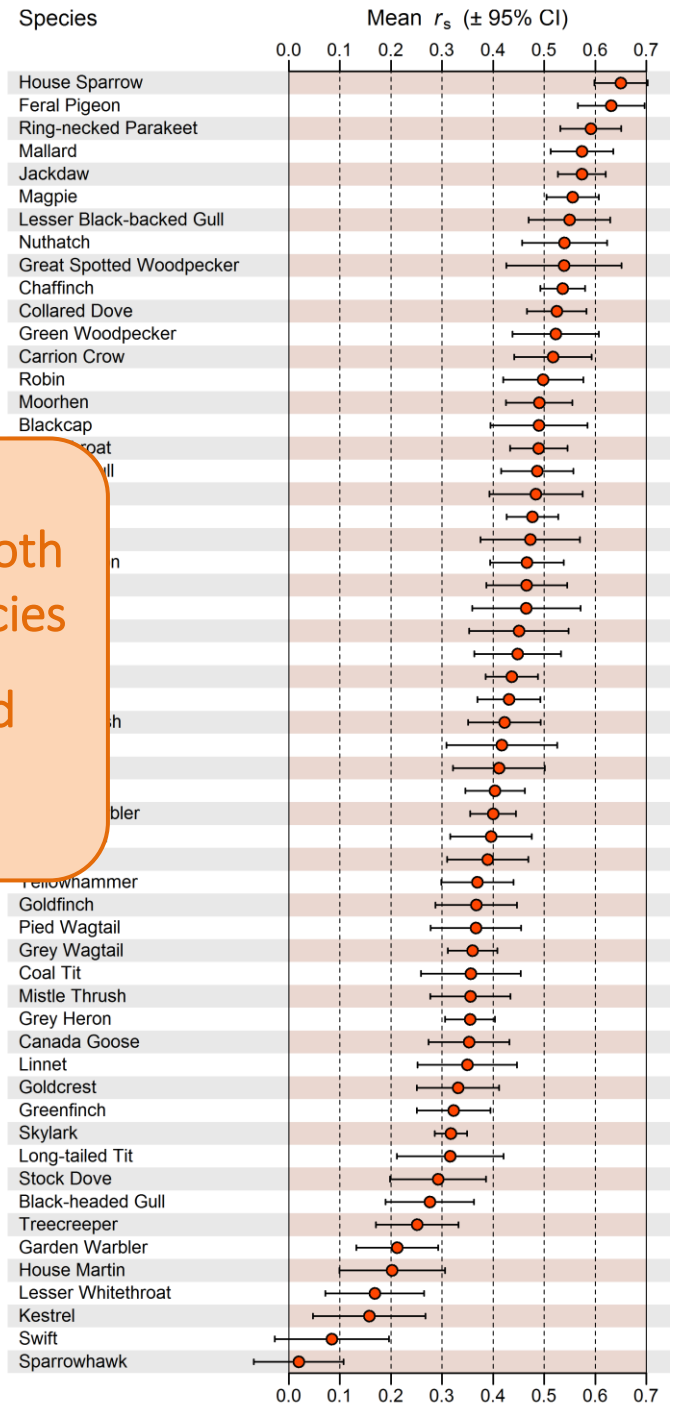
- House Sparrow
- Feral Pigeon
- Ring-necked Parakeet
- Mallard
- Jackdaw
- Magpie

Poorest for:

- Sparrowhawk
- Swift
- Kestrel
- Lesser Whitethroat
- House Martin
- Garden Warbler

Models can predict both ‘nice’ and ‘nasty’ species

Maximise some and minimise others?



RESULTS

Patterns of response across species

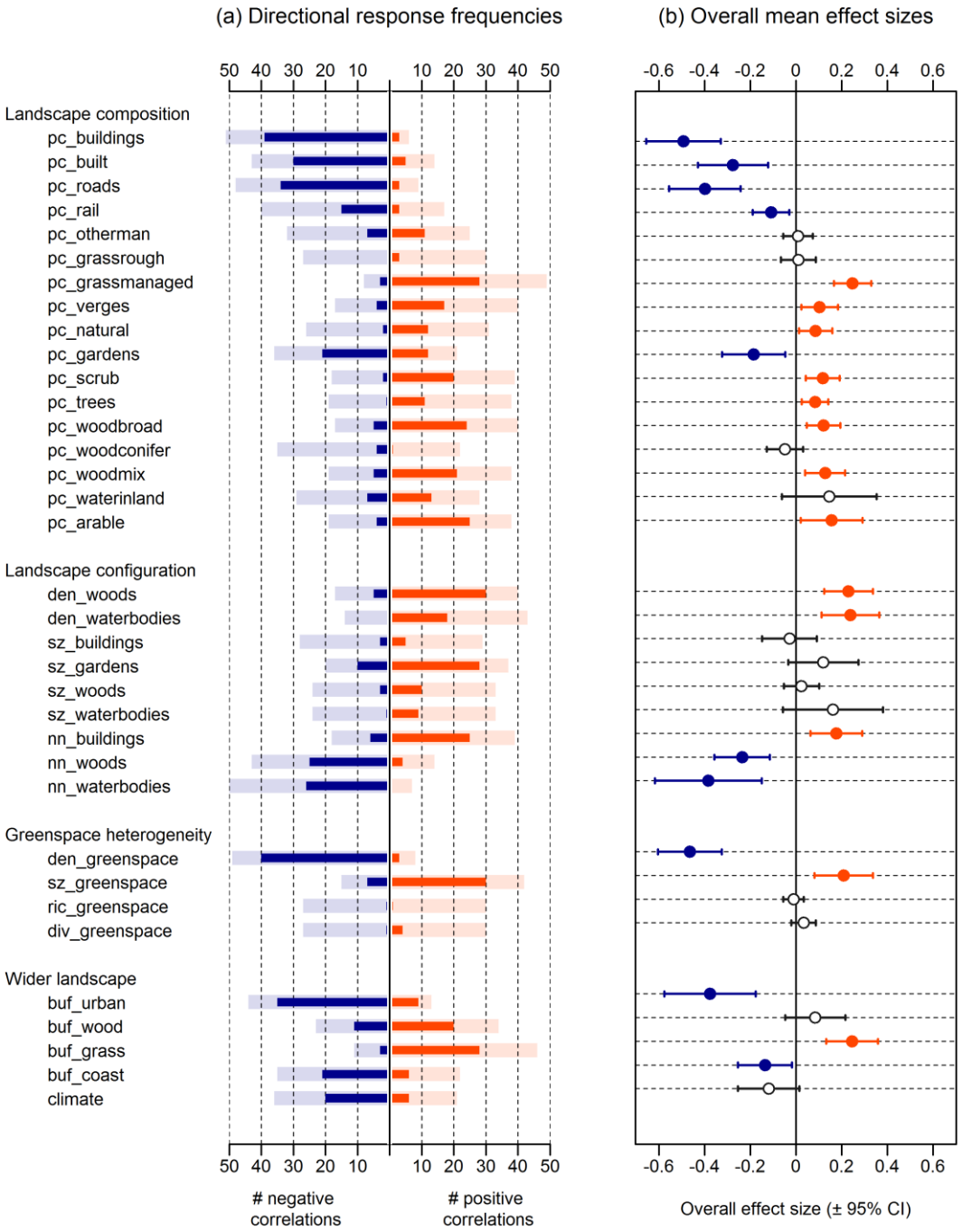
Most **positive** responses =

- Greenspace size
- Woodland density
- Garden size

Most **negative** responses =

- % Building, built and road cover
- Distance between waterbodies and woodlands
- Greenspace density

- Also significant landscape effects: surrounding **urban**, **wood** and **grass**
- All metrics affected at least two species, but patterns were not consistent



URBAN DESIGN FOR BIRDS


Photo © BTO

Key findings

- Habitat composition, configuration and greenspace heterogeneity all important
- Individual species respond differently

↓

Consider sum of individual species (not community indices) to predict biodiversity responses

- Predictive models are strong for common, terrestrial species

↓

Suitable to predict responses to development scenarios

BTO Looking out for birds

BBS

Data = Breeding Bird Survey (BBS)

IN CONCLUSION

- **So far =** quantifying relationships between UK birds and urbanisation
- Analyses of BTO datasets inform about factors driving biodiversity and counts support quantitative predictions at multiple scales
- Objective estimation of *net gain* within developments, under different options
- Informs human wellbeing benefits
- **Future =** more models for the garden scale
- Model approaches can also be applied to bats and butterflies
- Predictive models to support decision-making via an interactive, online tool
- *Co-design with landscape architects?*

BTO
Looking out for birds

THANK YOU TO:

BTO: Kate Plummer, Simon Gillings, Daria Dadam

Data providers: OS, CEH, Met Office

Funders: JNCC, NERC BESS, BTO *Beyond the Maps* appeal

BTO volunteers: The thousands of people who contribute data, making our work possible

Getting in touch…

gavin.siriwardena@bto.org

BTO Looking out for birds

JNCC Joint Nature Conservation Committee

Bird Atlas Beyond the maps

bess biodiversity & ecosystem service sustainability