

# QUANTIFYING NECTAR RESOURCES FROM THE FLOWER TO THE NATIONAL SCALE

Professor Jane Memmott, University of Bristol



# Outline of talk

- Who did the work
- Background
- The 3 questions
- How we did it and what we found
- Practical applications
- Summary





**Dr Mathilde Baude**



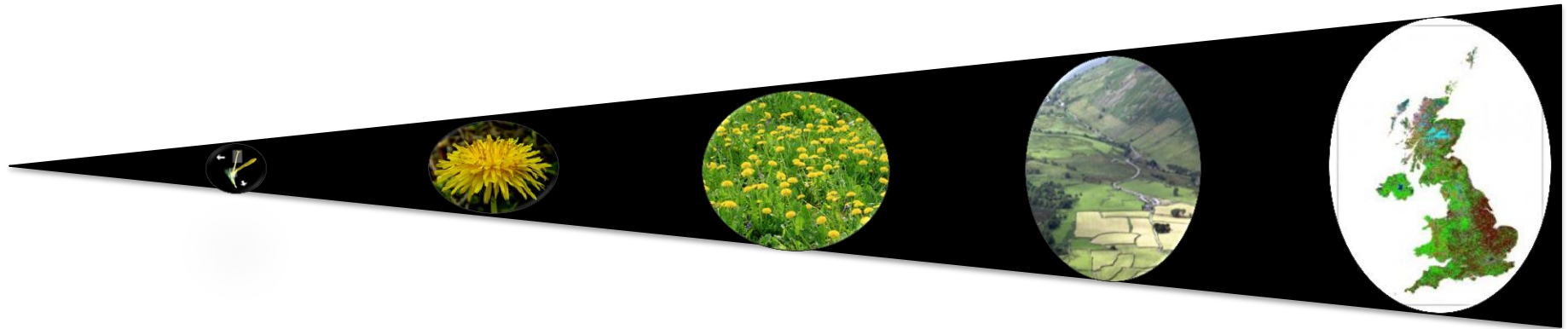
**Nancy Davies**



**Yves Darot**

# BACKGROUND

- Nectar and pollen are the main floral resources for pollinators.
- Lack of food is believed to be one of the major causes of pollinator decline in Great Britain.
- Currently – don't know the food value of different flower species to pollinators.
- Plant lists of plants good for pollinators – but not evidence based
- OUR AIM – to calculate the value of flowers to pollinators in GB, doing this at multiple scales



**1: FLOWER**

**2: FLOWER UNIT**

**3: VEGETATIVE**

**4: HABITAT**

**5: NATIONAL**

# USE THE DATA TO ANSWER 3 QUESTIONS

**QUESTION 1.** Which plant species provide the best floral resources for pollinators?

**QUESTION 2.** Which habitats are the best for pollinators?

**QUESTION 3.** Which species & habitats contribute the most at the national scale ?



# METHODS



**1: FLOWER**

**2: FLOWER UNIT**

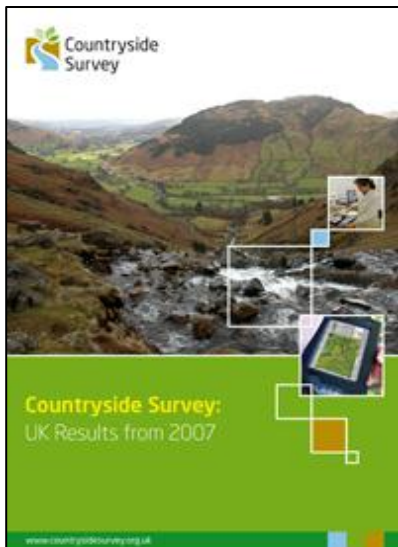
**3: VEGETATIVE**

**4: HABITAT**

**5: NATIONAL**

# STAGE 1: NECTAR AND POLLEN PER FLOWER

- 3842 plant species are found in the UK (2 year project!)
- The Countryside Survey
- Data on 2668 1km<sup>2</sup> plots in England, Scotland & Wales: 1978, 1990, 2000 & 2007



- 450 plant species cover 99% of UK landscape



- More than half of the 450 plants are not rewarding to pollinators so can be ignored
- Target – to sample the 220 common flowering plant species in the UK
- Along with 101 species which are likely to be locally important

# Top five most common plants in England, Scotland & Wales



Heather  
*Calluna vulgaris*



Bramble  
*Rubus fruticosus*



White clover  
*Trifolium repens*



Creeping buttercup  
*Ranunculus repens*



Bilberry  
*Vaccinium myrtillus*

# STAGE 1: NECTAR AND POLLEN PER FLOWER

- Find field sites where the targeted plant species grow



- 2 populations for each species sampled, 2011 & 2012

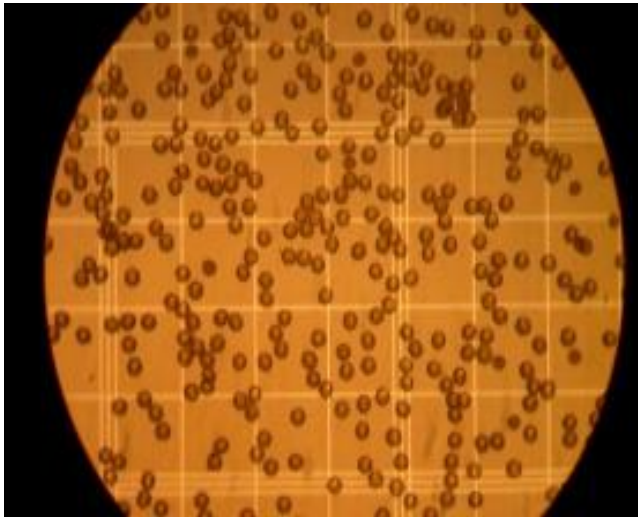


# STAGE 1: NECTAR AND POLLEN PER FLOWER



## NECTAR

- Bagged plant for 24 hrs (no pollinators)
- Collected nectar using micro-capillary tubes
- Volume & sugar concentration were measured per flower



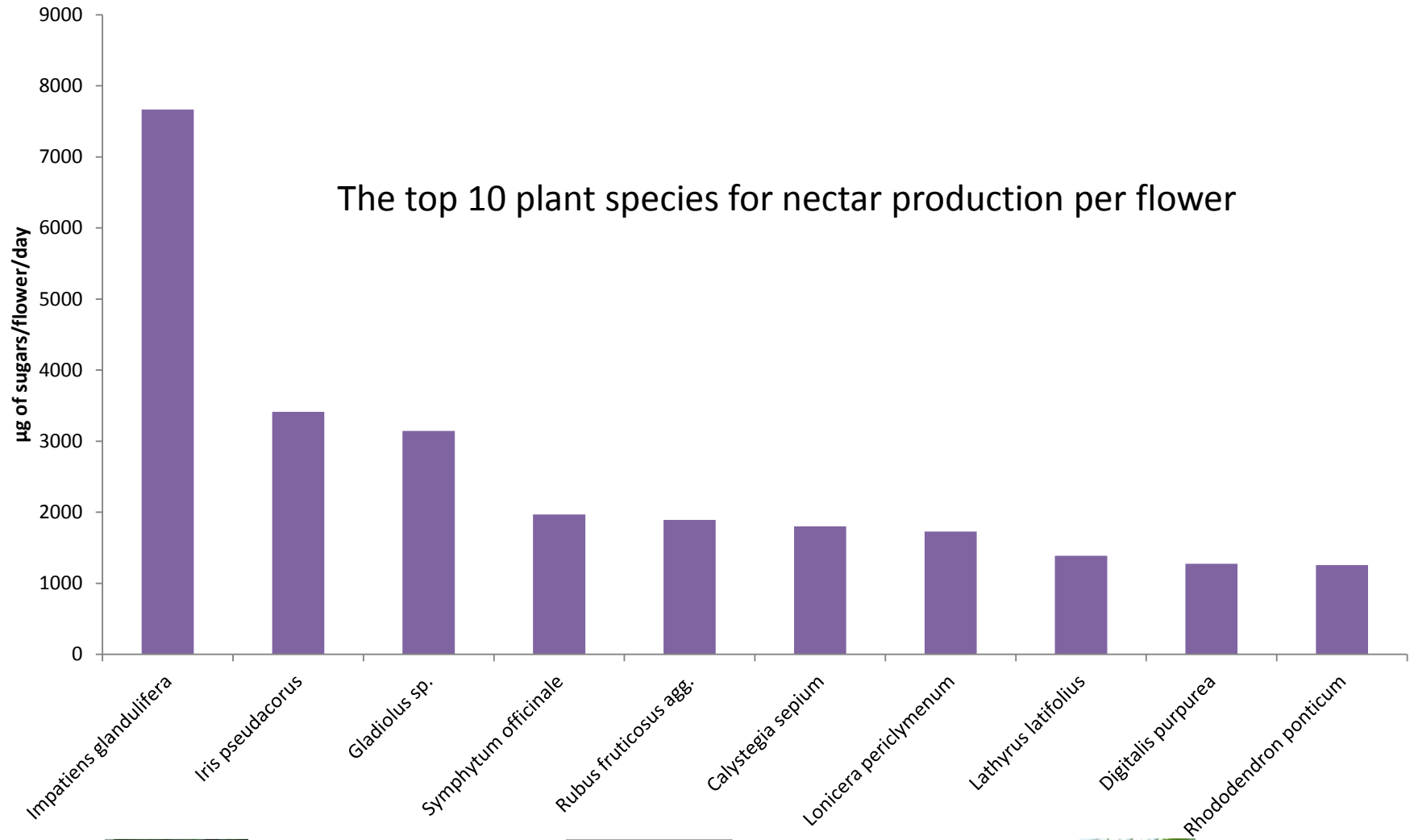
## POLLEN

- Collected unopened stamens and extracted the pollen
- Counted (!!!) & measured

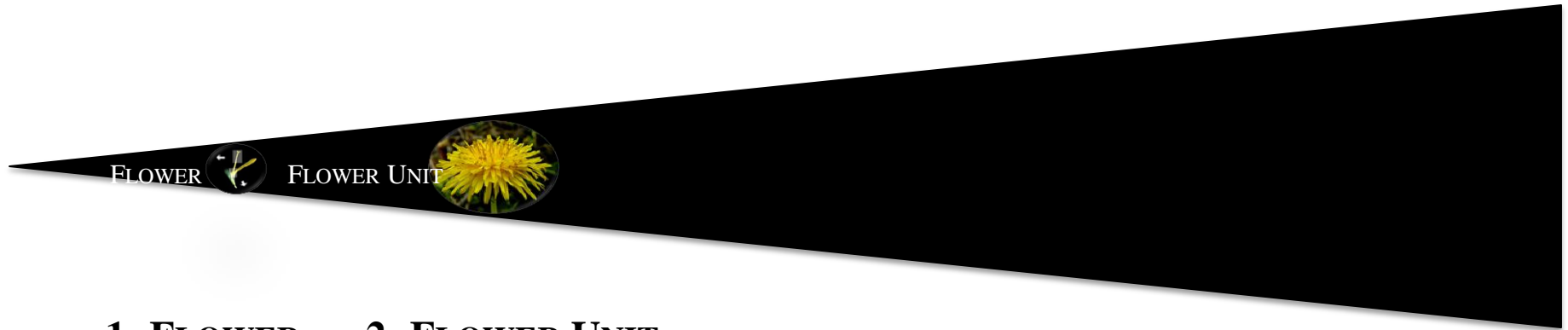


175 species were measured in the field,  
remainder had their nectar levels  
statistically predicted.

# STAGE 1: NECTAR PER FLOWER



# STAGE 2: NUMBER OF FLOWERS PER FLORAL UNIT

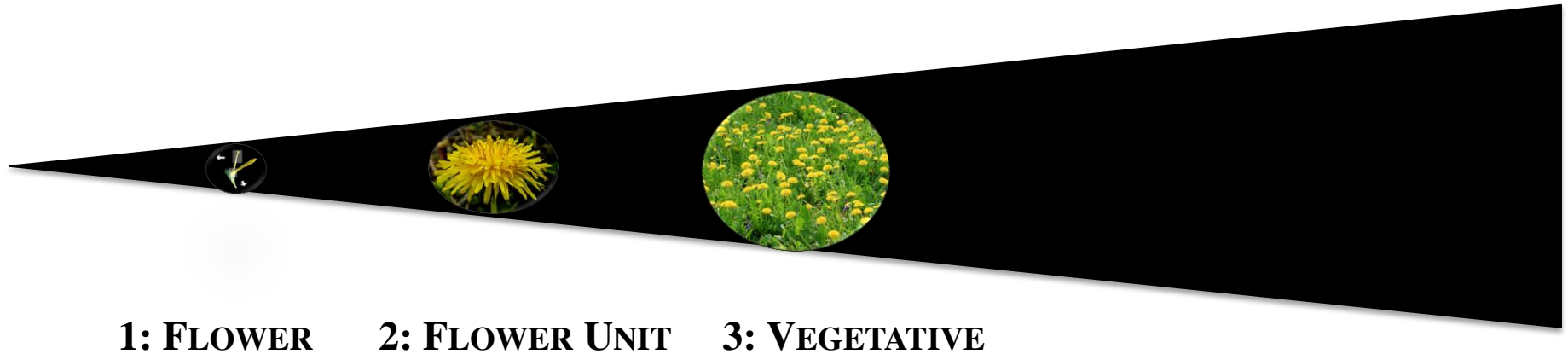


**1: FLOWER**      **2: FLOWER UNIT**

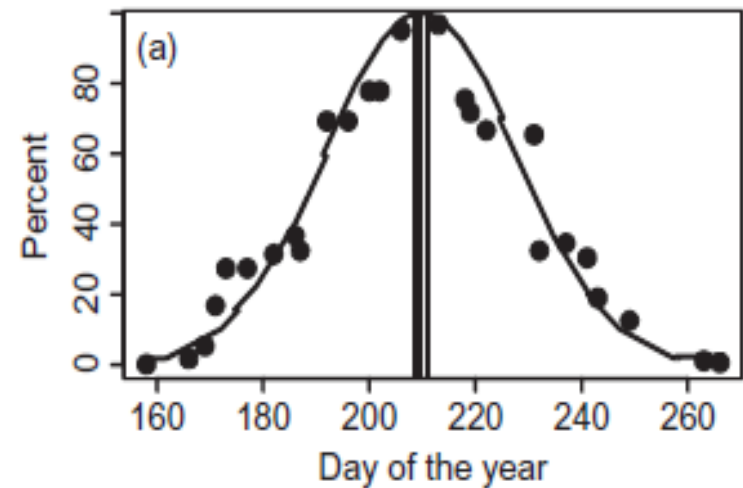


Nectar at the level of the flower, multiply up number of flowers per floral unit

# STAGE 3: NECATAR RESOURCES PER VEGETATIVE UNIT



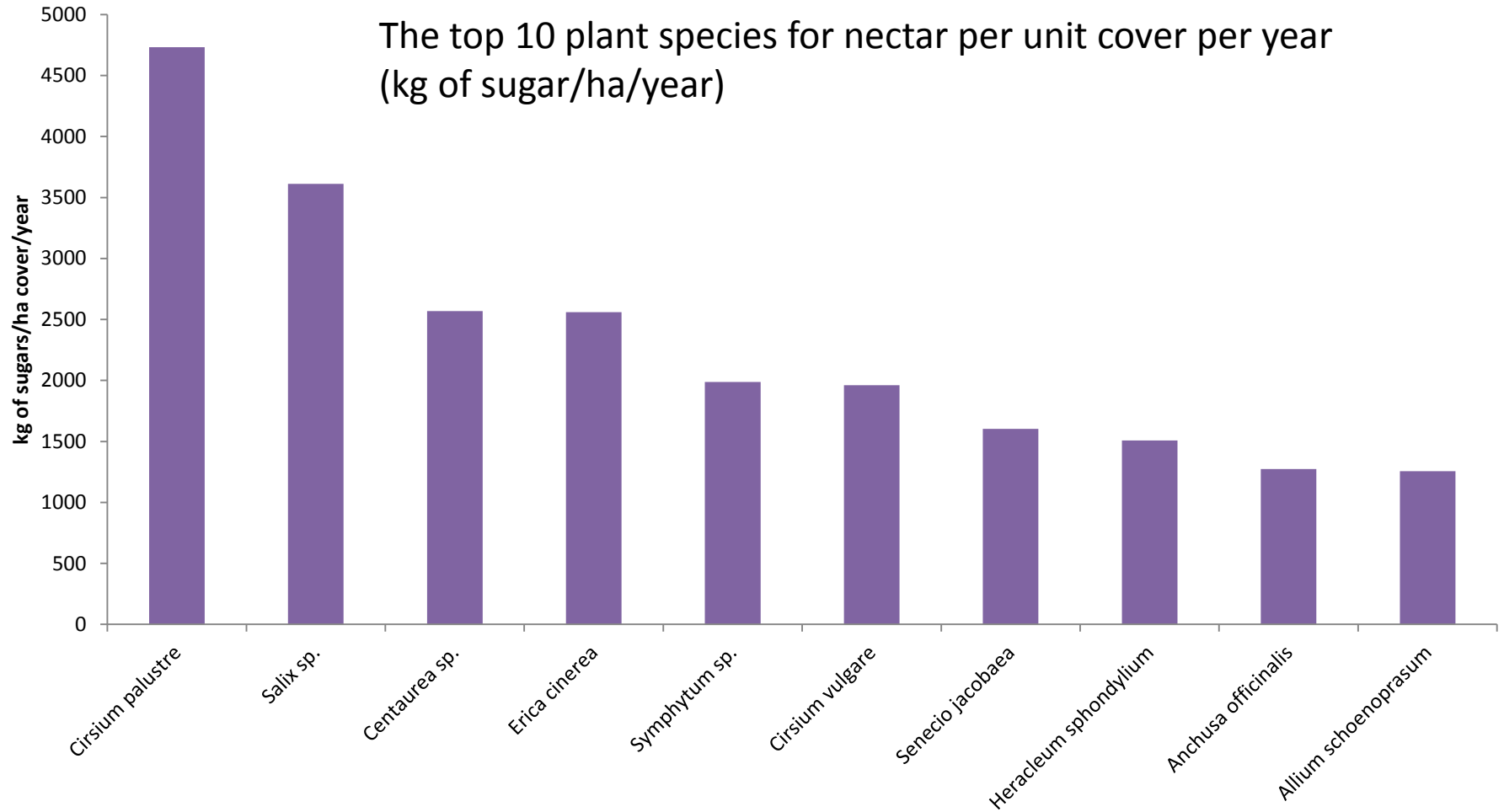
**FLOWER ABUNDANCE – 5  
QUADRATS PER SPECIES**



**FLOWERING PHENOLOGY**  
Data from the literature



# STAGE 3: RESOURCES PER VEGETATIVE UNIT



# ANSWERING QUESTION 1

**QUESTION 1.** Which plant species provide the best floral resources for pollinators?

*The best species per unit of area cover (kg of sugars/unit of area/year) are Thistle, Willow, Knapweed, Heather and Comfrey.*



*Cirsium palustre*



*Salix cinerea*



*Centaurea nigra*

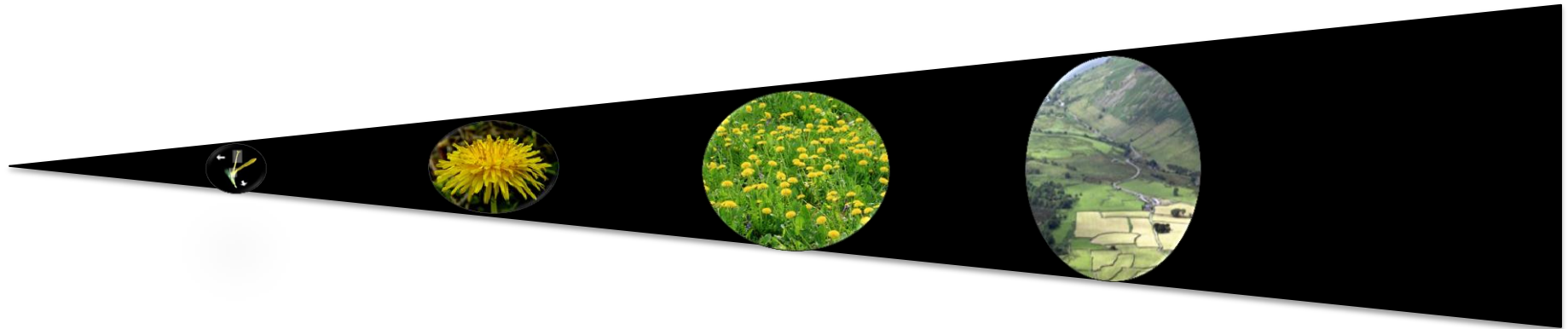


*Erica cinerea*

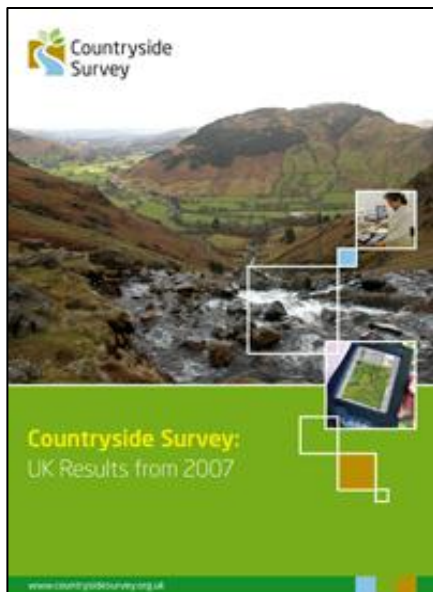


*Symphytum officinale*

# STAGE 4: RESOURCES PER HABITAT



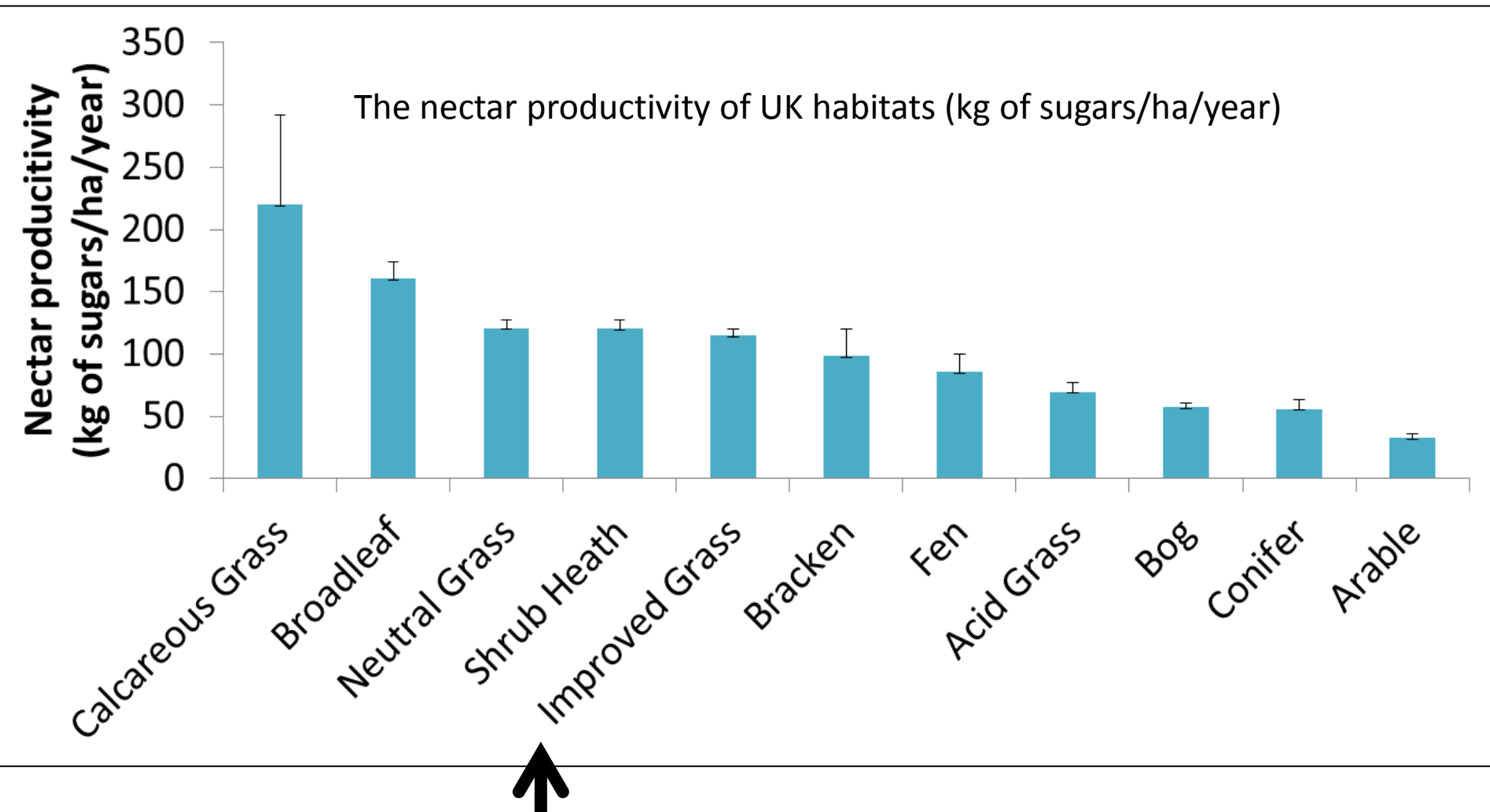
**1: FLOWER      2: FLOWER UNIT      3: VEGETATIVE      4: HABITAT**



**PLANT SPECIES COMPOSITION AND PROPORTIONAL COVER IN EACH HABITAT**

(from the Countryside Survey 2007)

## STAGE 4: RESOURCES PER HABITAT





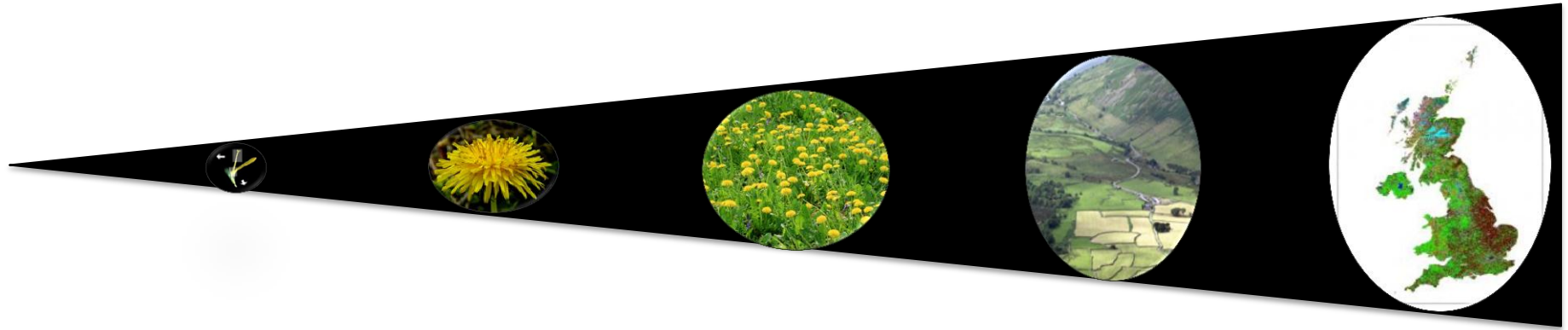
# ANSWERING QUESTION 2

**QUESTION 2.** Which habitats are the best for pollinators?

*Calcareous grassland, broadleaf woodland and neutral grassland show the highest nectar productivity (and diversity)*

*Arable shows the lowest nectar productivity (and diversity)*

# STAGE 5: RESOURCES AT THE NATIONAL SCALE



**1: FLOWER**

**2: FLOWER UNIT**

**3: VEGETATIVE**

**4: HABITAT**

**5: NATIONAL**

- After taking into account their national land cover, three species contribute almost 50% of national nectar provision.
- **White clover, marsh thistle & heather**

Jan

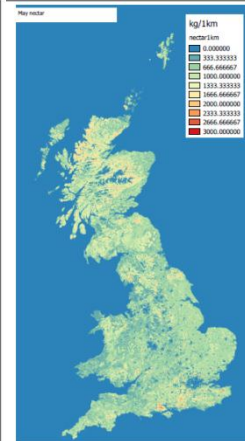
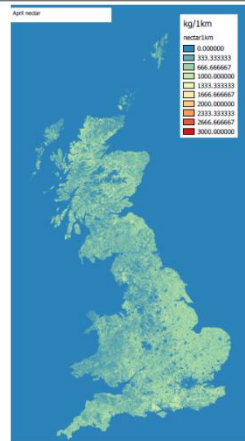
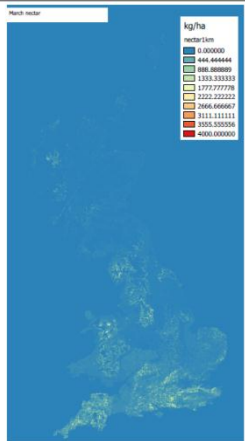
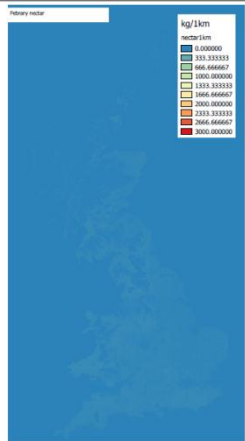
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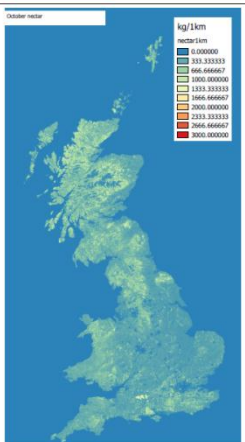
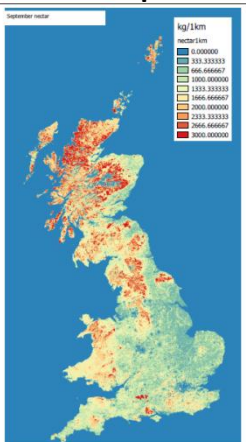
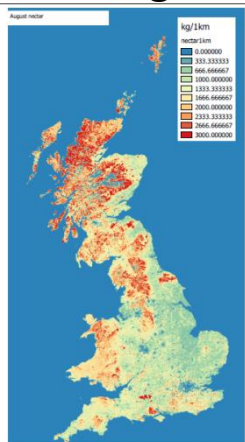
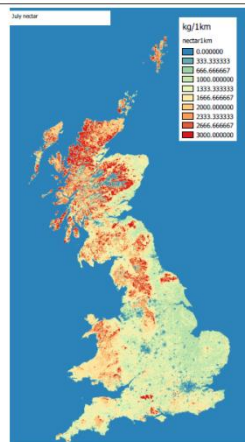
Aug

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Oct

Nov

Dec



# ANSWERING QUESTION 3

- **QUESTION 3.** Which species & habitats contribute the most at the national scale?

*White clover, marsh thistle & heather contribute all together to almost 50% of the national nectar provision*

*Improved grassland contributes the most to the national nectar provision*



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- Background
- The 3 questions
- How we did it and what we found
- Practical applications (3)
- Summary

# PRACTICAL APPLICATIONS

## 1: Which habitats to conserve



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**High nectar productivity & diversity and their low and declining land cover mean that calcareous grasslands should be a priority for habitat conservation dedicated to pollinators.**

# PRACTICAL APPLICATIONS

## 2: What to restore



**Managed habitats contribute well nationally in spite of their low nectar productivity per unit of area; improved grasslands and arable land can be improved in order to enhance the national nectar provision.**



# PRACTICAL APPLICATIONS

## 2: Habitat creation schemes – arable field margins/urban meadows



**Use of the floral database to find the optimal mix of plant species to provide floral resources throughout the pollinator season**



# Summary

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- Practical applications



Thanks to the funders

Agriland team