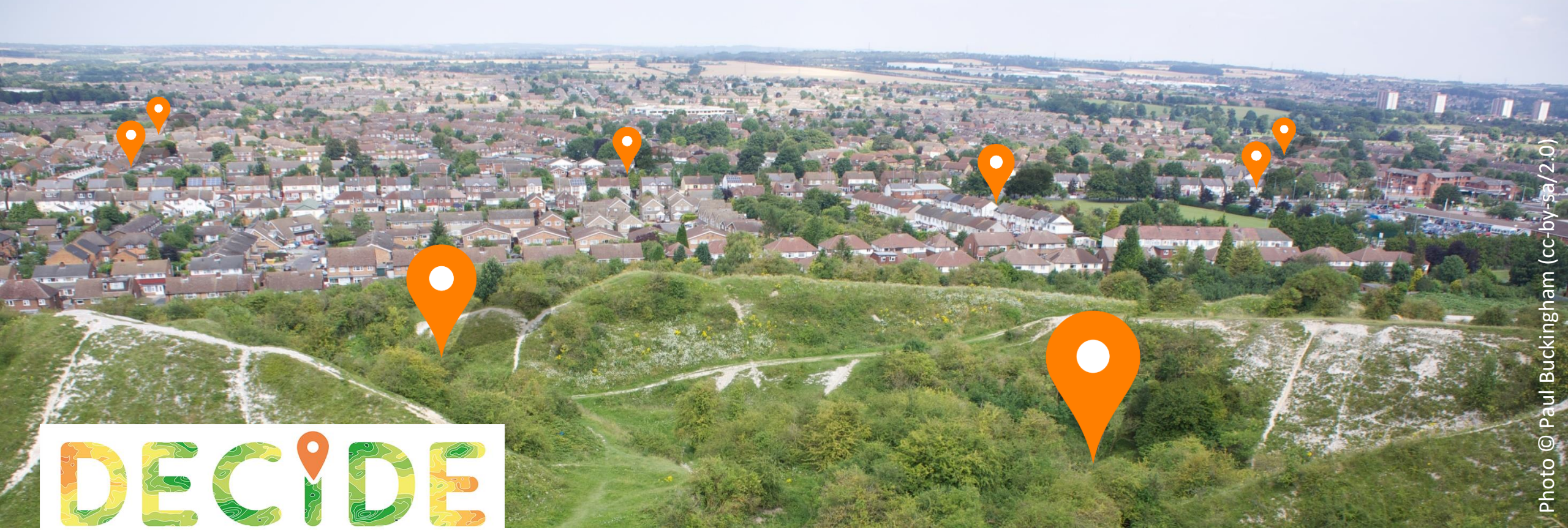


Precision citizen science:
Spatially targeting recording effort through adaptive sampling to improve biodiversity monitoring

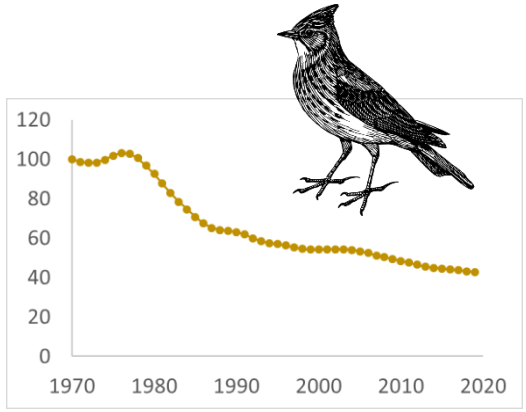
Michael Pocock | @mjopocock

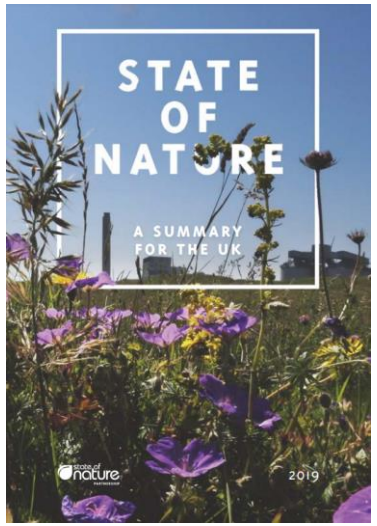
UK Centre for Ecology & Hydrology

Volunteer-collected biodiversity data

1 Assessing the state of nature:

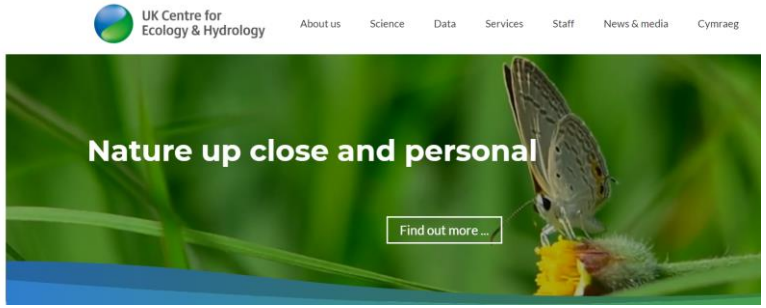
- to evaluate trends, distribution
- to assess impacts of interventions





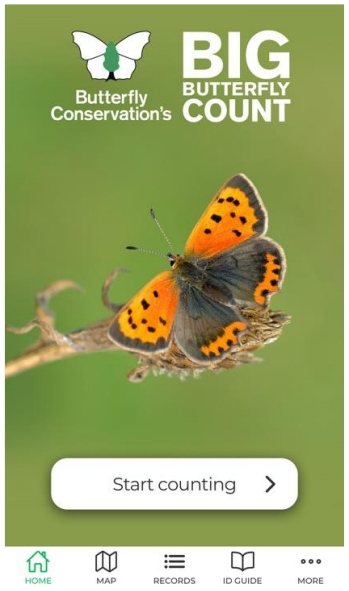
2 Benefiting individuals:

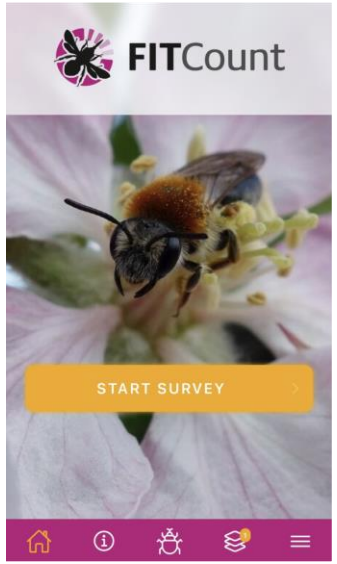
- connecting to nature
- supporting wellbeing



3 Supporting action for nature

How are citizen science data collected?





Structured monitoring

Revisit specific sites
Follow a protocol
Gather data on abundance

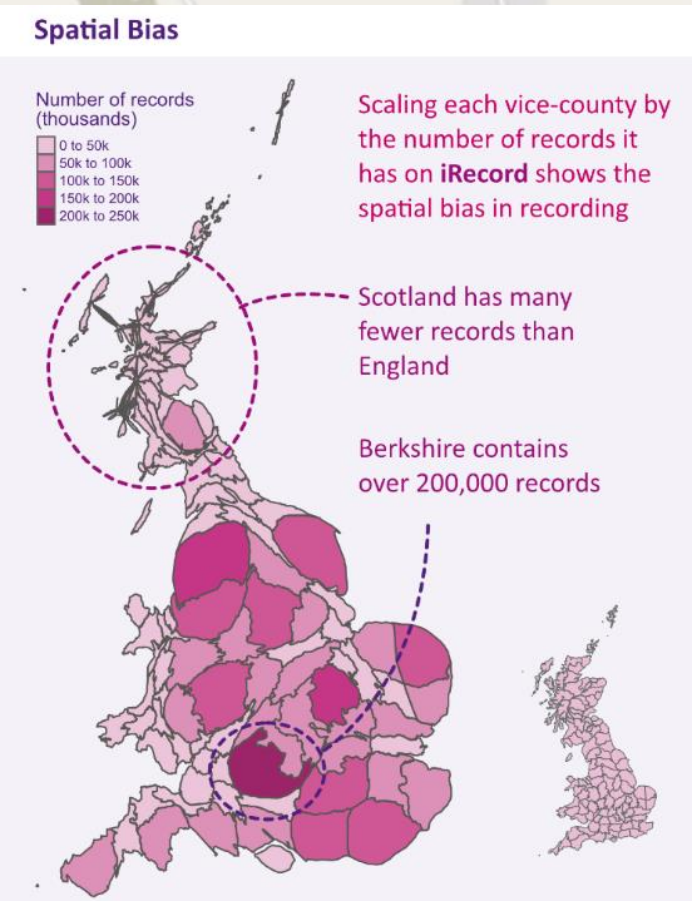
Semi-structured recording

Follow a protocol
Participate where
you want to

Unstructured recording

Record what you want
When you want
Many records gathered

Unstructured recording is spatially uneven



Visual: @tomaugust85

Butterfly records from Chesham, UK

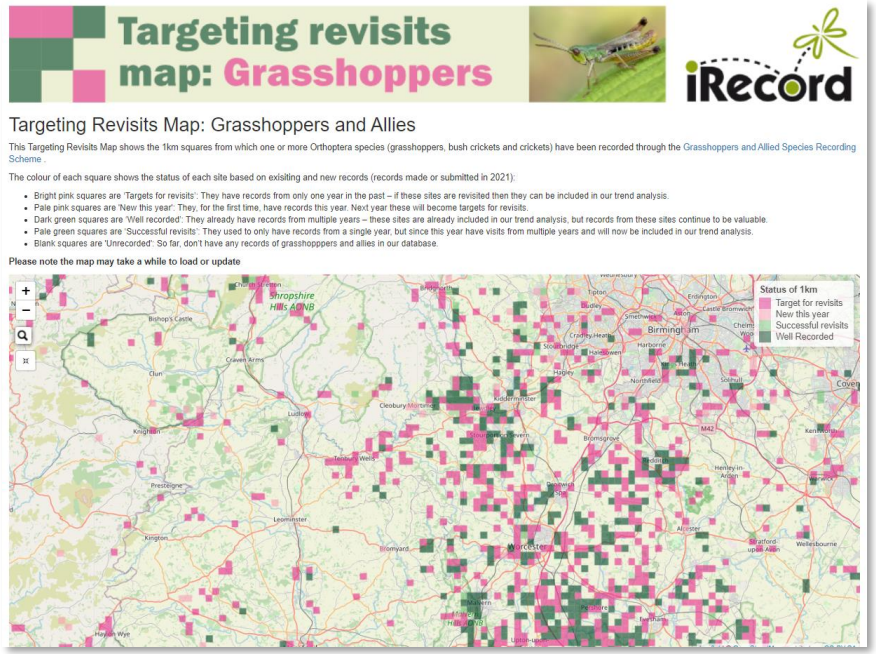
iRecord

All records are valuable, but…

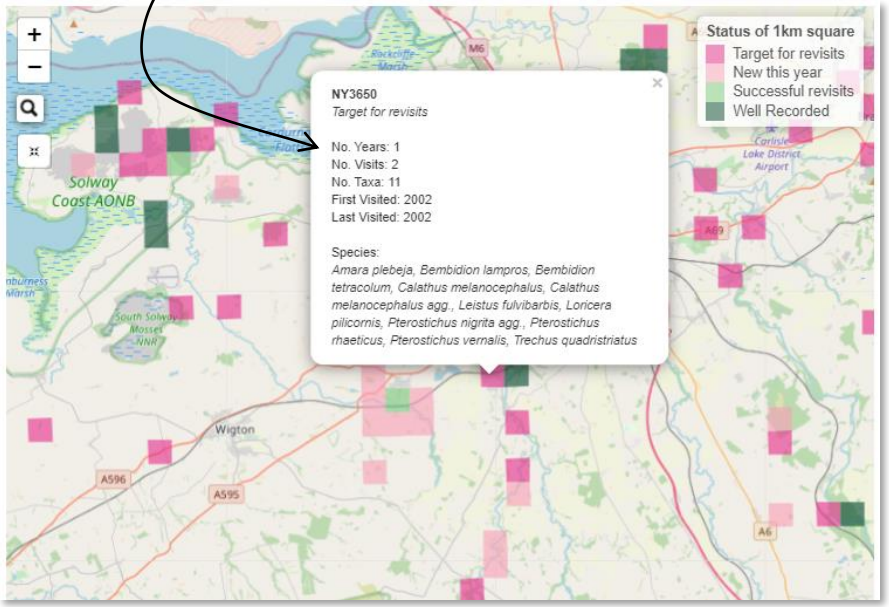
we don’t simply need ***more*** records, we need ***more informative*** records

So, how do you choose where to record?

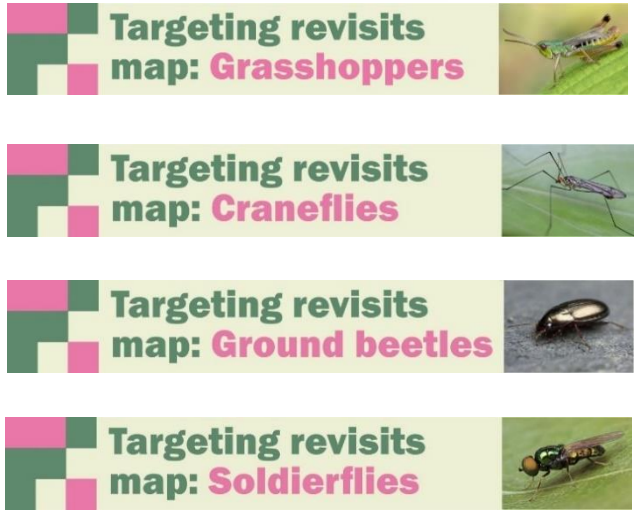
Targeting revisits map



Click on square to get more info
Updated in real time via iRecord



- Can you make the **pink** squares (visited in only 1 year) **green** (visited in more than 1 year)?
- Revisits → Improved data for trend modelling



Visit www.brc.ac.uk for more information

Follow links in tool to give feedback

Thanks to Colin Harrower

The DECIDE Project

Recording nature where it matters

Multidisciplinary team

Funded by NERC

Natural Environment Research Council

UK Centre for Ecology & Hydrology

Ecology, citizen science, statistics & data science

Michael Pocock
Tom August
Susan Jarvis
Thomas Mondain-Monval
Simon Rolph
Rich Burkmar
Katty Baird

University of York

Social science

Alison Dyke
Rachel Pateman
Jennifer Rao-Williams
Sarah West

The Open University

Computer science & citizen science

Advaith Siddharthan
Janice Ansine
Mike Dodds

WARWICK

Visual data science

Greg McInerny
Cagatay Turkay

JNCC

Earth observation

Emma Wright

Butterfly Conservation
Saving butterflies, moths and our environment

GiGL

North & East Yorkshire NEYEDC ecological data centre

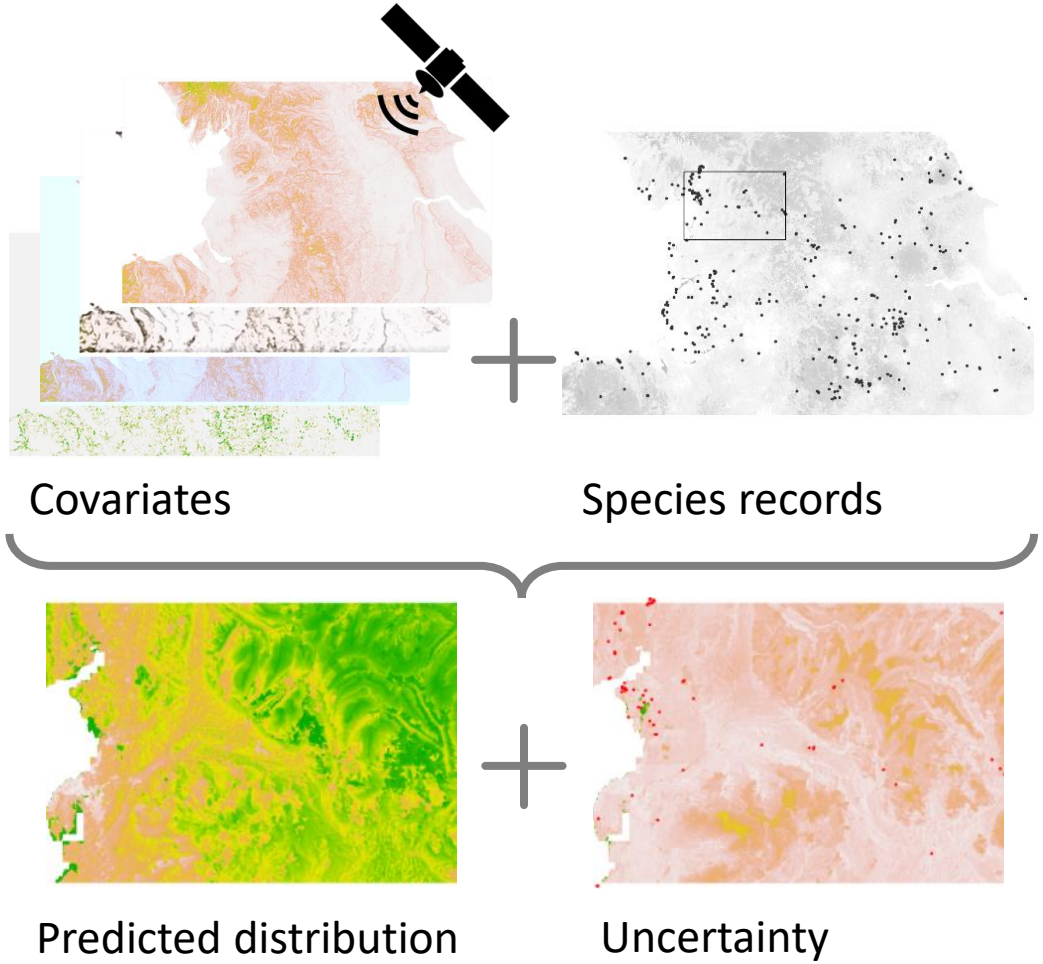
Co-design at the heart

What is the need?

- We have good information on
  - **Large-scale trends** for reporting
  - Using **records for site-level** management
- **Data users:** Lack comprehensive, fine-scale (1 ha) maps of natural capital to inform regional decision-making
- **Recorders:** Lack tools to guide their recording and increase its value for nature

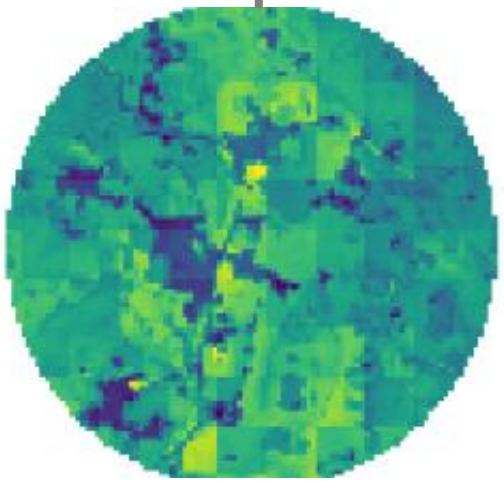
A solution?

Use species distribution models



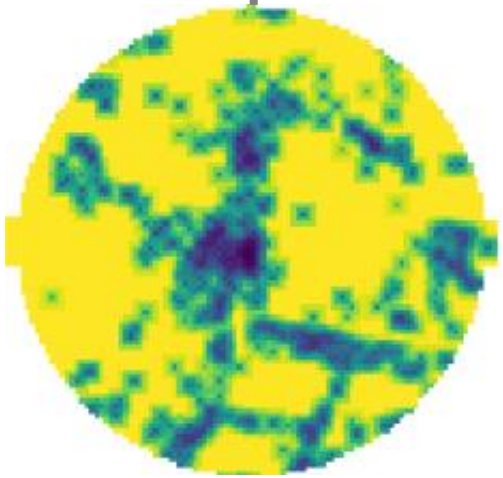
Identify priorities for recording

Where are models of species distribution least confident? (Uncertainty combined across species)



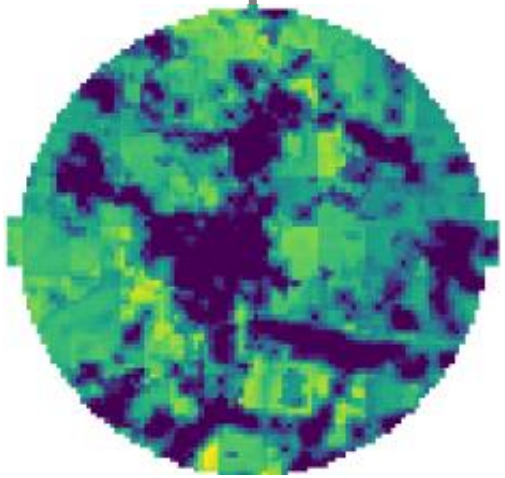
—

Where have observations already been made?



=

Where is it best to collect new observations?



The DECIDE Tool

Colours = 'recording priorities'

Pins = 'suggestions' in accessible places

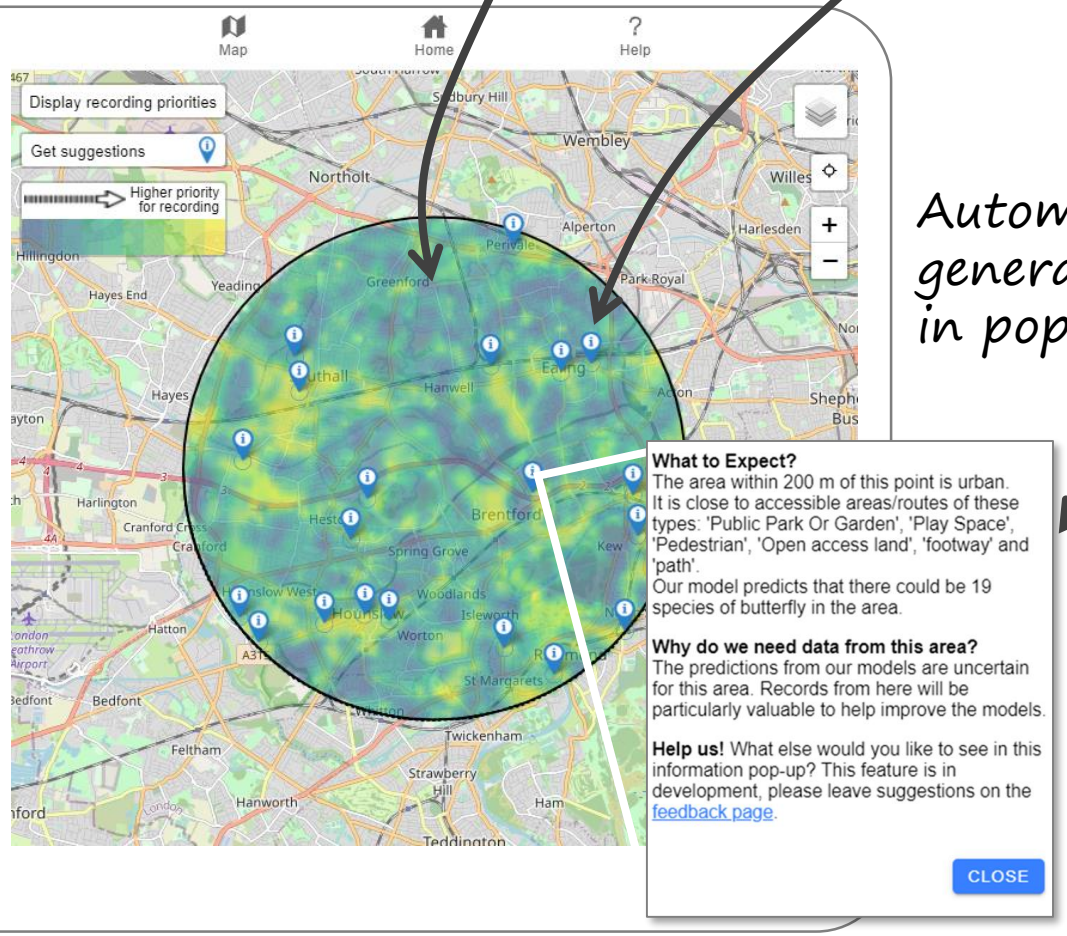
1. Do you want to discover new places to record wildlife?

2. Explore the DECIDE Tool. It shows places with high priority for recording.

3. Choose a location to visit. Record all species seen using existing apps and websites.

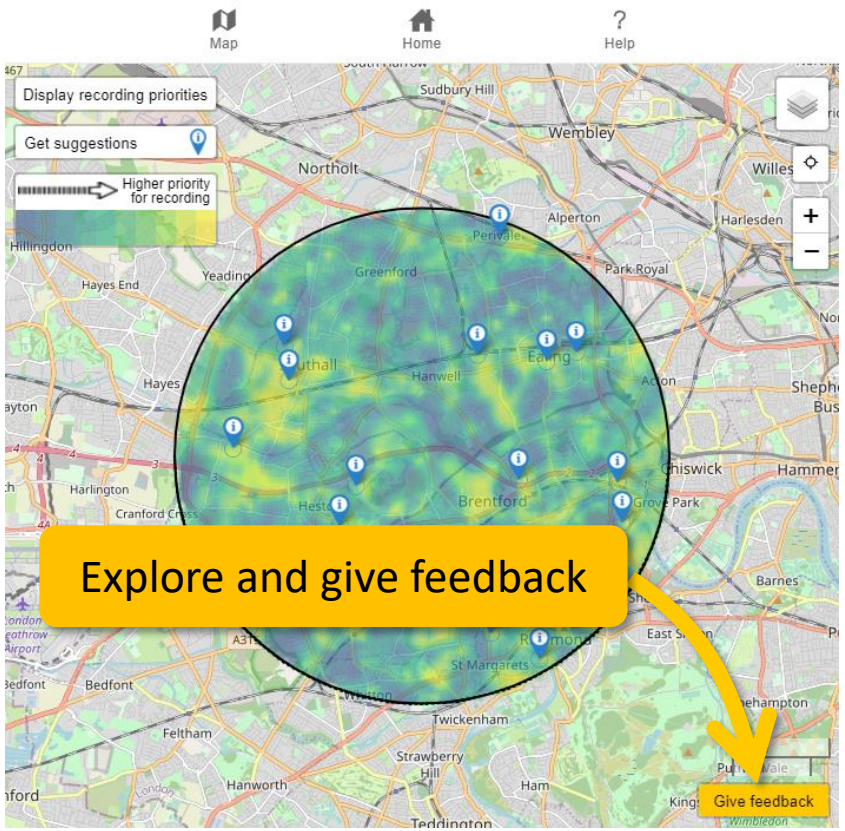
Find out more

Go to map



Automatically generated text in pop outs

Co-design in the DECIDE Tool

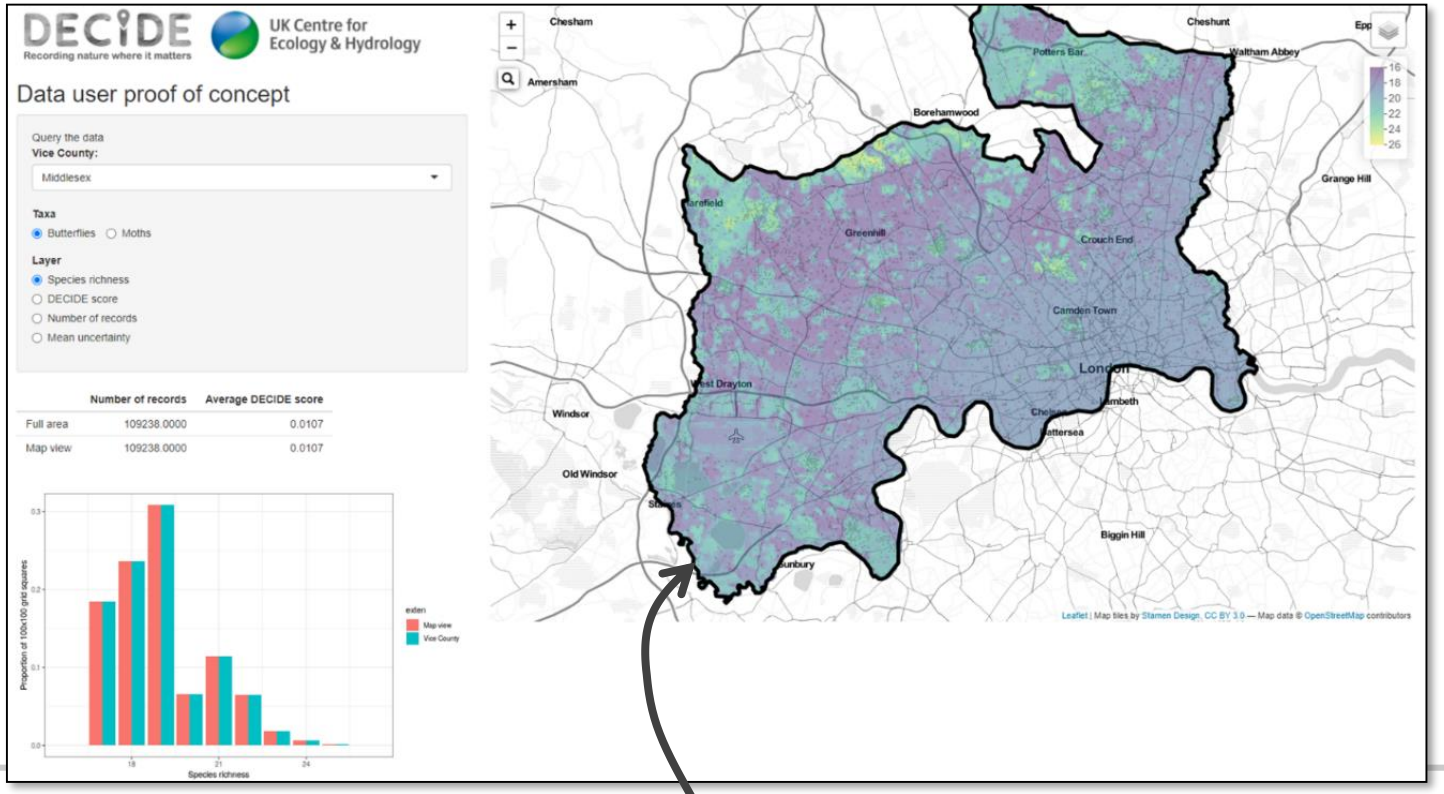


In 2022: Developing feedback to recorders that is more…

- Relevant
- Accessible
- Actionable
- Appealing

Co-design with data users

First proof of concept making layers of modelled information available for decision-makers



Winter 2021/22: Co-design with data users

Interested?
Email me for more information

Maps of modelled butterfly richness

DECIDE

Recording nature where it matters

Michael Pocock | @mjopocock | https://decide.ceh.ac.uk

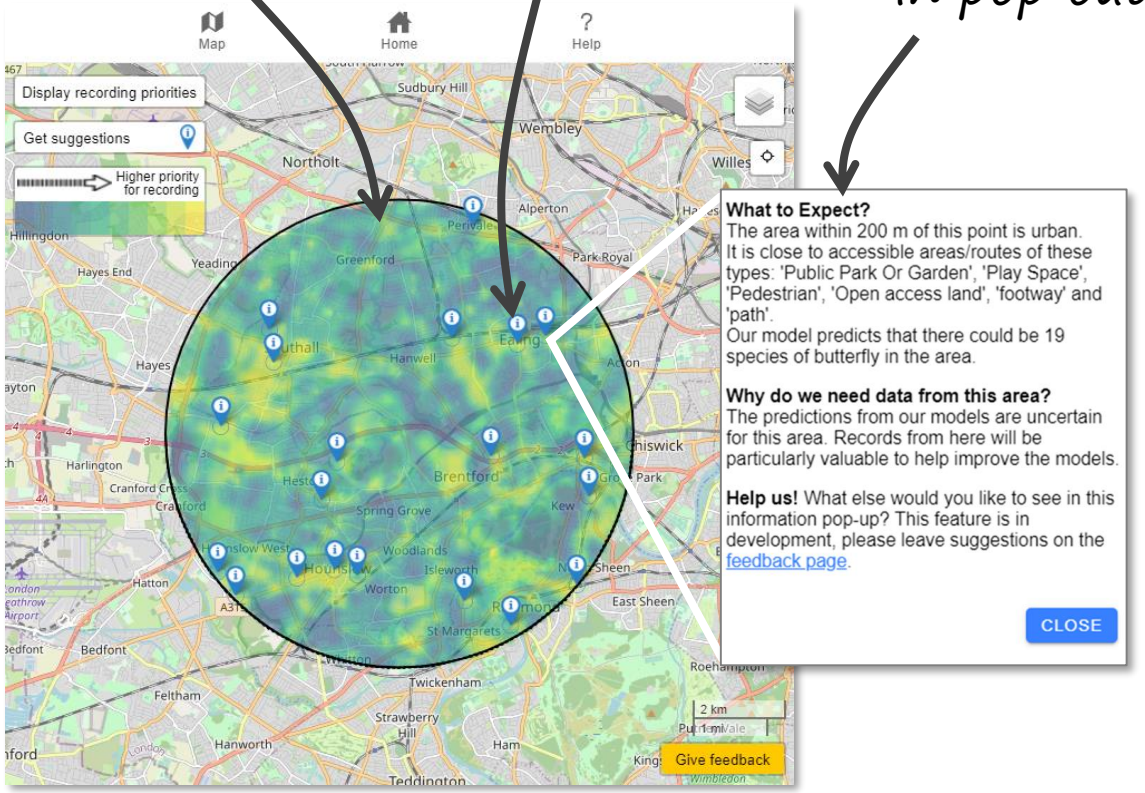
UK Centre for Ecology & Hydrology

For recorders

Colours = 'recording priorities'

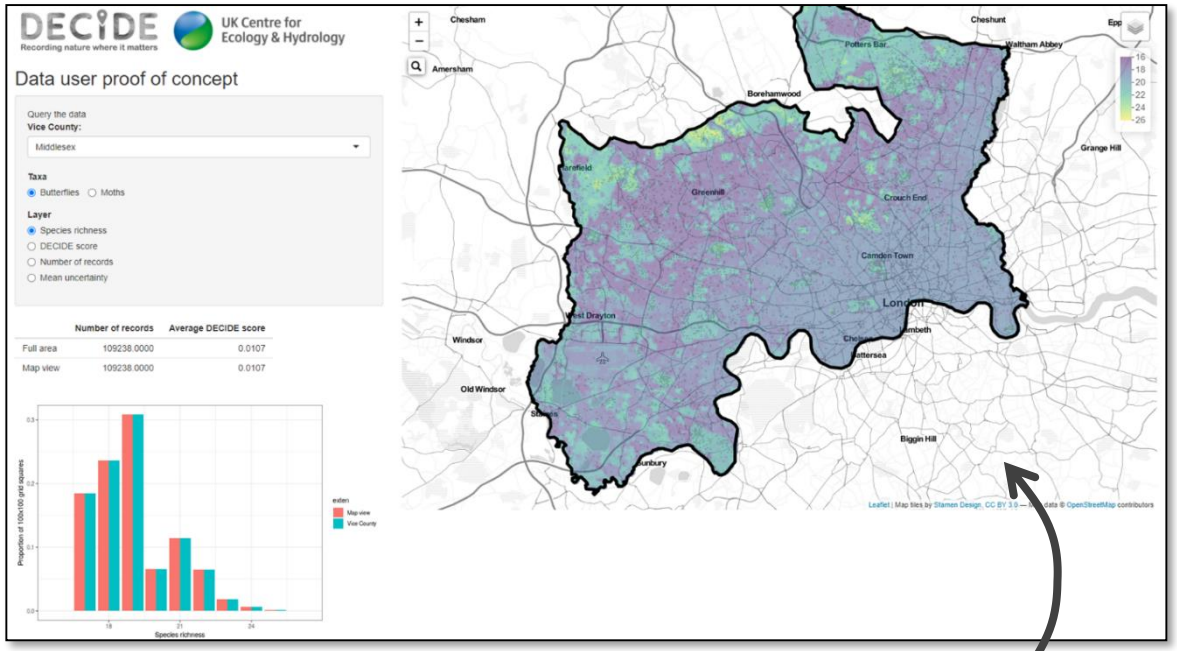
Pins = 'suggestions' based on accessibility

Textual information in pop out



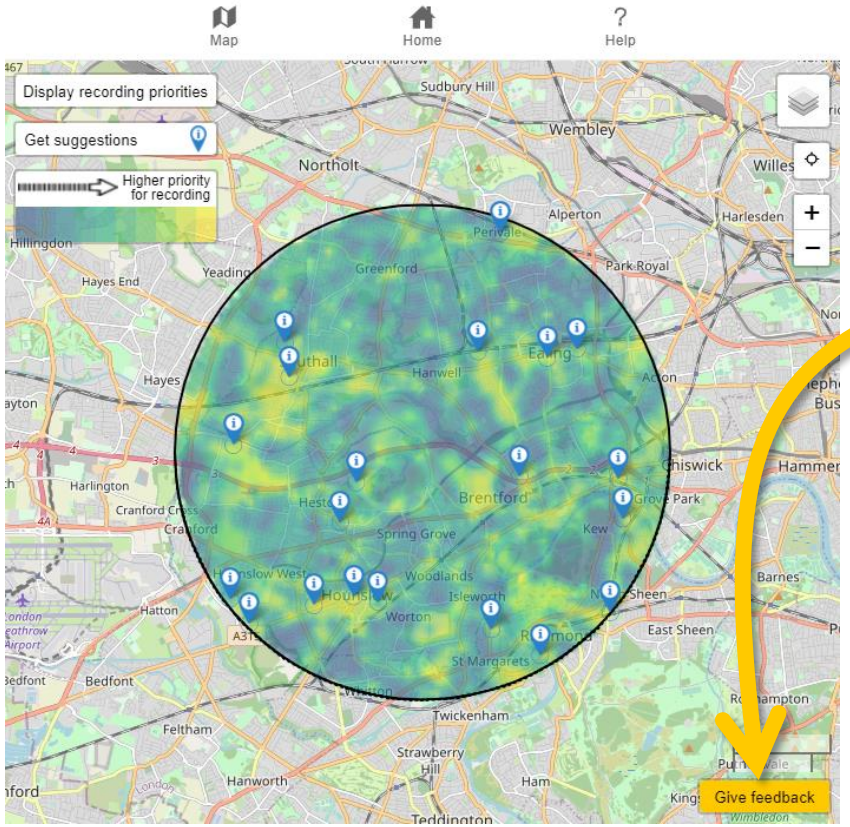
For data users

Co-design with data users in winter 2021/22 – email for more information



First proof of concept making modelled information available for decision-makers

How can you help?

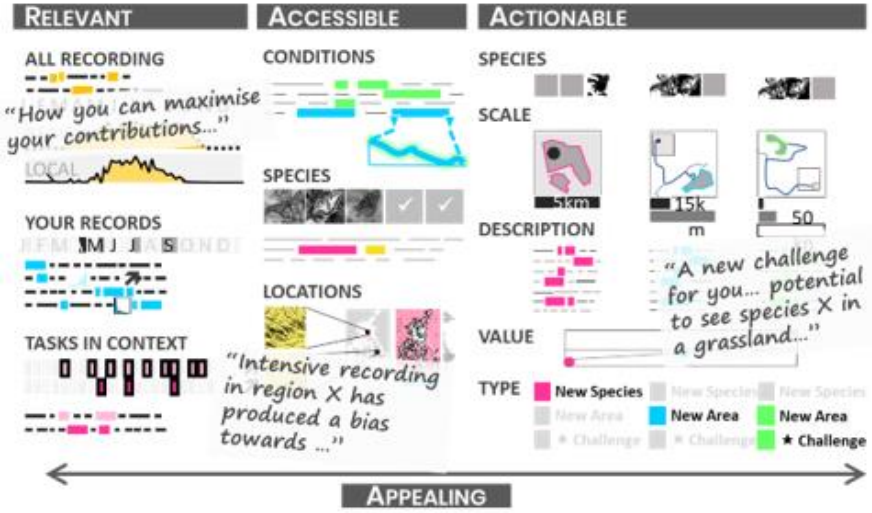


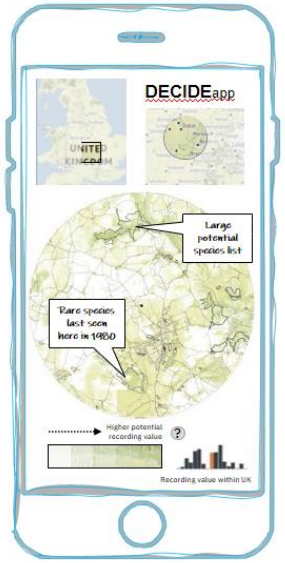
1. Explore the DECIDE Tool https://decide.ceh.ac.uk/
2. Give feedback
3. Join the mailing lists: General List and Co-design List

Next steps

- **Nocturnal moths**
  - Targeted recording with low-cost LED traps

- **Faster and richer feedback**
  - Automated updates via iRecord and iSpot
  - Testing richer feedback to contributors
  - Develop new applications in data-poor regions
  - Statistically model benefit of adaptive sampling





Precision citizen science: Spatially targeting recording effort by volunteers through #adaptivesampling to improve #biodiversitymonitoring #BOUsci21 #Sesh6 1/

#citizenscience is an incredibly valuable approach for #biodiversity #monitoring. All records are valuable… but we don't simply need more records, we need more informative records. This is where @decidenature comes in! 2/

We need better #biodiversity maps for #naturalcapital assessment, so in @decidenature we're using spatial distribution modelling #SDMs to identify where models have greatest uncertainty. 3/

.@decidenature is currently for butterflies and moths. (Not birds. Sorry!) But the concept of #adaptivesampling and #citizenscience is ideal for #ornithology too! Especially in data-poor areas. 4/

And we are designing a tool for nature recorders #citizenscientists so they can see locations that have the highest priorities for recording

Are you are recorder? Explore the tool showing locations with highest priority for recording https://decide.ceh.ac.uk/. Also join the mailing lists and please give us your feedback! #codesign 5/

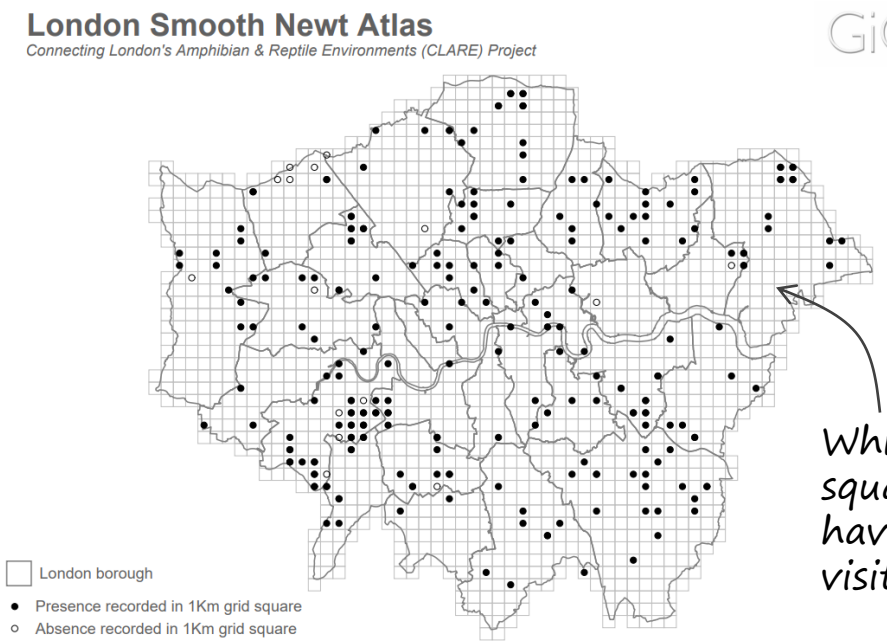
Are you a user of biodiversity data? Get in touch to help co-design a tool to meet your needs for spatial biodiversity info and natural capital data 6/

We think this is a really valuable approach that supports and adds to existing #citizenscience approaches. What do you think? 7/

Thanks to the awesome, interdisciplinary team @UK_CEH @TomAugust85 @RachelP_SEI @AlisonDyke_SEI @susanjarvis501 @TMondain @simon_rolph @kattyponder @burkmarr @SarahWest_SEI @isEmmaWright @iSpotnature @iRecordWildlife @RichardFoxBC @Moth_Lady @cagatay_turkay @GregMcI @JaniceAnsine

Not just more, but more informative

- Raw data and dot maps are great, e.g. for well-recorded sites and proving presence but…
  - They are incomplete
  - They are not fine scale



Which 1km squares have been visited?

There is much habitat variation in each 1km square

Not just more, but more informative

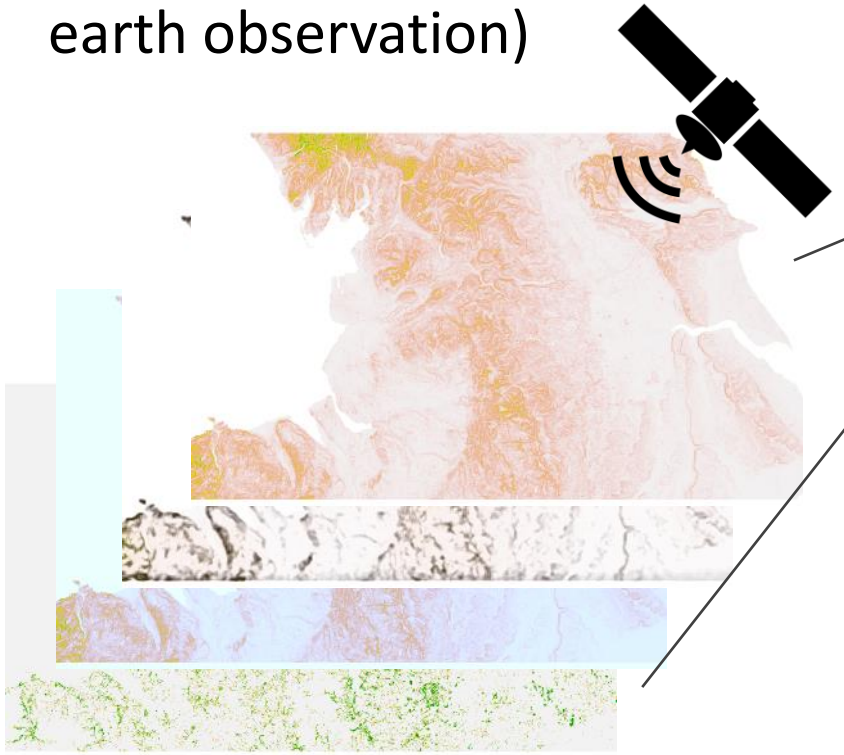
- Raw data and dot maps are great, e.g. for well-recorded sites and proving presence but…
  - They are incomplete
  - They are not fine scale

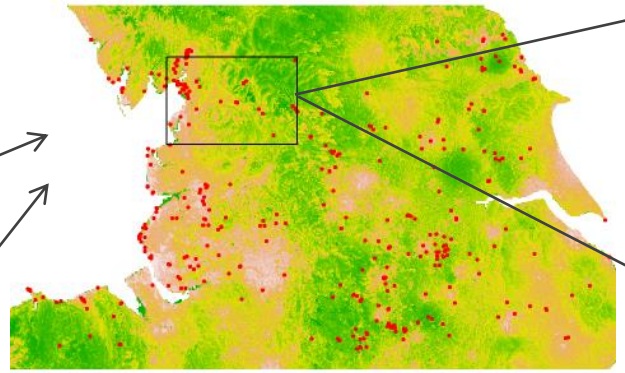
- For decision-making, people also need information that is comprehensive & finer-scale (covering all 25 million ha in UK)
- For example:
  - For strategic spatial planning
  - For screening for environmental impact
  - For natural capital assessment
  - To target biodiversity surveys

Solution: Use modelled outputs (not raw data) for this purpose
Ask recorders to record where we need records to improve models

Modelling distributions

Take lots of different variables (climate, habitat, earth observation)

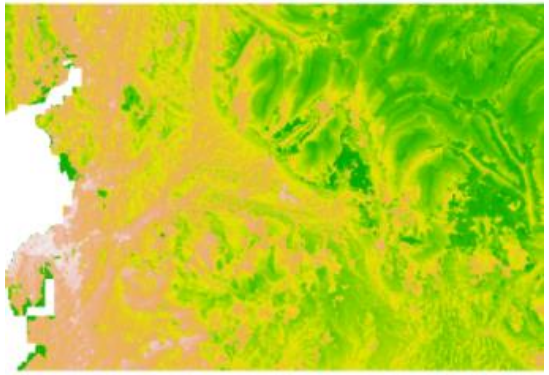




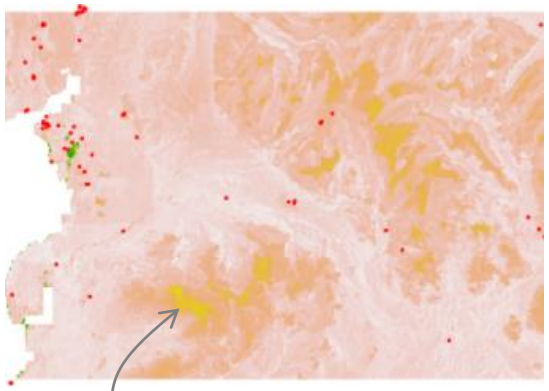
Combine with raw data
→ Predicted distribution

Do this for many different species

Predicted distribution

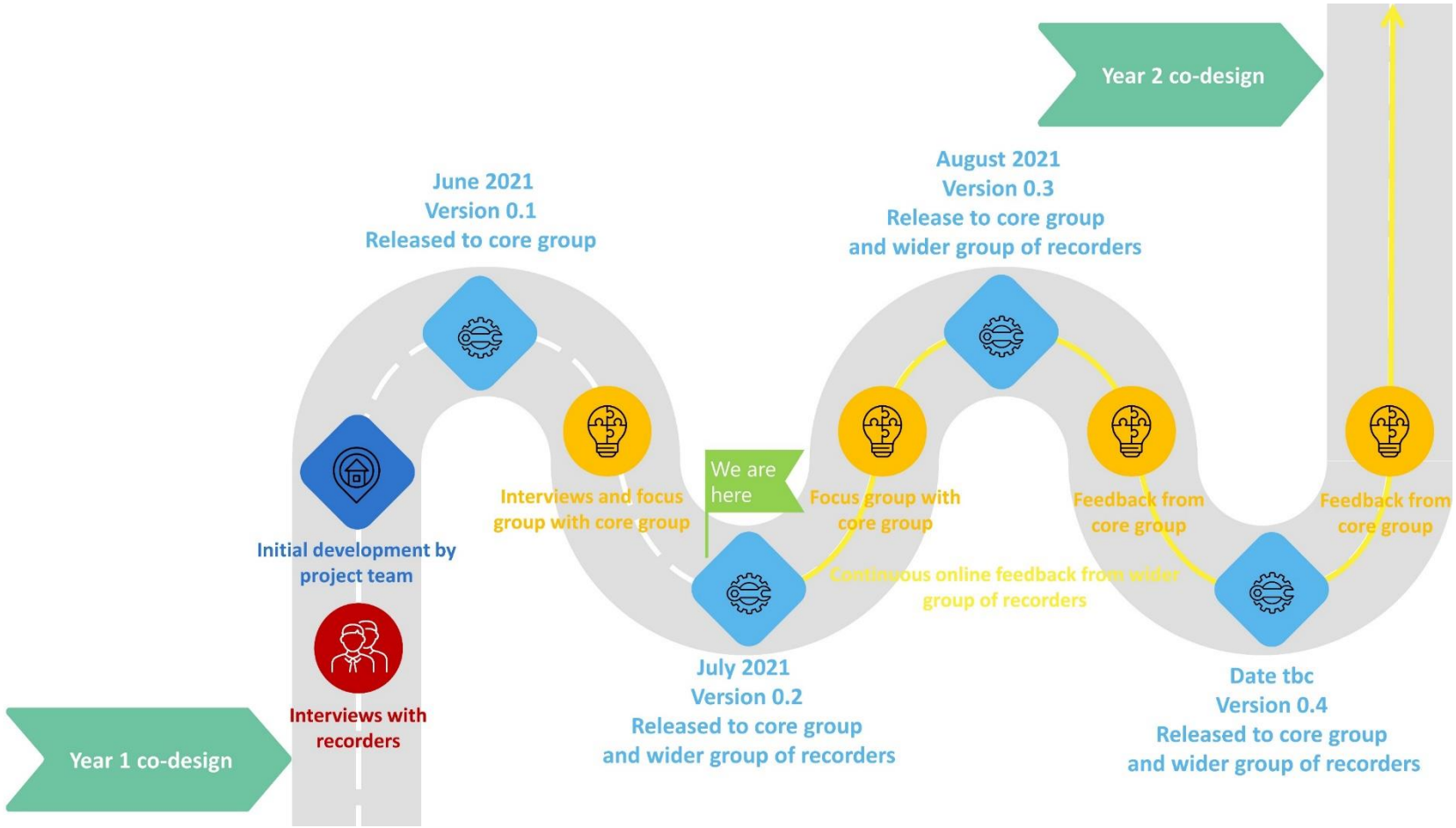


Uncertainty



More uncertainty = more records can help to improve models

Co-design with recorders



1. Interviews
2. Focus groups
3. Feedback

→ informs our design and priorities

In year 1 we focussed on butterflies and day-flying moths

The DECIDE Tool

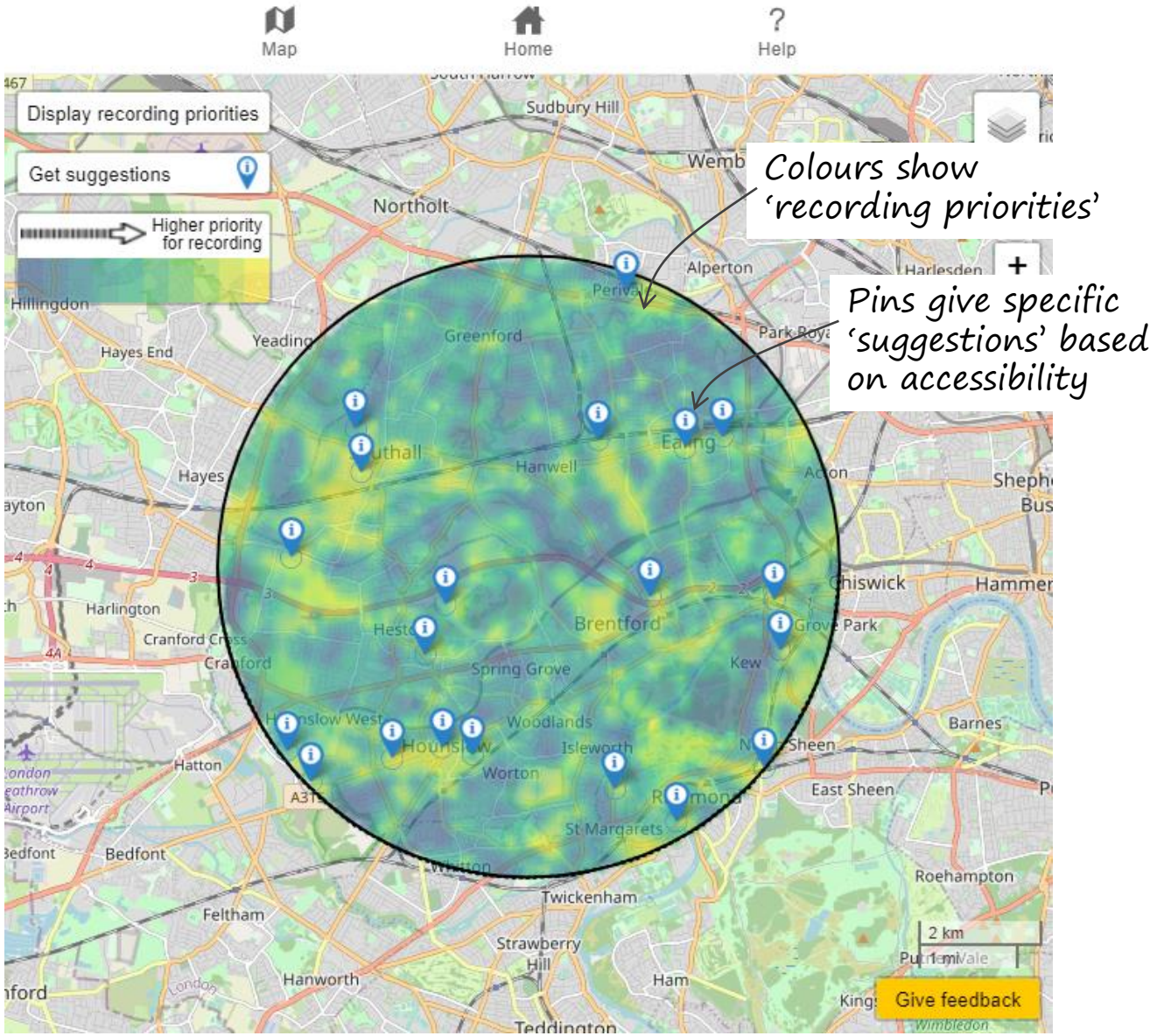
1. Do you want to discover new places to record wildlife?

2. Explore the DECIDE Tool. It shows places with high priority for recording.

3. Choose a location to visit. Record using existing apps and websites.

Find out more

Go to map



https://decide.ceh.ac.uk/

UK Centre for Ecology & Hydrology

DECIDE Recording nature where it matters

The DECIDE Tool

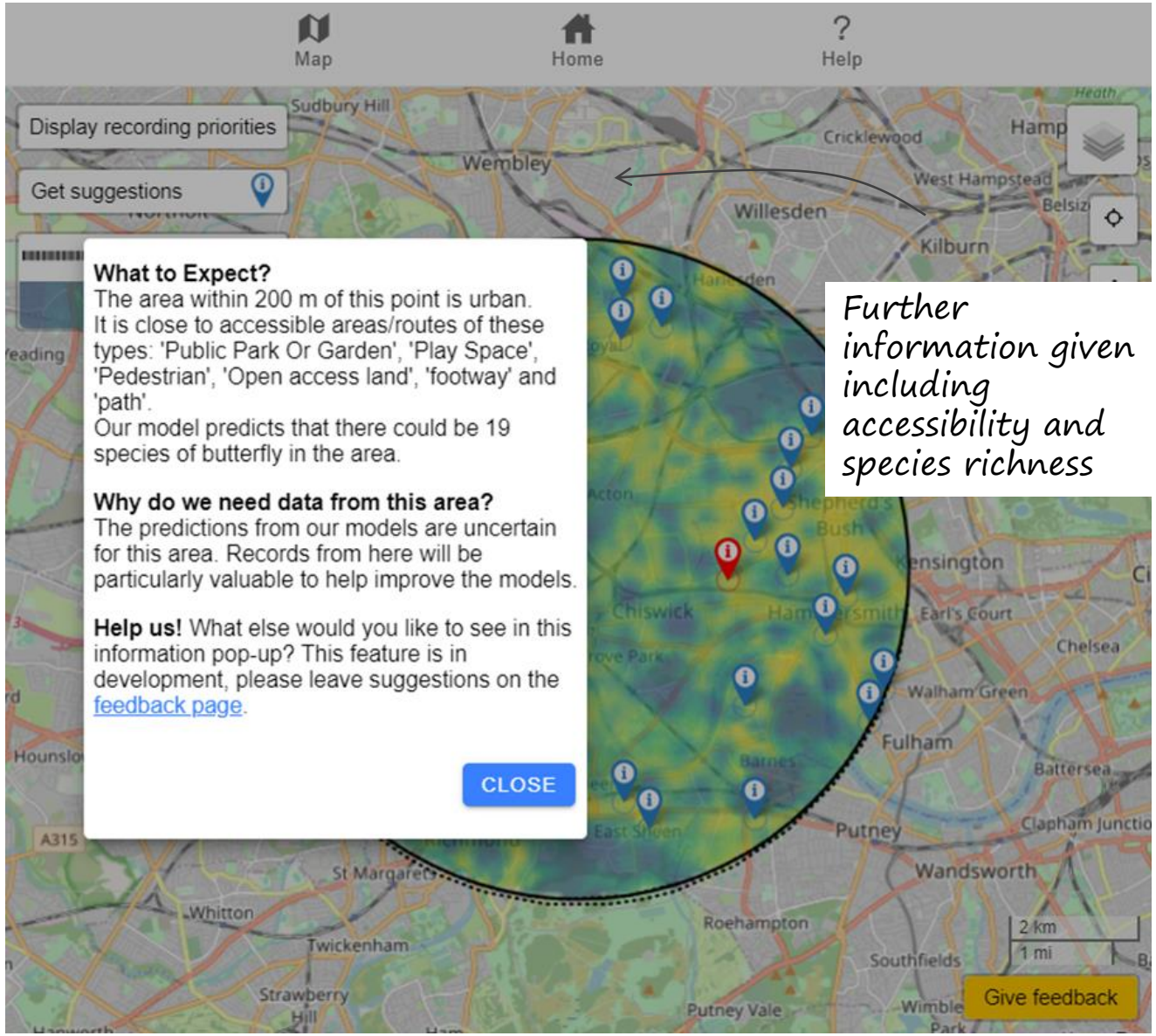
1. Do you want to discover new places to record wildlife?

2. Explore the DECIDE Tool. It shows places with high priority for recording.

3. Choose a location to visit. Record using existing apps and websites.

Find out more

Go to map



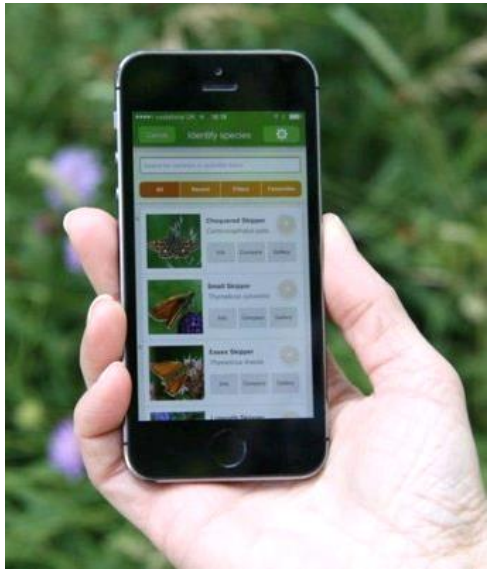
UK Centre for Ecology & Hydrology

https://decide.ceh.ac.uk/

DECIDE
Recording nature where it matters

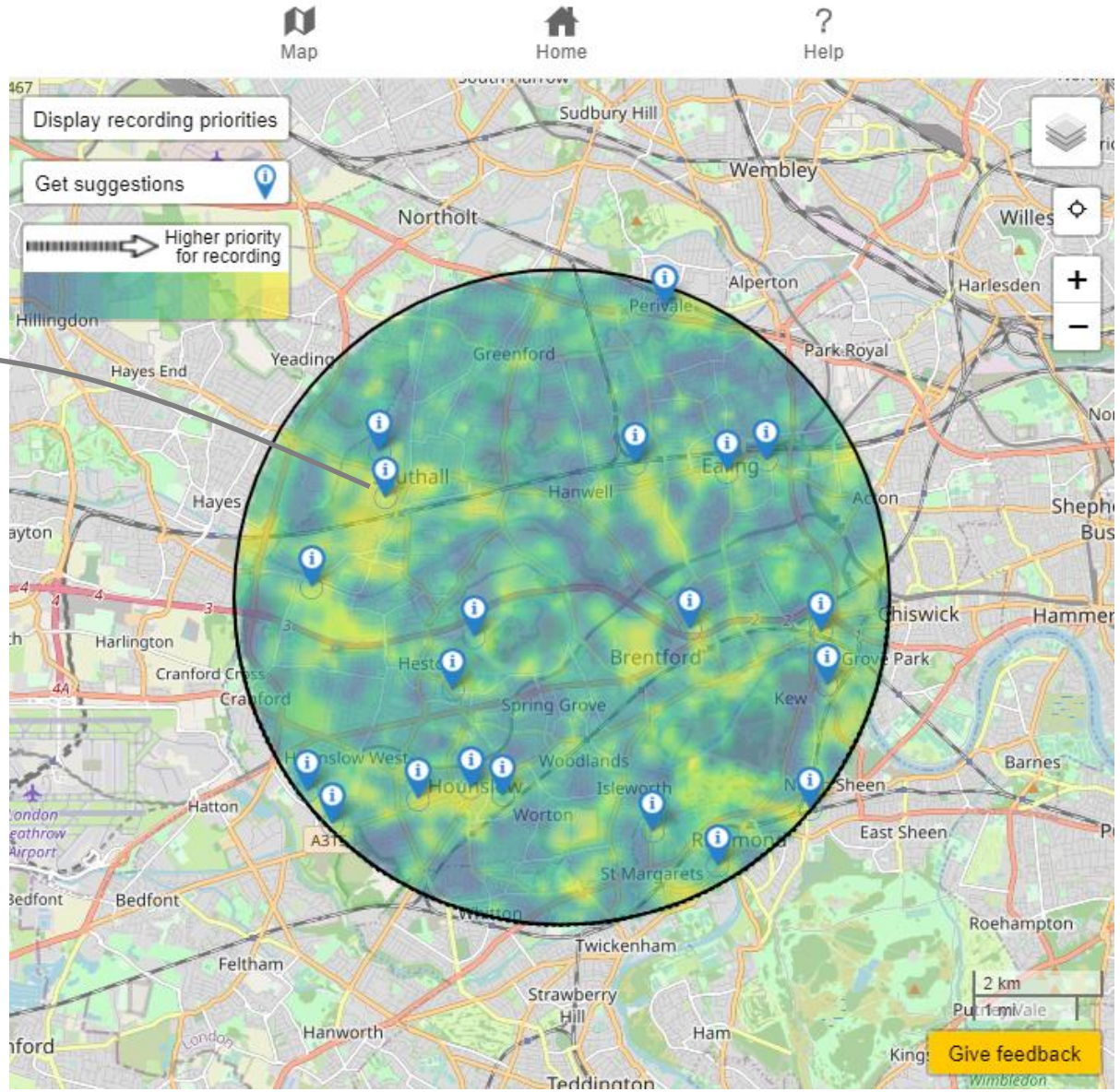
The DECIDE Tool

Record at your selected location using your usual tools



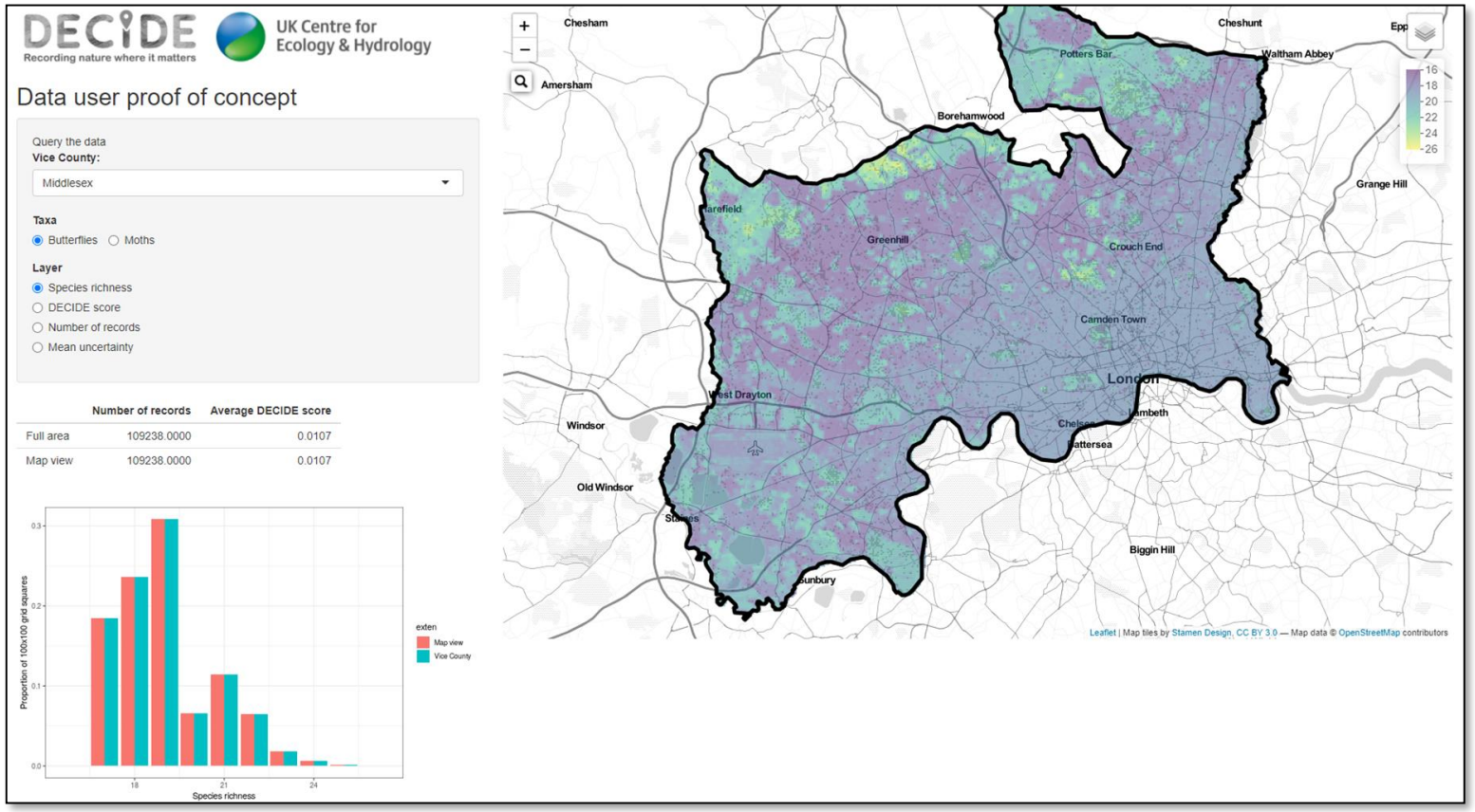
iRecord iSpot ispotnature.org

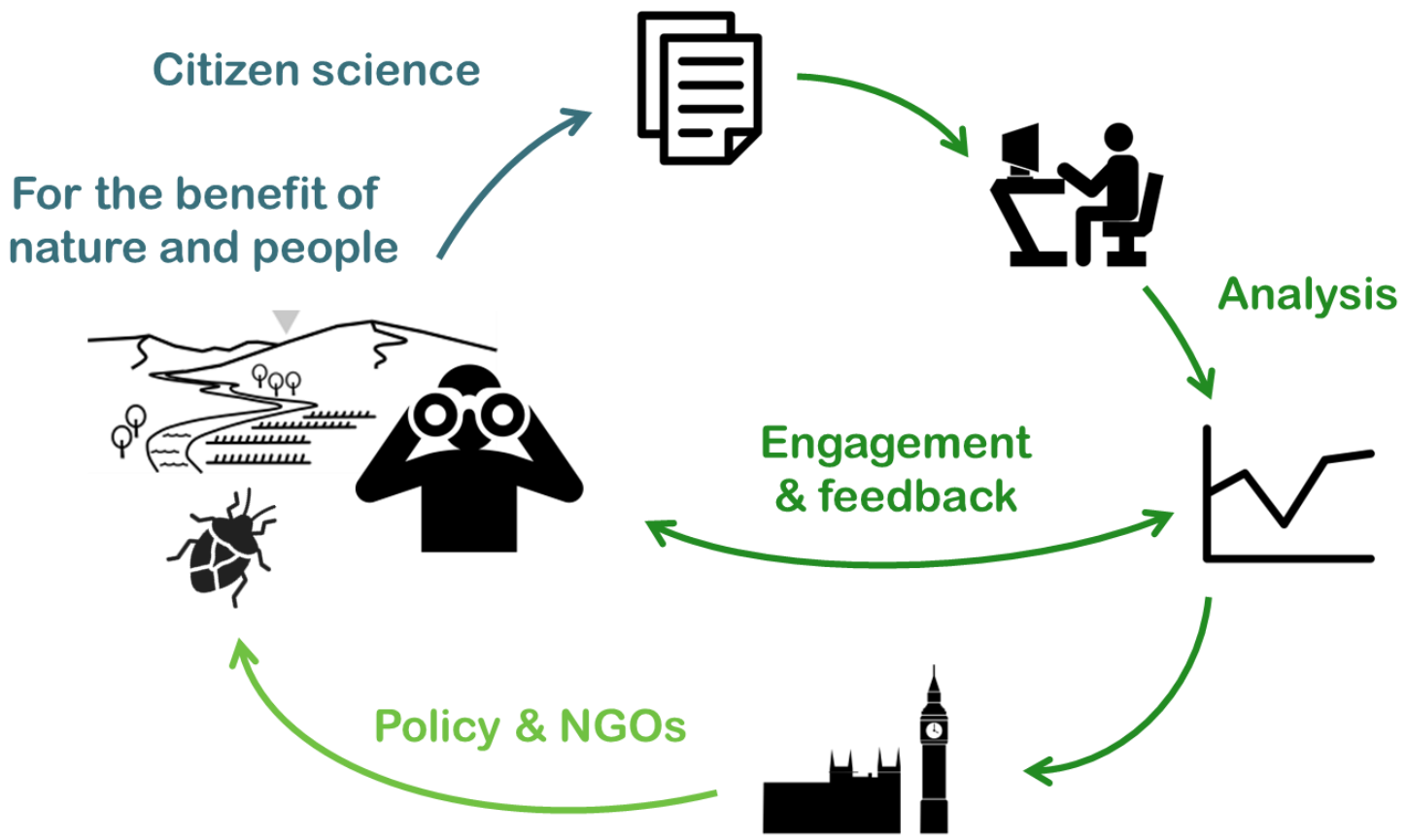
Ideally record <u>all</u> species that you see



For decision-makers

- Develop a tool for decision-makers to access comprehensive biodiversity information from our models
- Similar process of co-design





- Purposeful
- Inclusive
- Actionable
- Localised
- Personalised
- Precision