

## Land use change: Opportunities for pollinator conservation and risks for pollinator losses

Over the past century changes in land use in the UK have had significant impacts on pollinators; there are many opportunities for current land use planning to take pollinators into account.



Photo by Deepa Senapathi

Living With Environmental Change  
Policy and Practice Notes

Note No.25 - Insect Pollinators Initiative  
January 2016

The Living With Environmental Change Partnership brings together 22 public sector organisations that fund, carry out and use environmental research and observations. They include the UK research councils, government departments with environmental responsibilities, devolved administrations and government agencies. The private sector is represented by a Business Advisory Board.

**Land use in Britain has changed significantly over the last century. These changes have wide ranging implications for biodiversity, including pollinator species and communities. Availability of historic data, and the digitisation of the earliest land utilisation survey of Britain, have provided an opportunity to explore how changes in land use have affected pollinating insects. Characterising historical links between land use and pollinators can allow us to understand better how present and future land use decisions impact on pollinators. This in turn will help and provide information for policy makers and land owners to enhance land management for these important species.**

## **How has the way we use land in the UK changed over the past eighty years?**

**The UK has experienced major changes in land use since the 1930s in both rural and urban environments:**

- Rural environments have experienced agricultural intensification, with the UK area of insect pollinated crops rising from around 360,000 ha to about 913,000 ha between 1984 and 2013.
- Insect pollinated crops now cover about a fifth of UK cropland, and so demands for pollination services are high and increasing.
- The growth in area is coupled with higher inputs of fertilisers and pesticides.
- Mechanization of arable farming and improved transport to markets has contributed to larger fields (total arable area has changed from 5.7 million ha in 1930 to 6.3 million ha in 2013) and is associated with losses of boundary features such as hedgerows.
- Greater uniformity of rural landscapes has occurred, resulting in loss of habitat diversity, and reduced the availability of pollinator forage and nesting resources.
- Urban environments have expanded with over 18 new towns created since the New Towns Act of 1946 and further towns and cities being planned through the Millennium Communities Programme.

## **What do we already know about the effects of these land use changes?**

**There are a variety of changes that can happen within a landscape and effects can be either positive or negative for pollinators:**

- Changes can occur in the area habitats cover, the quality of habitats (degradation or regeneration), and the way they are arranged in the landscape (homogeneous or heterogeneous).
- Changes in legal status can also have effects. While some natural habitats have been lost, 23% of land area in England is designated as National Parks or Areas of Outstanding Natural Beauty, with 18% of these designated landscapes also being notified as Sites of Special Scientific Interest.
- These changes in land use can have varied impacts on different pollinator groups, as different pollinator assemblages need very different resources (flowers, nesting places, shelter etc) from the landscape.

## What resources and landscapes benefit pollinators?

### We know from recent research that:

- Pollinator diversity and abundance is generally highest in landscapes which:
  - Have a large proportion of natural (eg calcareous grasslands, heathlands) and semi-natural (eg low-input meadows, flower-rich field margins) habitats.
  - Provide rich floral resources and nesting opportunities (eg bare ground for mining bees, tussocky grass for bumblebees).
  - Are well connected, ie patches are linked together, for instance by linear features such as hedgerows or flower-rich field margins.
- Scale is an important factor in how pollinators respond to land use. Different pollinators have different forage and dispersal ranges, eg for bumblebees a couple of kilometres, for solitary bees a few hundred metres. The benefits from high quality habitats such as semi-natural grasslands diminish the further away one moves from them.
- Some manmade habitats, such as mass flowering crops (eg oilseed rape, field beans), can provide short bursts of very abundant floral resources, but these usually only last a few weeks.

## What does recent research tell us about the impact of land use change on pollinator communities?

### Evidence from 20 study sites across England suggests that pollinator species richness, abundance, distributions and community composition have all been significantly influenced by changes in land use:

- Land use within a particular site and up to 1 km around a site seems to have an impact upon the diversity and community of pollinators.
- Any changes to plant diversity and communities over time will result in shifts in pollinator communities and alter plant-pollinator networks and interactions.

### Increase in arable land has had a negative impact on species diversity due to the conversion of high quality heterogeneous or mixed habitats into agricultural land:

- While mass flowering crops (like oilseed rape) in arable land provide some resources, these are typically of short duration and these areas lack diversity of alternative foraging and nesting resources.
- A global study has shown that bees provide essential pollination services that are potentially affected both by local farm management and the surrounding landscape - bee abundance and richness was higher in diversified (ie small fields with boundary features) and organic fields, and in landscapes comprising more semi-natural, resource-rich habitats.
- Conventional fields with low plant diversity have a more diverse and abundant population of bees when surrounded by land with more varied vegetation.

### Some changes have the potential for positive effects:

- Transformations from a single habitat type (eg heathland) to mixed habitats (eg heathland and woodland) often have a positive effect on species diversity, resulting in increased pollinator species richness.
- Growth of urban areas may be of some benefit – the availability of green spaces and diversity of resources within urban (and suburban) gardens, parks and church yards could provide nesting and foraging resources across seasons.
- Urban pollinator populations have been found to be more homogeneous across space than those in farmland or nature reserves.

## How can policymakers and land managers ensure their future actions are more pollinator-friendly?

**Land use strategy at national and local policymaking level can help to promote pollinator-friendly environments and decisions taken by individual land managers will also play an important role:**

- A study on European agri-environmental schemes shows that pollinators respond positively to the floral resources created; current schemes however, need to be reviewed to include information on landscape complexity, land use types and configuration of existing semi-natural habitats, which research shows, influence the success of these schemes.
- Eligible farmers should apply for England's Countryside Stewardship scheme "Wild Pollinator and Farm Wildlife Package" which has combinations of options for pollinators. This is targeted at areas likely to deliver most benefits and provides information on land management.
- Nature reserves and protected areas should include the protection of pollinator habitats in their management plans.
- Land managers should consider both scale and heterogeneity of habitat when planning biodiversity management:
  - Land use changes both within and around protected areas for targeted biodiversity conservation is important.
  - Even within protected areas, the provision of mixed habitat needs to be considered and reserve management

- plans take into account the forage and nesting needs of pollinators.
- Local Planning Authorities should ensure that habitat requirements of threatened pollinator species in their area are considered in their planning surveys and management plans.
- Pollinator habitats should be considered wherever possible in Green Infrastructure Partnerships, Local Nature Partnerships, Nature Improvement Areas, and biodiversity off-setting, eg planting pollinator-friendly plants in urban parks and green spaces.
- Agri-environmental scheme payments for farmers and land managers could include incentives aimed at improving habitat heterogeneity and connectivity of semi-natural habitats near arable land.
- Linking payments for ecosystem services to the value of the public goods provided by the farmers rather than the size of the cultivated area would help to target pollinator needs.
- Policymakers could further incentivise and encourage farm level options such as mixed cropping and management of arable land to improve pollinator diversity (such as reduced cutting of hedgerows), and both Defra and industry level organisations should provide information to farmers about the benefits.
- In order to measure the effectiveness of habitat and land management actions, additional indicators on various pollinator species (such as the one established on bee species by Defra) could be developed as part of Defra's Biodiversity 2020 monitoring strategy

## Further information

This Policy and Practice Note was written by Deepa Senapathi, Mark Gillespie, Bill Kunin and Simon Potts drawing on research from the Linking Agriculture and Land Use Change project, part of the Insect Pollinators Initiative. The Insect Pollinators Initiative is funded by the Biotechnology and Biological Sciences Research Council, the Department for Environment, Food and Rural Affairs, the Natural Environment Research Council, the Scottish Government and the Wellcome Trust under the auspices of the LWEC partnership.

### Useful resources:

Linking Agriculture and Land Use Change:

<http://www.agriland.leeds.ac.uk/>

Insect Pollinators Initiative: <http://www.insectpollinatorsinitiative.net>

The whole series of LWEC Policy and Practice Notes, including those drawing on the Insect Pollinators Initiative, may be downloaded from <http://www.nerc.ac.uk/research/partnerships/lwec/products/ppn/>

Defra's National Pollinator Strategy:

<https://www.gov.uk/government/publications/national-pollinator-strategy-for-bees-and-other-pollinators-in-england>

The Welsh Action Plan for Pollinators:

<http://wales.gov.uk/topics/environmentcountryside/consmanagement/conservationbiodiversity/action-plan-for-pollinators/?lang=en>

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