Department for Environment Food & Rural Affairs

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A consultation on the National Pollinator Strategy: for bees and other pollinators in England

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Foreword by the Secretary of State for Environment, Food and Rural Affairs

Safeguarding our bees and other pollinators is a key part of my priorities to improve the natural environment and grow the rural economy. They contribute massively to the diversity of our plant and animal life. We want them to continue playing their essential roles in our food production and our environment.

We know that pollinators are valued by many people. We recognise that pollinators face many pressures which have led to declines in numbers, diversity and a reduction in the geographical ranges of some species.

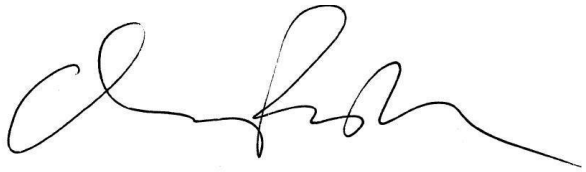
That is why we are publishing this consultation on a National Pollinator Strategy setting out our commitment to act and play a leading role. Over the next ten years, the Strategy will help build a solid foundation for our pollinators. By working with others we will ensure their needs are thought about synonymously with land and habitat management.

To get to this stage we have been working hard with a range of organisations and scientists. I am enormously grateful to those who have worked with us so far. We want to continue working in partnership with these organisations and scientists to implement the proposed actions. Through this consultation, we are inviting many other organisations, businesses and the public to also play their part. This will mean supporting our pollinators guided by the vision, aims and actions in the Strategy.

A particular challenge in developing proposals for action is uncertainty over the current status of pollinators. There are questions over the impact the threats against them are having. There are also questions over how resilient agricultural and natural systems are to changes in pollinator populations. An important part of our role in the proposed Strategy, and one of our priorities over the next three to five years, is to invest in science to address key gaps in our understanding to provide a strengthened evidence base for policy actions to support pollinators**.**

At the same time as improving the evidence base, there are actions we can take now. These actions build on current initiatives being taken by Government and others with a greater focus on pollinators' essential needs for survival. Many of the actions are about providing food and shelter for pollinators across a large range of land uses. We are committed to reviewing the Strategy's aims and the actions within the next five years when further evidence becomes available.

We want to continue working in partnership with interested organisations and the public to make the Strategy adaptable and accessible. With increased coordination and collaboration, we can achieve our goal of safeguarding the future of our pollinators.



Executive Summary

1. Bees and other insect pollinators play an essential role in our food production and in the diversity of our environment and its plant and animal life. They are valued by many people. They face a wide range of environmental pressures and some species are threatened. Examples of pressures are: intensification of land-use and habitat loss both leading to loss of food sources and shelter; pests and diseases; invasive species; use of pesticides; and, climate change.

2. Defra is inviting views from interested parties on the proposals for a National Pollinator Strategy ('the Strategy') as set out in this consultation document. Following the public consultation, we will review and finalise the Strategy and its actions and publish it in summer 2014, followed by implementation.

3. We are proposing this Strategy to safeguard pollinators and their essential pollination role, reflecting their importance and the many pressures they face. Our vision is to make sure that they thrive and continue their important role in food production and in our environment. The proposed Strategy supports many of our existing policies to improve biodiversity and the natural environment as set out in The Natural Choice (the Natural Environment White Paper, 2011) and in Biodiversity 2020 (2011).

4. Through the proposed Strategy, the Government's aim is to lead and set a new direction for pollinators, building on many current initiatives and drawing on the skills, experience and enthusiasm of all interested parties. We also want to inspire action at all levels by many other organisations and individuals, guided by the Strategy's vision, aims and actions.

5. The proposed Strategy is a shared plan between Government and other interested parties and therefore includes a mix of proposed actions for Government and for others to take forward. We have worked with non-government organisations (NGOs), professional bodies, farmers, growers, businesses, the science community and delivery agencies in the last six months to develop the proposed actions. We will continue to work with these organisations as we finalise the actions ready for publication of the Strategy in the summer and during implementation.

Available evidence on the status of pollinators and pressures

6. The Strategy aims to cover all of the approximately 1500 insect species that fulfil a pollination role in England including honey bees, many types of bumble bees, solitary bees, hoverflies, wasps, flies, butterflies, beetles and moths. There are growing concerns that a wide range of environmental pressures are leading to declines in the

number, diversity and geographical ranges of individual species. Available evidence on these concerns is set out in the independent report on the 'Status and value of pollinators and pollination services' ('the Status Report') which Defra commissioned in 2013 to help inform development of the Strategy. The Status Report is published with this consultation document.

7. This is a complex evidence picture. We have some understanding of the occurrence and geographical distribution of many pollinator species (from occurrence data) including those which are threatened. This includes evidence on declines in the diversity of wild bees, although there is some suggestion that this may now be slowing. We have limited evidence on abundance and related trends except for moth and butterfly populations where many but not all species show declines in recent decades. Similarly, the evidence is patchy on the precise impacts of known pressures (e.g. intensive land use, use of pesticides and pest and disease risks) on pollinators and the way that they interact.

8. Another area of uncertainty is the role of pollinators in crop and wild flower pollination. Apart from crops where additional pollination services are brought in (e.g. early strawberries grown under polytunnels), we have very little evidence of a deficit in pollination services or an effect of changes in pollinator populations on crop yield.

9. This patchy and uncertain evidence base presents a challenging starting point for developing policy actions to support our pollinators. There are important gaps in our understanding. In particular, we need to know more about the current status and abundance of many species of wild bees and other pollinators, how much of an impact threats against them are having, and how resilient agricultural and natural systems are to changes in pollinator populations.

Our approach to the proposed Strategy and its three main components

10. Given this patchy and uncertain evidence base, we will take a flexible and adaptive approach to the proposed Strategy which has three main components:

    1. **Evidence-gathering on pollinator status and impacts of pressures**. An important part of the Government's offer is to invest in monitoring and research to address key gaps in our understanding. The Strategy proposes 12 evidence actions (summarised in Table 1) to provide a sound base for future policies to support pollinators. These include:

        - A programme of six projects from 2014 to 2019 to develop and implement a coordinated and sustainable long-term monitoring programme on pollinators;

- Three projects from 2014 to 2016 on improving our understanding of the economic and social value of pollinators;
- Two projects from 2014 to understand the effects of neonicotinoids on pollinators in the field and the impacts of restrictions on neonicotinoids on farmers' decisions on cropping and pesticide use; and,
- A critical review in 2014/15 of the evidence on risks posed by commercially-produced bumble bees on other pollinators to help inform Defra's ongoing review on the release of bumble bees for commercial pollination.

Defra will lead on, and fund 10 of these projects and has allocated £500,000 from existing budgets in 2014/15 for this work to start. The two other projects are being considered by others. For example, the pesticide industry is required to support its approvals for neonicotinoids by building evidence on their effects. Defra is considering whether other work is required in this area.

2. **Priority policy actions**. In the meantime as we gather further evidence, the Strategy proposes 18 priority actions (summarised in Table 2) for Government and for others to implement from 2014. These actions recognise that we need to do more to support our pollinators. They reflect current evidence and in some cases build on and expand current initiatives to refocus on the needs of pollinators, i.e. access to food (pollen and nectar) from March to October and shelter and nest sites including during the winter. The key outcomes we are seeking are:

   - diverse and flower-rich habitats to support our pollinators on farmland and public land, in towns, cities and gardens, along transport networks and on land surrounding other infrastructure such as water treatment works and flood defences;
   - healthy bees and other pollinators to support pollination services;
   - enhanced awareness across a wide ranges of businesses, other organisations and the public of the actions they can take to support pollinators.

   The proposed 18 priority actions cover:

   - One action on producing and disseminating a simple 'Call to Action' message and evidence-based advice for all land managers and the public on the actions they can take to support pollinators. The Government will work with NGOs and the science community to produce this by summer 2014 and to disseminate it.

   - One action for the public to support pollinators by actions in their gardens guided initially by the 'Perfect for Pollinators' advice from the Royal Horticultural Society and in due course by the 'Call to Action' advice.

- Three actions guided by the ‘Call to Action’ advice to improve the management of farmland to support pollinators. These are through reform of Common Agricultural Policy which the Government is finalising in 2014, and through voluntary actions from 2014 by the Campaign for the Farmed Environment. In addition, three actions to be implemented by the Government and farming bodies such as Linking Environment and Farming (LEAF) from 2014 to promote and increase the uptake of integrated pest management (IPM) by farmers and growers.

- Seven actions on improving the management of our towns, cities and public land to support pollinators to be implemented from 2014. These are mainly actions for Government to secure commitment from others, such as transport operators and water companies to implement changes in land management guided by the ‘Call to Action’ advice.

- Two actions on responding effectively to pest and disease risks in honey bees, to be implemented from 2014, including updated policies to improve beekeepers’ control of the *Varroa* mite and preparation to minimise the effects of exotic pests, such as the Asian hornet. These are shared actions between Government, the National Bee Unit, beekeeping associations and beekeepers.

- One action for Government to improve and strengthen the sharing of knowledge on pollinators’ needs between scientists, conservationists and non-government organisations from 2014. Our aim is to ensure that initiatives and campaigns to support pollinators are based on up-to-date evidence.

3. **A commitment to review and refresh the Strategy’s aims and actions as additional evidence becomes available**. From 2016, we will have new evidence from the monitoring programme and other evidence projects. In addition, we will have lessons from the effectiveness of the policy actions and from the partnerships and collaborations we build during 2014 to 2016. Using this evidence, we will work with other interested parties to review the Strategy’s aims and to identify any necessary additional policy actions or ways of working to strengthen our response by 2019.

Pesticides

11. The issue of pesticide effects on pollinators has received much attention of late. The Strategy recognises that pesticides are one of the potential pressures that pollinators face amongst others such as habitat loss. It also recognises that neonicotinoids are not the only pesticides that have the potential to damage pollinators. The Government continues to support strict regulation of pesticides based on scientific risk assessment. We also believe that authorised pesticides need to be used sustainably, minimising the

residual risks. Consistent with this approach, the Strategy includes three proposed priority actions on promoting and increasing the uptake of integrated pest management (IPM) by farmers and growers.

12. The Strategy's proposed actions build on Defra's current policies and plans on IPM and the sustainable use of pesticides, giving them fresh impetus and an increased focus on pollinators. Increased uptake of IPM would help achieve a more targeted and risk-based approach to managing pests, weeds and diseases, with potential benefits for pollinators and other wildlife.

Interim advice to the members of the public before the 'Call to Action' advice is ready

13. The finalised version of the Strategy in summer 2014 will contain the 'Call to Action' message and initial accompanying advice. Before then, members of the public who want to take action now to support our pollinators could consider:

- **Growing more flowers**. Bees and other pollinators need pollen and nectar from flowers to eat. A large range of plants (wild flowers, herbaceous perennials, shrubs and trees) offer these essential foods for pollinators, but not all flowers produce pollen and nectar, so check before planting. Most pollinator species are active from March to October and need flowers for food throughout that time. Advice on this is currently available from the Royal Horticultural Society (Perfect for Pollinators) to help gardeners identify plants that will provide nectar and pollen for bees and many other types of pollinating insects. http://www.rhs.org.uk/Gardening/Sustainable-gardening/Plants-for-pollinators

- **Spraying safely.** Following good practice advice on the use of pesticides. Advice for gardeners on the responsible use of pesticides including on disposal and minimising use, is provided on the Government's website. http://www.pesticides.gov.uk/guidance/industries/pesticides/user-areas/garden-home#Alternatives.

Delivery and implementation

14. The Strategy commits Defra to working with other interested parties to produce a delivery plan within six months of publishing the finalised Strategy (i.e. by the end of 2014), and a one-year-on progress report by summer 2015. Defra will lead overall on coordinating implementation of the Strategy and monitoring progress. We will also work with other interested parties to develop a governance structure for managing and reporting on delivery of the Strategy. This will include how we will coordinate policy development and implementation with Scotland, Wales and Northern Ireland.

Table 1: Summary list of evidence-gathering actions from 2014 to 2017

	Evidence Actions	Lead/ others	2014		2015		2016		2017	
1	Develop and field-test a new monitoring framework that can be implemented by volunteers and professionals.	**Defra**, with partners	■	■	■	■				
2	Implement new monitoring scheme(s).	To be confirmed					■	■	■	■
3	(continue to) Improve standards of data collection, management and analysis in volunteer recording schemes.	**Defra,** Joint Nature Conservation Committee, Natural England, volunteer recorders	■	■	■	■				
4	Expand pool of taxonomic expertise and capability for identifying insect pollinators.	To be confirmed		■	■	■	■	■	■	■
5	Improve understanding of motivations of volunteer recorders to aid recruitment of additional volunteers into new monitoring scheme for pollinators.	**Defra** with volunteer recording schemes		■	■	■				
6	Support long-term storage if insect specimens from research projects in anticipation of improved identification technology.	**Defra and other funders** of the Insect Pollinators Initiative, Natural History Museum	■	■	■	■				
7	Feasibility study on conducting primary research on relationship between pollinators and pollination services in the crop production.	**Defra**		■	■					
8	Scoping study to consider benefits of research on ecology of pollinator/wild plant interactions.	**Defra**			■	■	■			
9	Study to develop a framework for assessing the indirect benefits and socio-cultural value of pollinators to the public.	**Defra**			■	■	■	■		
10	Determine the effects of neonicotinoids on wild and managed pollinators in field conditions.	**Pesticide manufacturers;** possibly others.		■	■	■	■	■		
11	(continue to) Assess the impacts of restrictions on neonicotinoids on farmers' decisions on cropping and pesticide use.	**Defra**	■	■	■	■				
12	Critically review evidence on risks posed by commercially produced bumble bees on other pollinators	**Defra**		■	■					

Key: ■ Dark grey indicates commissioning of project and timeframe for completion

Table 2: Summary list of policy priority actions from 2014 to 2017

	Priority Actions	Lead/others	2014		2015		2016		2017	
1	Create 'Call to Action' package of advice for bees and other pollinators.	**Defra,** academia, NGOS								
2	Ensure pollinators represent a key focus of CAP reform.	**Defra**, Natural England, CFE, NFU								
3	Secure commitment from providers of advice to farmers to draw on 'Call to Action' package.	**Defra,** Natural England, CFE, agronomists, NGOs								
4	Develop and implement a programme of pollinator events on farm.	**CFE**								
5	Review and update guidance on Integrated Pest Management (IPM).	**HSE,** Defra, LEAF, VI, AHDB								
6	(1) VI to revise guidance on insecticide best practice and (2) to work with National Register of Sprayer Operators on their training courses on use of insecticides.	**VI**, National Register of Sprayer Operators								
7	Facilitate increased sharing of IPM practices between farmers.	**CFE, LEAF, AHDB, VI,** Defra								
8	Secure commitment from large-scale land managers to follow 'Call to Action' advice.	**Defra,** land managers, businesses								
9	Disseminate 'Call to Action' advice to brownfield site managers.	**CIRIA**								
10	Policy and practice note on urban pollinators produced and disseminated as part of Insect Pollinators Initiative.	**IPI Programme Management Group** to commission								
11	Integrate 'Call to Action' advice into local biodiversity initiatives.	**Defra,** DCLG, Natural England								
12	Develop pollinator best practice awards and/or competitions.	**RHS, Defra**, others to be confirmed								
13	Develop pesticide guidance for amenity managers.	**HSE,** Defra, Amenity Forum								
14	Develop quality standard to ensure availability of high quality native origin seeds for wildflower planting schemes.	**Kew's Native Seed Hub and Millennium Seed Bank**								
15	(continue to) improve beekeepers' management of pest and disease risks of honey bees through the Healthy Bees Plan.	**Defra,** NBU, beekeeping associations								
16	Implement revised policies to control pest and disease risks of honey bees.	**NBU,** Defra, beekeeping associations								
17	Members of the public to consider growing a range of plants to provide pollen and nectar sources for pollinators	**Members of the public**								
18	Improve knowledge share between scientists, conservation practitioners and NGOs.	**Defra,** Natural England, academia and NGOs								

Key: Dark grey indicates development Light grey indicates implementation

AHDB – Agriculture and Horticulture Development Board CFE – Campaign for the Farmed Environment
CIRIA – Construction Industry Research and Information Agency HSE – Health and Safety Executive
IPI – Insect Pollinators Initiative LEAF – Linking Environment and Farming NBU – National Bee Unit
NFU – National Farmers' Union VI – The Voluntary Initiative NGO – non government organisations

Chapter 1 Introduction

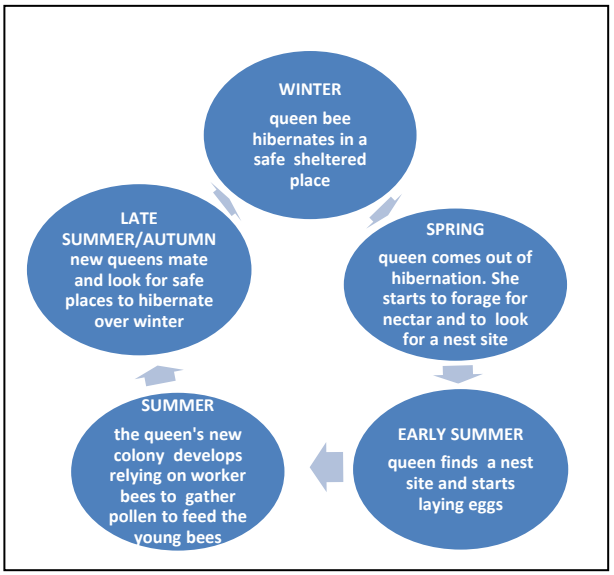
1. Bees and other insect pollinators are essential for our food production and the diversity of our plant and animal life. They are valued by many people. They face a wide range of environmental pressures and some species are threatened. We are proposing this National Pollinator Strategy ('the Strategy') to safeguard pollinators for food production and for the wider environment, reflecting their importance and the many pressures they face. The Strategy is a shared plan between Government and other interested parties. It is an essential part of the Government's aims to grow the rural economy and to improve the environment.

What are insect pollinators and what do they need?

2. Many of our food crops such as apples, pears, strawberries, raspberries, tomatoes and field beans, as well as many wild flowers need visits by insects to transfer the pollen between plants leading to fertilisation and the production of seeds and fruits[1]. For some crops, insect pollination leads to higher yields and improved quality of the fruit or seeds. Many other plants, trees and wild flowers also need insect pollinators to produce seeds and fruit.

3. At least 1500 species of insects pollinate plants in the UK including bumble bees, honey bees, solitary bees, hoverflies, wasps, flies, beetles, butterflies and moths. All have complex life cycles and specific needs. For example, bumble bees have specific needs for food (i.e. pollen and nectar), shelter and nest sites during the year, as shown in Diagram 1. Many bees only live from spring until autumn and then die leaving their eggs, other inactive life stages or hibernating queens in sheltered places to over winter before emerging the following spring. The number of insect pollinators is highest in summer coinciding with peak plant growth and supplies of pollen and nectar.

Diagram 1: Simplified diagram of the needs of a bumble bee during the year



[1] Note: our main food crops such as cereals and potatoes rely on wind pollination, self-pollination or vegetative growth for production and yield. Oil seed rape relies on wind pollination and insect pollination.

4. The majority of pollinator species live in the wild. In contrast, a few species are 'managed' by humans such as honey bees which are kept for honey and wax production, and, in some cases, for commercial pollination of orchard fruits. In addition, UK farmers and growers use commercially-bred bumble bees and solitary bees in glasshouses and poly-tunnels for pollination of crops such as strawberries and tomatoes. The abundance of these managed species is therefore determined by the number of people who want to keep them or use them for commercial pollination.

What are the main pressures and the impacts on bees and other insect pollinators?

5. Pollinators can face many pressures: intensification of land-use leading to reduction in their sources of food and shelter; habitat loss; pests and diseases; invasive species; use of insecticides and herbicides; and, climate change. There are growing concerns that these pressures are leading to declines in the number, diversity and geographical ranges of individual species. These pressures are described in more detail in the independent report on the 'Status and value of pollinators and pollination services' ('the Status Report') which Defra commissioned in 2013 to help inform development of the Strategy. The Status Report is published with this consultation document.

6. The Status Report describes the uncertainties about the importance of these pressure factors and the ways in which they interact to influence pollinator populations. It also summarises current understanding of the abundance of pollinator species in England and highlights crucial gaps in this understanding. A summary of this evidence and the gaps in our understanding is given in Annex 1 of this document.

Current policies and initiatives to support pollinators

7. Current government-led policies and initiatives which are relevant for, and beneficial to pollinators are set out in Defra's report 'Bees and other pollinators: their value and health in England. Review of policy and evidence. July 2013'.[2] These policies form an important starting point for the Strategy and include habitat and species protection and other aspects of biodiversity and conservation, pest and disease control in honey bees, pesticides, stewardship schemes on agricultural land, planning and investment in science such as the Insect Pollinator Initiative[3]. These policies and initiatives are delivered by many organisations across central and local government, government agencies and the science community.

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[2] https://www.gov.uk/government/publications/bees-and-other-pollinators-their-health-and-value.

[3] A £10 million jointly funded research programme by the Biology and Biotechnology Research Council, the Natural Environment Research Council, the Wellcome Trust, Defra and the Scottish Government.

8. Pollinator-specific initiatives by local authorities include Kent County Council which is working with local businesses, environmental groups, farmers and land owners to develop an action plan, Kent's Plan Bee to identify what can be done to increase the population of wild and managed bees in Kent. In addition, many other organisations, including businesses and civic society, have their own initiatives to help bees and other pollinators and have been effective in raising public awareness about the risks to these insects.[4]

How the Strategy was developed and our approach

9. Over the last six months, the Government has worked with retailers, non-government organisations (NGOs), professional bodies, farmers, growers, businesses, the science community and delivery agencies to develop proposals for action in a collaborative Strategy. We are committed to working in partnership with these interested parties through this proposed Strategy to build on the many current activities supporting pollinators and to draw on the skills, experience and enthusiasm of all.

10. The proposed actions in the Strategy are a mix of new initiatives and enhanced existing initiatives to support our pollinators. In order to get the best outcome for pollinators, we want to take effective actions, supported by the best available evidence, in partnership. So whilst many of the actions are for Government to lead, the Strategy also includes actions for others to lead. We will press ahead with these actions from 2014 in parallel to addressing key gaps in our understanding about the status of pollinators, their roles and the impacts of pressures on them. We will review and adapt the Strategy by 2019 and, as necessary, identify additional actions as further evidence emerges and as we learn lessons about the impacts of the actions.

11. The case for Government intervening to safeguard our pollinators is based on a market failure. For example, a landowner who provides the conditions for bees to prosper and provide crop pollination services, cannot exclude others from also benefitting. Pollination services therefore often have a 'public good' characteristic, because others can free-ride on the landowner's efforts, which may lead to an undersupply of pollination services. Government is also intervening as a facilitator and coordinator.

[4] For example: the Co-operative's Plan Bee, Buglife's B-lines, the Bumblebee Conservation Trust's advice to gardeners and land managers, the Friends of the Earth's Bee Cause, the Soil Association's Keep Britain Buzzing, Syngenta's Operation Pollinator, the National Federation of Women's Institute's SOS for Honey Bees, Garden Organic's Bee Heard Campaign and the British Beekeepers Association's advice on habitats and planting for pollinators to the public and local authorities.

Purpose of the public consultation

12. Defra is inviting views on the proposed Strategy from all interested parties through this public consultation with a view to engaging a wider audience. The main purpose is to gather further evidence and information to help finalise the actions in the Strategy and to guide implementation. We aim to publish the final version of the Strategy in the early summer.

13. Further background information on the actions in the proposed Strategy and to support the consultation process is presented in a separate document entitled 'Supporting document: additional background material on the proposed National Pollinator Strategy and actions'.

14. Consultees can respond using the on-line survey. Alternatively, written responses are possible. Unless you specifically request your response to be treated confidentially, responses may be made publicly available.

15. As well as inviting written comments on the draft Strategy, we are planning three workshops open to the public during the consultation period in London, York and Bristol. Those wishing to attend will need to register by completing the registration form. Places will be allocated on a first response basis but Defra may need to balance attendance across the different areas of interest. Defra are not able to cover individual travel costs.

Consultation questions

(1) Do you have any comments on the vision and aims for pollinators (in Chapter 2)?

(2) Have we given a fair summary of main areas of concern for pollinators and the available evidence, or are there further issues you want to identify (in Annex 1)?

(3) Do you have any suggestions on the best ways to communicate the 'Call to Action' (once agreed) to many different audiences (in Chapter 3)?

(4) Do you agree with the priority actions in Chapter 3? Can you provide any examples of good practices in these areas which are already helping pollinators? For example, land management in towns and cities, local authority initiatives particularly in fruit growing areas, management of farmland and Integrated Pest Management, and knowledge sharing networks.

(5) Have we identified the right priority areas for further research and monitoring, or are there further issues you want to identify (in Chapter 3)?

(6) How could you contribute further to the priority actions?

(7) We have asked a number of specific questions. If you would like to provide any comments on related issues which we have not specifically addressed, please use the space on the on-line survey to report them.

Chapter 2 Our proposed vision and aims

16. Given their importance for food production and biodiversity as well as their intrinsic value to the public, we are determined to set a new direction to safeguard bees and other pollinators so that they survive and thrive.

> Our vision is to see pollinators thrive, providing essential pollination services and benefits for food production, the wider environment and everyone.

17. The proposed Strategy will seek to safeguard pollination services and wider environmental benefits by aiming to reduce losses in the diversity of pollinator species and to improve their overall status as part of healthy and well-functioning ecosystems.

18. Addressing gaps in our understanding is an important part of the proposed Strategy given the limited data on the status of many pollinator species in the UK and the extent to which they might be at risk, as described in the Status Report, and in Annex 1. While there is some evidence that declines are slowing, we accept that bees and insect pollinators in general have experienced an overall decline in diversity[5] in recent decades and that many species of butterflies and moths, the only major pollinator group for which we have evidence, have declined in abundance over the last 35 to 40 years.

19. The uncertainties in our understanding present particular challenges in designing effective policies, and in making the case for increased investment by Government and others. Given this general backdrop of uncertainty, the Strategy needs a flexible approach, adapting to new data and understanding as they emerge to identify and/or refine more targeted policies and actions to support our pollinators. Reflecting this adaptive approach, our aims over the next 10 years are to:

- **Build partnerships and consensus**: To build partnerships from 2014 to 2016 to expand pollinator-relevant actions already being taken by Government and others, such as environment groups and businesses. This will include a closer focus on pollinators' essential needs based on an agreed 'Call to Action' for pollinators, and

[5] As measured by number of species per unit area.

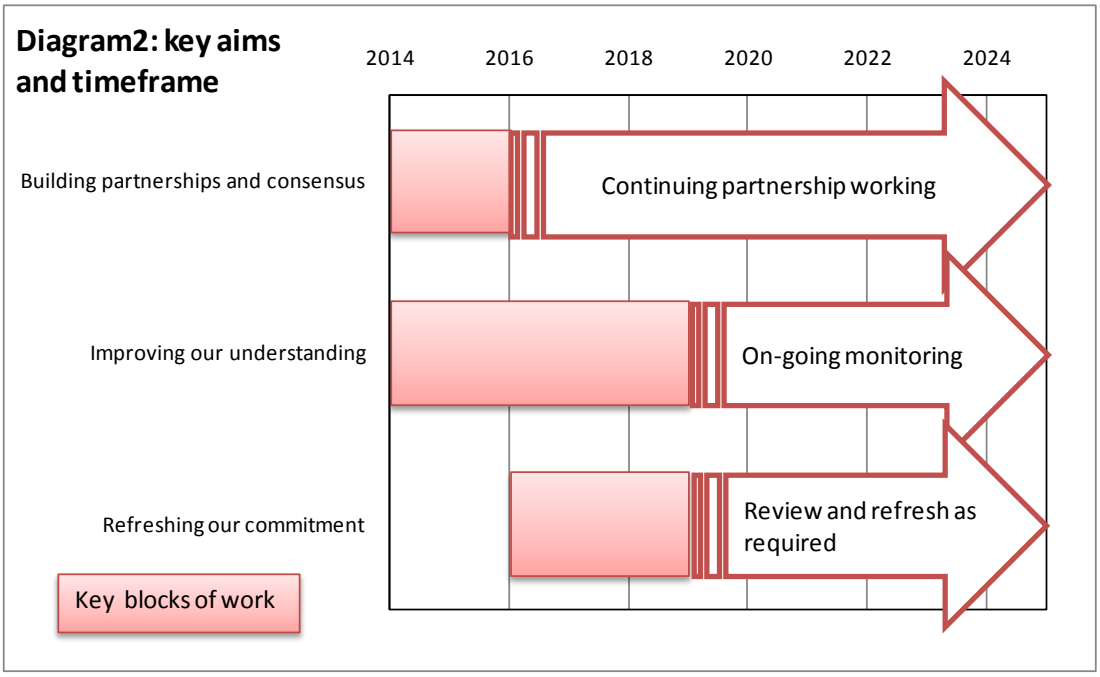
raising public awareness of these needs and how they can help. The actions will continue after this initial two year development phase.

- **Improve our understanding**: To focus over the next five years to 2019 on improving understanding of the baselines for status and trends in pollinator populations and pollination services in England, and addressing policy-relevant gaps in understanding of pollinator interactions with crop production and wild flowers;

- **Refresh our commitment:** To review the aims of the Strategy by 2019, identifying any necessary additional policy actions to strengthen our response based on an improved understanding of the baselines, the nature of the problem and the role of pollinators. The review will also consider lessons learned from the initial policy actions and partnership working. We will work with interested parties on the review as the evidence emerges from 2016 onwards; and,

- **Think globally**: To coordinate and drive forward this work in partnership with the Devolved Administrations and to contribute to emerging international work on understanding the problem and current baselines.

20. Diagram 2 shows how we will work on these aims in parallel from 2014.



21. The National Pollinator Strategy follows The Natural Choice (the Natural Environment White Paper, 2011) and Biosecurity 2020 (2011), both of which set out many initiatives that will deliver benefits for pollinators, including Nature Improvement Areas. In turn, many of the Strategy's proposed policies and initiatives, such as promoting planting

schemes to provide food, shelter and nesting opportunities for pollinators will have broader benefits for biodiversity.

22. Other policies areas supported by actions proposed in the Strategy include the Pesticides National Action Plan and work to further develop the concept of payment for ecosystem services where gaps exist in developing this concept to apply to pollination services.

Scope

23. The Strategy covers all wild and managed pollinator species and pollination services across England. Defra will coordinate the development of pollinator-relevant policies with the Devolved Administrations which are also developing pollinator strategies; Wales already has a pollinator plan. Proposed policies and initiatives in the Strategy are relevant for other Departments and agencies in addition to Defra and its agencies, including management of the Government's estate and public land, such as management of the green or soft estate along roads and railways.

Chapter 3 Proposed priority actions

Introduction

24. Government will play a leading role in delivering the vision and aims of the proposed Strategy but as we are not always best placed to deliver, we want to work in partnership with other organisations. Many organisations have already played an important role and have helped develop the Strategy's 30 proposed priority actions set out in this Chapter. We will continue to work with these organisations as we finalise the actions ready for publication of the Strategy in the summer.

25. Of these 30 proposed actions, 18 actions are policy initiatives for Government and for others take forward from 2014, building on or expanding current initiatives, to place a greater focus on pollinators' essential needs for survival.

26. The key outcomes we want from the priority policy actions are:

    1) diverse and flower-rich habitats to support our pollinators on farmland and public land, in towns, cities and gardens, along transport networks and on land surrounding other infrastructure such as water treatment works and flood defences;
    2) healthy bees and other pollinators to support pollination services;

3) enhanced awareness across a wide ranges of businesses, other organisations and the public of the essential needs of pollinators and actions they can take to support them.

27. The 18 proposed policy actions will be taken forward in a way which is compatible with Government's other priorities. We do not intend to introduce unnecessary burdens or regulations; rather our aim is for the priority actions to be used as a focus and driver for voluntary action by partners under the Strategy. We want to inspire action at all levels by all partners.

28. The remaining 12 proposed actions are on evidence gathering starting in 2014 or 2015 to improve our understanding of the status of pollinators and the impacts of the pressures they face. This strengthened evidence base, alongside lessons learned from the initial policy actions and partnership working, will provide a sound basis for future policy actions and partnership working to support pollinators.

A 'Call to Action' for bees and other pollinators

29. An important part of the Government's contribution to the proposed Strategy is to provide the right information to businesses, other organisation and the public to support our pollinators. The Government plans to work with Natural England and a core group of stakeholders, including natural and social scientists, during 2014 to create a 'Call to Action' message and package of evidence-based advice on how to support bees and other pollinators.

30. The 'Call to Action' message and advice will focus on the essential needs of bees and other pollinators for survival: access to food supplies (nectar and pollen from wild or cultivated foraging sites including crops, wild flowers, shrubs, herbaceous plants and trees) from March to October and places to shelter and nest and overwinter.

31. Our aim is to provide advice on how to optimise land management to support pollinators across all land uses including farms, public land, allotments, land beside transport and other infrastructure, semi-wild land, nature reserves, designated conservation areas, urban environments and domestic gardens. The 'Call to Action' package will be designed to help landowners select the most relevant measures for their own circumstances. It underlies many of the other proposed policy actions in the Strategy, as described later in this Chapter.

32. The actions we propose to deliver the 'Call to Action' message and advice are:

Priority actions	**Lead**/participants	Timeframe
1. Create a 'Call to Action' package for bees and other pollinators consisting of simple message on their essential needs, simple actions to take and web-based detailed advice for farmers, land managers, gardeners and the public on how to meet these needs.	**Natural England** with input from Defra, science community and non-government organisations	• Early 2014: 'Call to Action' message agreed • Summer 2014: Initial advice published • 2014/15: Advice refined in line with new evidence

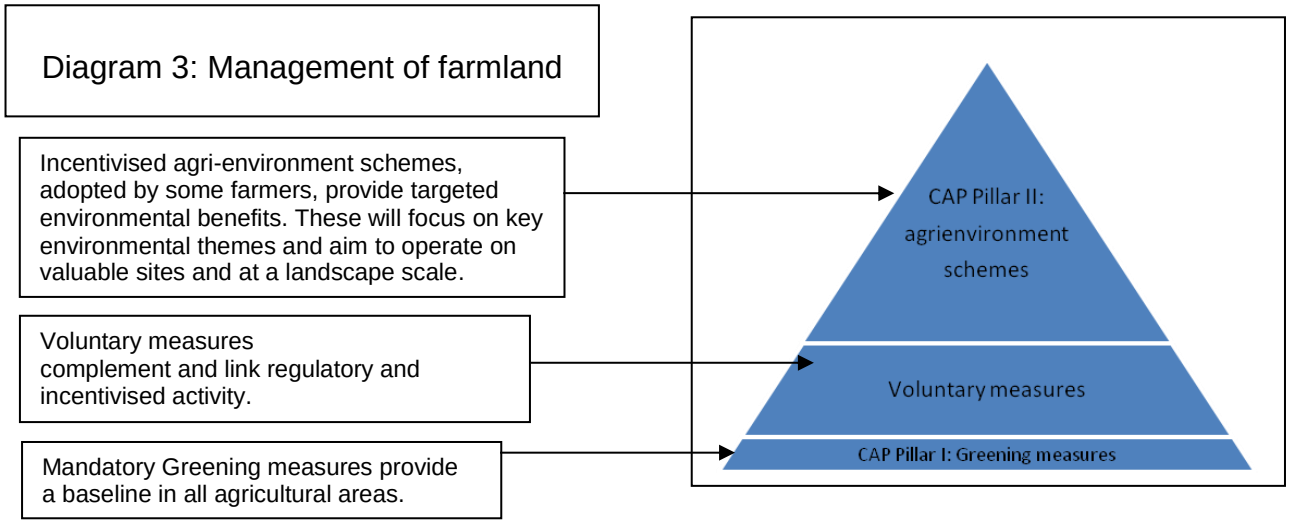
33. The 'Call to Action' will be a communications tool adaptable for use at different levels of detail, through diverse channels, including NGOs, retailers and government agencies, planners, landowners and the general public. By providing a unified message on what to do, our intention is for the efforts of a diverse range of organisations and individuals to complement each other to produce better outcomes for our insect pollinators. This includes an important role for retailers, businesses, NGOs and government agencies to promote the message and advice to land managers and the public.

Management of farmland

34. The promotion of pollinator-friendly management of farmland is key to extending flower-rich habitats for pollinators. Our plans in this sector will build on the Government's existing policies on improving the environmental management of farmland. However, this is a time of transition for farming policy in England as the reform of Common Agricultural Policy (CAP) is in the final stages of EU negotiation and we move to implementation. We will only be in a position to finalise plans for promoting the pollinator-friendly management of farmland once Ministers have taken the full range of decisions on how CAP will be implemented in England. Some decisions have already been announced and others will be announced shortly.

35. To deliver environmental benefits for pollinators whilst promoting competition and safeguarding food security, the regulatory environment must maintain a balance of incentivised, voluntary and regulatory activity, as represented in Diagram 3. Our aim is to put pollinators' needs at the forefront of each level of the pyramid.

Diagram 3: Management of farmland



36. The actions we propose to deliver diverse and flower-rich habitats to support our pollinators on farmland are:

Priority Actions	**Lead**/participants	When
2. Ensure pollinators represent a key focus of the ongoing implementation of CAP reform under Pillars I and II and in the development of targeted voluntary actions to complement and enhance the emerging CAP reform measures.	**Defra** working with Natural England, National Farmers Union, Campaign for the Farmed Environment (CFE)[6]	2014/15
3. Secure commitment from farm advice providers to draw on the 'Call to Action' package for bees and other pollinators to engage and inform farmers.	**Defra** working with Natural England, CFE, agronomists and other key interested parties including NGOs	2014/15
4. CFE will develop and implement a programme of pollinator events on farm supported by promotional and communication activities, including a new leaflet on 'Pollinator management for your farm business'.	**CFE partners**	From 2014

[6] The CFE is a partnership of the main farming and farm advisory organisations and also key environmental groups (Wildlife Trusts, RSPB, Game and Wildlife Conservation Trust).

37. The Government will continue to with work CFE, the National Farmers Union, Natural England and others to ensure that the ‘Call to Action’ advice for farmers is promoted in the right way at the right time. Given that this is a time of transition in the farming sector with the reform of the CAP, the ‘Call to Action’ advice will need to be integrated into the guidance to be developed to support the new CAP measures. If the voluntary measures (see Diagram 3) fall beneath expectations then an option remains to tighten-up the minimum Greening requirements.

Integrated pest management

38. We also propose a set of actions to promote and increase the uptake of integrated pest management (IPM) by farmers and growers particularly for crops which are attractive to pollinators. Increased uptake of IPM would help to achieve a more targeted and risk-based approach to managing pests, weeds and diseases, with potential benefits for pollinators and other wildlife. Policies on IPM and the sustainable use of pesticides sit alongside the tough regulatory regime governed by EU law to ensure that potential harmful effects from pesticides on human health and unacceptable effects to the environment do not occur.

39. Integrated pest management means:

> ‘ careful consideration of all available plant protection methods and subsequent integration of appropriate measures that discourage the development of populations of harmful organisms and keep the use of plant protection products and other forms of intervention to levels that are economically and ecologically justified and reduce or minimise risks to human health and the environment. ‘Integrated pest management’ emphasises the growth of a healthy crop with the least possible disruption to agro-ecosystems and encourages natural pest control mechanisms’ (reference - Directive 2009/128/EC on the sustainable use of pesticides).

40. Integrated pest management does not prohibit pesticide use but draws on a full range of tools and techniques to control pests, weeds and diseases and to ensure targeted use of pesticides to minimise risks to the environment. It is a toolkit for combining effective crop protection with a full awareness of potential environmental impacts.

41. The actions we propose to promote and increase the uptake of IPM are:

Policy actions	**Lead/**participants	When
5. Review and update current guidance and information on Integrated Pest Management (IPM), particularly for crops which are attractive to pollinators, and ensure its effective distribution to farmers through multiple channels.	**Health and Safety Executive** working with Defra, LEAF, Voluntary Initiative (VI) and Agriculture and Horticulture Development Board (AHDB)	During 2014/15
6.(1) The VI will revise and re-publish its guidance on insecticide best practice and (2) work with the National Register of Sprayer Operators to revise its annual training course to include more detailed coverage on the responsible use of insecticides.	**VI**	During 2014
7. Facilitate increased sharing of IPM practices between farmers and growers particularly on the management of crops which are attractive to pollinators, including on-farm demonstrations, farm walks and on-farm workshops.	**Defra** working with CFE, LEAF[7], AHDB and VI.	From 2014

Management of towns, cities and public land

42. Loss of semi-natural habitat by urban and suburban development over many years has had negative impacts on biodiversity and has reduced the availability of essential resources for pollinators. The priority actions in this section build on current policies and initiatives, such as Nature Improvement Areas as part of Biodiversity 2020 which are seeking to establish a coherent and resilient ecological network across the country for the benefit of all wildlife. Examples of other policies are given in Annex 2. We are seeking to work with key partners to deliver a step change in land management from 2014 to improve pollinators' access to habitat and essential resources in towns, cities and public land. These include: parks, brownfield sites, cemeteries and transport and other infrastructure such as road verges, roundabouts, land beside railway lines and flood defences.

43. Several organisations have already agreed to take actions on vegetation planting and management to support pollinators as their contribution to this Strategy. Specifically

[7] LEAF will shortly publish its guide to pollinating insects for farmers called 'Great habitats, more flowers, better protection'

the Highways Agency, Network Rail, Environment Agency, Ministry of Defence Estate Managers, the Association of Local Government Ecologists, the Local Government Association, and the Landscape Institute. Details of how these organisations have agreed to contribute are at Annex 3.

44. We propose seven actions from 2014 to deliver diverse and flower-rich habitats to support pollinators on urban and public land:

Priority actions	**Lead**/participants	When
8. Secure commitment from large-scale land managers in cities, towns and in utility and transport businesses to follow the 'Call to Action' advice in managing their land.	**Defra**, land managers, encouraged by retailers, businesses and NGOs	From 2014
9. Disseminate 'Call to Action' advice to brownfield site managers	**CIRIA**	From 2014/15
10. A policy and practice note to improve the environment for urban pollinators will be produced and disseminated in 2014/15 as part of the Insect Pollinator Initiative (IPI).	To be commissioned by the **IPI Programme Management Group**[8]	2014/15
11. Secure integration of the 'Call to Action' advice into current and emerging initiatives which seek to improve local biodiversity, including Green Infrastructure Partnership, Green Flag Award Scheme and biodiversity off-setting.	**Defra,** Department for Communities and Local Government, Keep Britain Tidy and Natural England[9]	From 2014
12. Develop pollinator best practice awards and/or competitions available at multiple scales from individuals to local authorities.	**Royal Horticultural Society working with Defra** and others who could offer awards	From 2014/15
13. Develop detailed guidance on use of pesticides by amenity managers, including integrated and more sustainable approaches for weed control and pest management.	**HSE** working with Defra and the Amenity Forum	In 2014

[8] BBSRC, NERC, Defra, Scottish Government and the Wellcome Trust who are planning dissemination activities for the nine IPI projects due to be completed in 2014/15. The Management Group will coordinate its dissemination plans with others, including NGOs such as the Bumblebee Conservation Trust and the British Beekeepers Association.

[9] Friends of the Earth will contribute to this work by looking at ways to reach local authority planners and share good practice including through the Town and Country Planning Association eco-development group.

Priority actions	**Lead**/participants	When
14. Develop voluntary quality standard to ensure availability of high quality native origin seeds for wildflower planting schemes.	**Kew's Native Seed Hub and Millennium Seed Bank**	From 2014

45. In support of these actions, many NGOs stand ready to offer practical advice and expertise on pollinator-friendly management and planting to farmers, other land managers and gardeners including Buglife, Wildlife Trusts, Plant Life, the Bumblebee Conservation Trust, Butterfly Conservation, Garden Organic, Sustain and the Royal Botanical Gardens Kew Native Seed Hub.

46. Defra will assess progress in implementing these actions by encouraging land managers to capture local initiatives at an appropriate scale on geographical information systems such as the existing Biodiversity Action Recording System http://ukbars.defra.gov.uk/.

Responding to pest and disease risks

47. The Government has a long-established honey bee health programme delivered by the National Bee Unit (NBU). Through this programme we have a good understanding of pest and disease risks in honey bees and long term trends on infection rates in colonies across England (and Wales).The Status Report sets out the pest and disease risks of honey bees and these risks were also covered in detail in Defra's 2012 review of policies to control pest and disease risks of honey bees.[10]

48. This programme has been effective in reducing pests and disease risks in honey bees. For example, the incidence of American Foulbrood and European Foulbrood is at very low levels (1-2% of colonies inspected). This low incidence was confirmed by the random apiary survey of honey bee pests and diseases commissioned by Defra in 2009 and undertaken by the NBU[11].

49. The programme was expanded in 2009 by implementation of the 10 year Healthy Bees Plan. The Plan has a particular focus on improving beekeepers' skills in managing pests and diseases, particularly the Varroa mite and emerging risks such as the small hive beetle and the Asian hornet. In addition, revised policies to further

[10] https://www.gov.uk/government/consultations/improving-honey-bee-health.

[11] The NBU carried out this survey from 2009 to 2011 by visiting and taking samples from around 5000 apiaries selected at random from BeeBase, their database of beekeepers in England and Wales.

strengthen our response to honey bee pest and diseases will be in place from April 2014 following Defra's 2012 review.

50. The priority actions reflect Defra's ongoing commitments to protecting and improving honey bee health:

Priority actions	**Lead**/participants	When
15. Improve beekeepers' management of pest and disease risks by continuing to work in partnership with the National Bee Unit (NBU) and beekeeping associations to deliver the Healthy Bees Plan.	**Defra** working with NBU and beekeeping associations	ongoing
16. Implement revised and updated policies to control pest and disease risks of honey bees. This follows Defra's 2012 review of these policies and public consultation in 2013.	**NBU** working with beekeeping associations	New policies to be implemented from April 2014.

51. In contrast to our good understanding of honey bee health risks, disease trends and how to manage these risks, our understanding of the pests and diseases affecting wild pollinator species is limited in the UK and globally. We also have little knowledge of the extent to which pests and diseases are transmitted between honey bees and wild pollinators and vice versa, or the impact of this (if it is occurring) for the population dynamics of the different species.

52. Potential risks from commercially-produced and managed bumble bees are currently being considered by Natural England and Defra. For some 20 years, these bees have been increasingly used under protected and semi-protected conditions for high-value crop production. Risks may include health issues, as all commercially-produced bumble bees are imported and might act as vectors for exotic pests and diseases. The non-native bumble bees may present a risk of hybridisation or competition with native bumble bees, though to date there has been no evidence of this occurring in the UK. In addition, red mason bee cocoons are produced in the UK and sold for pollination use in gardens and orchards; it is currently unclear whether they present health risks to other pollinators.

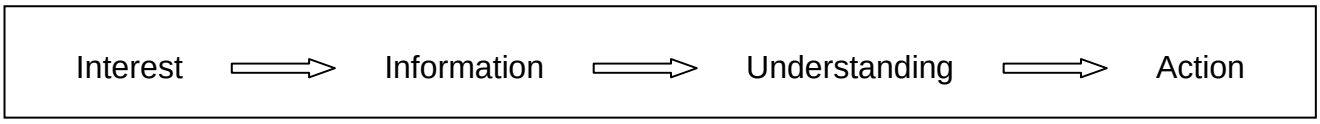
53. Recent evidence of pests and disease risks from commercially produced bumble bees indicated that some of these colonies carried pests and diseases with the

potential to spread to wild pollinators (Graystock *et al*. 2013).[12] A follow-up study is planned by the same authors to clarify these findings and to investigate the impact of changes to production recently introduced by the producers. This emerging evidence needs to be considered against a background of uncertainty. In particular, we do not know whether the local wild pollinator population has a lesser or greater burden of pests and diseases than the commercially produced bumble bees; and whether pests and diseases which might be carried by the commercial bumble bees have the potential to cause significant losses to the local wild pollinator population.

54. The Non-native Species Risk Assessment for imported non-native bumble bees, indicates a medium overall risk to native bumble bees at a high degree of uncertainty, reflecting the limited availability of evidence (http://www.nonnativespecies.org/index.cfm?pageid=143 or http://www.nonnativespecies.org//downloadDocument.cfm?id=866). Defra is currently reviewing policies on the release of commercially–produced bumble bees and whether to take a more precautionary approach to reduce these risks whilst limiting any impact on the commercial production of greenhouse crops (like tomatoes and peppers) and soft fruits, for which these pollinating agents are essential. Policy decisions are expected during 2014. As with other pollinator issues, controls over commercially produced bumble bees will continue to be considered in the light of emerging evidence.

Engaging the public and sharing knowledge

55. The Government's role in producing a National Pollinator Strategy is to maximise the benefit of the public awareness of the threats facing bees and other pollinators. We plan to achieve this with the 'Call to Action', as described above. Promotion of the 'Call to Action' by partner organisations and others will support our aim of improving the public journey from interest to action, making sure that action is informed:



[12] Graystock, P., Yates, K., Evison, S. E. F., Darvill, B., Goulson, D., Hughes, W. O. H. (2013), The Trojan hives: pollinator pathogens, imported and distributed in bumblebee colonies. Journal of Applied Ecology, 50: 1207–1215. doi: 10.1111/1365-2664.12134

56. In the interim before the 'Call to Action' package is published, members of the public could consider the following actions to provide the essential needs of bees and other pollinators:

- **Growing more flowers**. Bees and other pollinators need pollen and nectar from flowers to eat. A large range of plants (wild flowers, herbaceous perennials, shrubs and trees) offer these essential foods for pollinators, but not all flowers produce pollen and nectar, so check before planting. Most pollinator species are active from March to October, so they need flowers for food throughout that time. Advice on this is currently available from the Royal Horticultural Society who have compiled two downloadable plant lists (Perfect for Pollinators) to help gardeners identify plants that will provide nectar and pollen for bees and many other types of pollinating insects. http://www.rhs.org.uk/Gardening/Sustainable-gardening/Plants-for-pollinators

- **Spraying safely.** Following good practice advice on the use of pesticides. Advice for gardeners on the responsible use of pesticides including on disposal and minimising use, is provided on the Government's website. http://www.pesticides.gov.uk/guidance/industries/pesticides/user-areas/garden-home#Alternatives.

57. Sharing knowledge and scientific evidence between the science community, conservation practitioners and NGOs is important to ensure that ongoing and new actions and the 'Call to Action' advice to support pollinators are based on up-to-date evidence.

58. The actions we propose to engage the public and to improve the sharing of knowledge are:

Policy actions	**Lead/**participant	When
17. Members of the public to consider planting a range of flowers and other plants in their gardens, balconies or window boxes to provide nectar and pollen as a food source for pollinators.	**Members of the public** based on the 'Call to Action' advice when ready	2014 onwards
18. Develop options to improve knowledge share on pollinators' needs between scientists, conservation practitioners and non-government organisations.	**Defra** working with the science community and all interested parties	2014 onwards

Improving our understanding of the status of pollinators and the service they provide

Introduction

59. Chapter 2 noted that one of the important components of the Strategy is to address the key gaps in our understanding about pollinators. In particular, their status and the relationship between this and the benefits they provide. This lack of data has led to a high level of uncertainty in models of the benefits of pollinators, and projections for the future security of those benefits, as they are necessarily based on assumptions that are currently hard to verify. Annex 1 provides an overview of our current understanding about pollinators.

60. Given the complexity of the issues, we want to take a stepwise approach to addressing the evidence gaps combined with key review points to assess whether it is worthwhile continuing. This allows us to build to a more considered evidence base whilst closing off approaches that either will not deliver scientifically or can be replaced by a more cost-effective approach.

61. The following questions summarise the main evidence gaps:

1) What is the current status of [important] insect pollinators and what are the options to assess changes in status over time?
2) How do we future-proof a cost-effective, fit for purpose pollinator monitoring system (to 2025+)?
3) Are pollination services in crops and wild flowers adequate or in deficit – how do we assess changes in pollination services and whether we are near a tipping point?
4) Do we have a full picture of the key drivers of change in pollinator status and services and the interactions between these factors?
5) What are the effects of neonicotinoids on populations of wild and managed pollinators in field?
6) Whether and how farmers will change their practices in response to the recently enacted restrictions on the use of neonicotinoids?
7) What are the threats to our native pollinators from commercially- produced bumble bees (used commercially in horticulture)?

62. In the rest of this section, we set out proposed evidence actions on monitoring, valuing pollinators and on pesticides. The proposals were considered and supported by the Pollinator Expert Advisory Group chaired by Professor Charles Godfray which was set up in summer 2013 to advise Government on the scientific evidence necessary to support the Strategy.

Monitoring

63. Table 1 shows our proposed six actions to develop and implement a fit-for-purpose and sustainable long-term monitoring programme on pollinators, building on existing insect monitoring programmes. Annex 4 provides further background on existing monitoring programmes and factors we will consider in developing a programme.

Table 1 – To develop a fit-for-purpose and sustainable long-term monitoring programme

Evidence priority actions	Outcomes	**Lead/**participants	Timeframe
1. Develop and test a new systematic and sustainable monitoring framework for pollinators that can be implemented by volunteers (citizen science) and professionals. The work will develop and field test repeatable methods, design a sampling framework, building where possible on existing activity; and identify who and how future monitoring will be implemented.	New framework will be used to determine the current status of our pollinators, establish how this has varied over time and for future monitoring of status.	**Defra (**lead funder) and a wide range of partners involved in current monitoring schemes.	2014 to 2016
2. Implement new monitoring scheme(s). Field testing of the new monitoring framework (from 2014 to 2016) to ensure it works followed by deployment by volunteer recording schemes and professional monitoring groups (from 2016).	Baseline on current status and recent trends to be established between 2016 and 2019.	To be confirmed. Defra is discussing with the agencies and researchers	2016 to 2019
3. Continue ongoing work with volunteer recording schemes to improve standards in data collection, management and analysis for pollinators and other species. (Note: Data collected to include metrics appropriate for long-term tracking of trends in the status of pollinators and pollination service as informed by projects 1 and 2 above as they deliver.)	On-line capture of data from volunteer schemes and consolidation into single source of data accessible to other volunteers, scientists and the public.	**Defra,** Joint Nature Conservation Committee, Natural England, working with volunteer recording schemes	From 2014
4. Expand the pool of taxonomic expertise and capability for identifying insect pollinators to ensure that longer term we have access to experts able to identify the many species of pollinators in the UK.	Maintenance of taxonomic expertise over the longer term to ensure provision of experts who can identify pollinators.	To be confirmed.	From 2014/15

Table 1 – To develop a fit-for-purpose and sustainable long-term monitoring programme			
Evidence priority actions	Outcomes	**Lead/**participants	Timeframe
	This is as an essential part of the new monitoring framework for pollinators.		
5. Improve understanding of who participates in volunteer recording schemes and their motivations to aid recruitment of additional volunteers into new monitoring schemes on pollinators (such as surveying pollinator species on farmland or degraded habitats)	Recruitment of additional volunteers to undertake new aspects of volunteer monitoring schemes	**Defra** (lead funder) and volunteer recording schemes.	From 2014/15
6. Support long-term storage of insect specimens from research project funded by the Insect Pollinators Initiative in anticipation of improved identification technology and potentially leading to lower cost monitoring programmes for pollinators in the future.	Contributes to the development and testing of new lower-cost and fast throughput technology for identifying insects which could bring significant benefits to future monitoring programmes.	**Defra with partners** who fund the Insect Pollinators Initiative are discussing with the Natural History Museum.	2014/15

64. Adequate monitoring that identifies the direction and strength of change in pollinator status and pollination service is the first step towards determining actions that may address any trends identified. We will consider follow-up work on determining the drivers behind these changes and the effects of policies on reversing undesirable trends or reinforcing positive ones; this will build on the results from the Insect Pollinator Initiative (IPI) which will start to be available from 2014.

Valuing Pollinators

65. We want to improve our understanding of (1) the relationship between the economic benefits from pollination and the status of pollinators, and (2) the indirect benefits of pollinators to the public. As with our proposed approach to monitoring requirements, the knowledge gaps will be addressed in stepwise fashion to ensure that each part of the evidence gathering builds on a well understood base and to ensure that later projects are achievable and cost effective. The key evidence question is:

- Are pollination services in crops and wild flowers adequate or in deficit – how does this vary between crops and wild flowers; how do we assess changes in

pollination services; what are the drivers of change; and, are we near a tipping point?

66. Table 2 shows our proposed three actions to address this question. Annex 4 provides further background in support of these actions. In particular the rationale for undertaking feasibility and scoping studies in this area. We will consider the results from the IPI to help inform the specifications of the scoping studies outlined in this section.

Table 2 – To improve our understanding of the benefits from pollinators

Evidence priority actions	Outcomes	**Lead/**participants	Timeframe
7. Feasibility study on need for and practicality of conducting primary research on the relationship between pollinators and pollination service in the cropped environment. [Subject to the feasibility study, we will aim to either commission follow-on research or reassess how we can proceed in the absence of data.]	Improved understanding of how changes in pollinator status and services impact on crop production and economic benefits.	**Defra** (lead funder)	2014/15
8. Scoping study to consider the benefits of research on ecology of pollinator/wild plant interactions. This will include identifying the evidence gaps and assessing whether basic ecological research on the relationships between pollinators and wild plants is necessary to guide policy development.	Improved understanding of how changes in pollinator status and services impact on wild plants and the wider ecosystem.	**Defra** (lead funder)	2015/16
9. Study to develop a framework for assessing the indirect benefits and the socio-cultural value that the public gain from pollinators, such as fruits and berries contributing to a healthy diet and the contribution of pollinators to nature-rich environments leading to improved health and well-being.	Values for these indirect benefits and the socio-cultural value of pollinators would provide a tool to assist the prioritisation of policy actions on helping pollinators.	**Defra** (lead funder)	2015/16

Pesticides, including neonicotinoids

67. In May 2013 the European Commission adopted Regulation 485/2013 which from 1 December 2013 prohibits the use of three neonicotinoid insecticides (clothianidin, imidacloprid and thiamethoxam) on crops visited by pollinators. The decision will be reviewed in 2015 on the basis of the scientific evidence then available. The Regulation sets a number of data requirements to be addressed by agrochemical companies. There has been concern that bees and other pollinators collecting pollen and nectar from crops such as oilseed rape and sunflower, and pollen from maize, may suffer unacceptable sub-lethal effects from exposure to these three insecticides.

68. The evidence base underlying these decisions is chiefly from laboratory studies, and chiefly from work on honey bees. Although there are a number of regulatory field trials, these were not considered in the EU assessment as it was considered that they did not fully meet the developing requirements. The UK did not support the European Commission proposals because our assessment of the available evidence was that the risk to bee populations from neonicotinoids was low. The immediate key evidence question is:

    1) What are the effects of neonicotinoids on populations of wild and managed pollinators in field conditions (to be addressed by the pesticide manufacturers)?

69. Table 3 shows two proposed actions to address this question. In relation to action 10, Defra is considering whether further work is required to produce robust evidence and will be discussing this with stakeholders. We are also participating in the work of the European Food Safety Authority (EFSA) and the European Commission to draw up new guidance on the risk assessment of pesticides in relation to bees.

70. It is not only neonicotinoids that are toxic to pollinators. There is therefore a need to understand more fully the impacts of other pesticides on pollinators in field conditions. The EU process for assessing this risk and for taking regulatory decisions is currently being updated and, over time, the risk assessment of all pesticides will be brought up to the new standards.

Table 3 – To understand the effects of neonicotinoids on pollinators in the field and impacts of restrictions on neonicotinoids on farmers' decisions on cropping

Evidence priority actions	Outcomes	**Lead/**participants	Timeframe
10. Determine the effects of neonicotinoids on populations of wild and managed pollinators in field	This new data will inform the European Commission's 2015	**Pesticide manufacturers.** Possible role for	From 2014

Table 3 – To understand the effects of neonicotinoids on pollinators in the field and impacts of restrictions on neonicotinoids on farmers' decisions on cropping			
Evidence priority actions	Outcomes	**Lead/**participants	Timeframe
conditions.	review of the current restrictions	others (to be confirmed)	
11. (ongoing project) to assess the impact of the restrictions on neonicotinoids on farmers' decisions on cropping, pesticide use and other management changes. [Over a longer timescale, changes in use of pesticides will be captured through surveys such as the Pesticide Usage Survey.]	Establish whether and how farmers and growers are changing the crops they grow and their crop protection methods, including using different pesticides.	**Defra**	2014/15

Commercial bumble bees

71. In relation to commercial bumble bees, given the potential risks to other pollinators as discussed in paragraphs 52 to 54 of this Chapter, it would be useful to better understand the risks that they might present through a critical review of the evidence. Defra is considering whether to proceed with this as part of an ongoing review of policy on the release of bumble bees for commercial pollination services which will include identifying evidence gaps. This will take into account ongoing work in this area which the Bumblebee Conservation Trust and others are supporting. Table 4 shows our proposed action on this issue.

Table 4 – to improve our understanding of potential risks from commercially produced bumble bees to other pollinators			
Evidence priority actions	Outcomes	**Lead/**participants	Timeframe
12. A critical review of the evidence on risks posed by commercially produced bumble bees on other pollinators taking into account ongoing work in this area and identifying evidence gaps	To help inform Defra's ongoing review on the release of bumble bees for commercial pollination.	**Defra**	2014/15

Chapter 4 Delivering the Strategy and measuring success

72. The proposed Strategy will provide the framework for a wide range of national and local organisations, businesses, NGOs and individuals to work together. Government and its agencies will play a leading role in coordinating delivery of the Strategy, but cannot achieve success alone. To ensure success we want to draw on the skills, experience and enthusiasm of all interested parties.

73. Delivery actions at all levels will be guided long term by the Strategy's vision and the aims for the next 10 years; and in the shorter term by the 'Call to Action' package and priority actions.

74. Defra will be accountable for overall delivery of the Strategy, including investing in addressing key evidence gaps with other potential funders. Natural England will lead delivery, with assistance from other organisations, as part of its delivery role for Biodiversity 2020.

75. Defra will work with key partners to develop a rolling delivery plan, looking three years ahead, shared between Government and stakeholders, to be in place within six months of publication of the Strategy. It will set out how to deliver priority actions and monitor their impacts. We will work with key partners to develop a fit-for-purpose governance structure in time for the publication of the Strategy, allowing us to manage, coordinate and report on delivery of the Strategy in England, providing clear accountability. We will coordinate policy development and implementation with the Devolved Administration through the Four Countries Biodiversity Group.

76. A number of initiatives under Biodiversity 2020 will also complement and support the local delivery of actions under this Strategy. For example, Local Nature Partnerships and Nature Improvement Areas.

Measuring success

77. To measure progress with policy implementation there needs to be a common understanding of the baseline from which we are starting and an agreed set of things to measure in the field, which, as the Status Report suggests, we do not currently have. Once we do (after actions set out in Chapter 3), we will be in a better position to assess the impact on the status of pollinators in the area where an action is taken.

78. In the interim period (next 5 years), we will measure progress with the Strategy through existing indicators and monitoring plans:

- the emerging pollinator indicator under the planned Biodiversity 2020 monitoring strategy. We will continue to develop and test this, to assess whether it can be used to report trends using existing or planned monitoring data, with a high degree of confidence. In addition, we are looking at whether and how to expand the Biodiversity Action Recording System so that land managers and others could capture their pollinator initiatives on these map-based records, assuming at a sufficiently large scale.

- extending the monitoring and evaluation framework for Nature Improvement Areas to include pollinators;

- monitoring of current agri-environment schemes and of the emerging new environmental land management schemes under CAP reform to assess whether they have a population-scale benefit for pollinators (and other wildlife).

79. We will report on progress with these indicators and monitoring plans through the governance structure for the Strategy.

One-year-on progress report

80. We will coordinate the production of a progress report with key partners on implementation of the Strategy in summer 2015 which will be one year on from its planned publication (following public consultation). Our aim would be for the report to include progress on implementing the delivery plan such as:

    - details of the development of partnerships with stakeholders to support delivery;

    - the latest policies in key areas which are currently in transition, such as in agriculture, and how these policies reflect the needs of pollinators;

    - progress with the uptake of the ‘Call to Action’ message by key partners;

    - progress with extending on-farm demonstrations of integrated pest management;

    - progress with establishing a coordinated monitoring programme; and,

    - progress with setting up a knowledge exchange network.

Annex 1 Our current understanding and the gaps

Introduction

1. This Annex sets out our current understanding of the status of insect pollinator populations in the UK, the drivers of population change and the implications of those changes for the pollination of crops and will plants. To understand whether our estimated 1500 or more species of insect pollinators are thriving, we need to:

    - Identify which insects or groups of insect species are important pollinators across different habitat types;

    - Collect and analyse data on:
        - occurrence and distribution of species across the UK; realising that resources and capabilities do not exist to do this at a high resolution for all species;
        - distribution, abundance or activity of insect pollinators, as a proxy for pollination services;
        - the state of pollination services for targeted plant species, particularly species grown as crops or those of conservation importance;

    - Better understand the relationship between pollinators and pollination services for crops and wild flowers.

2. We have some information on changes in **occurrence and distribution** of many insect species in the wider environment, but we lack information on trends in **abundance,** except for moths and butterflies. Knowledge of the status of pollinators on cropped land is especially sparse. We are therefore not able to state categorically whether pollinators are in trouble in the UK and whether this has implications for the pollination of crops and wild plants.

3. How we value the benefit that society gains from pollination is another area of uncertainty. Aside from honey and wax production, honey bees together with wild insect pollinators have a commercial value because they can boost crop yield and quality. Insects also have a value in wild plant pollination and an intrinsic or cultural

value[13] simply because we enjoy sharing our environment with them. More research is needed to determine the value of insect pollination to crops in the UK with greater accuracy. But research has estimated it at several hundred million pounds[14] (and this does not include social and environmental value).

4. Given the incomplete picture of the status of our pollinators, the impacts on pollination and the value of pollination services, a key aim of this Strategy is to address these gaps in our understanding (see proposals in Chapter 3).

The status of pollinating insects

Managed pollinators

5. UK honey bee colony numbers fell between 1985 and 2010 (Potts *et al* 2010b), following the arrival of the Varroa mite in the early 1990s. Over the last few years the number of colonies has increased in response to recent awareness campaigns run, for example, by the British Beekeepers Association. In 2013, over 28,000 beekeepers managing around125,000 colonies, were registered in England on the National Bee Unit's BeeBase database, compared with 15,000 beekeepers managing 80,000 colonies in 2008.

Wild pollinators

6. Although there has been no systematic monitoring covering all major wild pollinating insects in the UK, the Status Report sets out evidence for changes to populations of many wild insect species, based on analysis of data collected by thousands of expert volunteer recorders. Information on long-term changes in **abundance** of insect pollinators is limited to butterflies and moths. Although recording is not uniformly distributed across the UK, so that there is, at least for butterflies, a bias towards high value sites, the data strongly suggest a directional change in the last 35-40 years, with a greater number of species showing significant declines in abundance compared to those showing significant increases. Analysis of distribution data for butterflies show that declines have been coupled with losses of diversity in some areas. Butterflies and

[13] Social or cultural value refers to non-market value – the quantifiable benefit to people, who enjoy owning or seeing bees and other insects although there is no direct economic benefit. Intrinsic value also refers to less quantifiable moral values.

[14] The Decline of England's Bees (Breeze et al. 2012) provides a value of £510m per year; this updates the UK National Ecosystem Assessment 2011, which originally estimated the value at £430m

moths are unlikely to be important crop pollinators in the UK and the extent to which they can be used as indicators of trends for other insects is not well understood.

7. Information on abundance is not generally available for other insect species, although trends in **distribution and diversity** have been extracted from records of occurrence for bumble bees, other bees and hoverflies. These show:

    - Of the 25 UK species of bumblebee, eight have undergone major range contractions since 1950, three are considered extinct and there has been one colonisation and one re-introduction;
    - The diversity of bumble bee and solitary bee species has fallen over the last 40 years in Great Britain, with some areas are showing an increase in diversity, but a significantly greater area is showing a decline[15] (with some evidence that this trend is slowing or is starting to reverse);
    - The diversity of hoverflies has declined in some local areas, with some evidence of increasing dominance of a few more common species.

8. Loss of richness and diversity is an important issue in itself, and species that have contracted in range are also likely to have reduced in number, but the extent to which impacts on pollination service have been offset by increases in range or abundance of more common species of bee or hoverfly is unknown.

9. Reduced abundance or diversity of insects is often correlated with higher land-use intensity. This is sometimes used to infer declines, given that there has historically been a process of agricultural intensification in England which coincided with extensive home and road building activities (1930 – 1990). However, the extent to which this is driven by loss of semi-natural habitat or other agricultural practices and its relevance to more recent trends is largely unknown with some evidence that declines in certain groups have halted or are starting to reverse (Carvalheiro *et al.,* 2013).

The drivers of observed or inferred trends

10. Wild and managed pollinators face a number of environmental pressures, which are set out in the Status Report. These include agricultural land use change, pesticide use, urbanisation, pests and pathogens, invasive non-native species and climate change. We have limited understanding of the relative importance of these pressures and how impacts vary between different pollinator groups.

[15] Declines in diversity are likely to be correlated with significant range contractions for specialist species associated with natural or semi-natural habitat or narrow forage requirements;

11. Within this overall context of uncertainty, there are things we do know. There is strong evidence that habitat loss and fragmentation in our countryside and urban areas, have driven declines in abundance or range of many species and that increasing the proportion of semi-natural habitat within the farmed landscape can increase insect abundance and diversity within the crop (Winfree *et al.* 2009; Warren *et al.* 2001; Fox 2013; Pywell *et al*. 2012). We also know that managed honey bees face continued threats from pests and diseases, and exotic threats such as the Asian hornet. Policies that provide restoring nesting and foraging habitat in the countryside and urban areas for wild and managed pollinators, and responding to honey bee pests and diseases are therefore important for sustaining pollinators.

12. There is good evidence that agri-environment schemes benefit pollinators (Scheper *et al.*, 2013; Batary *et al*., 2011; Potts *et al.,* 2009). However, whether this is just that pollen and nectar sources are attracting existing populations of pollinators into the crop or whether there is an impact on the wider population is uncertain. There is some emerging evidence of population effects for bumble bees and solitary bees (Heard *et al*., 2007; Heard *et al.* 2008; Kleijn *et al*., 2011), and although this is an area that would merit further study, it seems prudent to continue to carefully target land-management schemes.

13. The Campaign for the Farmed Environment promotes a voluntary approach to environmental land management, with 22 management measures designed to protect wildlife, water and soil. In 2013, 677,000 hectares were managed under the unpaid environmental measures listed[16]. Although there has been no specific monitoring of pollinators, uptake of habitat that provides resources for pollinators has been substantial. For example, over 230,000 hectares fertilizer-free permanent pasture were recorded, over 6,000 hectares of unsprayed and/or unfertilized cereal headlands, and over 2,000 hectares each of wildflower mixes, pollen and nectar mix and flower-rich temporary grass.

14. Habitat requirements to support pollinator populations in urban areas have been identified as a key knowledge gap (Dicks *et al*., 2012). As with agri-environment schemes, there is some evidence of benefits for pollinators through improved management of gardens (Osborne *et al*., 2008; Dicks *et al*., 2010; Samnegard *et al*., 2011). Further research is underway, and will allow us to modify to the management practices as new research on best approaches emerges.

[16] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/207446/landenvmanagement-statsnotice-18jun13.pdf

15. There is an immediate requirement to improve the evidence on the effects of neonicotinoids and other pesticides. The emerging results from the Insect Pollinators Initiative will further inform our understanding of drivers of change.

The implications for pollination services

16. The implication of changes in pollinator populations for the pollination of crops and wild plants is a final source of uncertainty. For wild plants we know that there has been a greater decline in the occurrence of insect pollinated plants compared to other plants, but it is not clear whether this is a causal relationship (loss of insects driving loss of plants) or correlative (with other factors, such as reduced habitat extent or condition, driving both). We need to maintain surveillance of key species of wild plants and better understand the nature of the relationship between wild plant and pollinator trends to help us conserve wild plants.

17. For crops, we do not fully understand how pollinator abundance, composition and diversity regulate crop yield or quality. We do know that low levels of pollination can result in a loss of yield or quality, for example in fruit crops or oil seed rape, but we do know the scale or magnitude of any risk. Some areas of the country show patterns of depressed functional diversity of insect groups (Woodcock *et al*, 2013)[17] and this may guide targeting of measures to manage any risk.

Summary

18. In summary, we know that there has been a decline in the abundance of some pollinating insects over the last 50 years, and that others have contracted in range. We suspect that wild bees and other pollinators are generally less abundant and widespread in the landscape than they were a few decades ago, but we need to do more to establish recent and ongoing trends with greater confidence. We know that habitat loss has been a key driver of change to pollinating insect populations, and that restoring habitat features works well to support pollinators. Other drivers of change may be becoming more important, and this is an area of active research.

19. We need to do more to better understand the relationship between pollinators and pollination, and design effective monitoring. We need to understand what more we can do to efficiently manage the risk to pollination services for wild plants and crops. With this improved understanding we may be able to target and refine existing and new

[17] Functional diversity refers to how diverse a particular population in relation to its pollination service (for example a more diverse community will have a greater number of species that are on the wing at different periods, providing a longer-term pollination service)

policies to enhance outcomes for pollinators in their own right as well as mitigating risks to crop pollination.

20. The gaps in our understanding highlighted in this Chapter are broadly consistent with those identified in the November 2013 report by the European Food Safety Authority (EFSA) 'Towards holistic approaches to the risk assessment of multiple stressors in bees'. This was a report from an EFSA scientific colloquium in May 2013 attended by 115 international scientists and stakeholders from 23 countries, including from outside the European Union.

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Annex 2 - Current policies and initiatives relevant to supporting pollinators in towns, cities and public land

Chapter 3's section on actions to support pollinators in towns, cities and public land indicated that these actions would build on a wide range of current policies and initiatives which are directly or indirectly relevant for pollinators. These include:

- Government policies on habitat and species conservation which are directly and indirectly beneficial for pollinators. As part of Biodiversity 2020, we are improving existing and creating new priority habitat to benefit species and helping vulnerable species with particular needs through more targeted action. We are also seeking to establish a coherent and resilient ecological network across the country which will be beneficial for all wildlife. The 12 government-funded Nature Improvement Areas (NIA) are examples of this approach and our plan is for more locally identified NIAs to become established. We are currently exploring how the New Environmental Land Management Scheme as part of CAP reform could incorporate a similar approach to NIAs.

- Public authorities can also help species and habitats through the biodiversity duty under section 40 of the Natural Environment and Rural Communities Act (2006). In addition specific commitments under the Natural Environment White Paper (2011) are also potentially beneficial for pollinators, such as establishing green corridors along roads and railways (see Annex 3).

- Government policy on planning. The National Planning Policy Framework (2012) requires planning authorities to promote the preservation, restoration and re-creation of priority habitats, ecological networks and the protection and recovery of priority species populations. It prescribes that local plans should have a clear strategy for enhancing the natural, built and historic environment and supporting wider biodiversity networks. The Government has recently consulted on options for the greater use of biodiversity offsetting, a system which ensures that, when there is residual biodiversity harm from development, it is compensated for fully and transparently. It is possible that organisations seeking to establish habitats or havens for pollinators could offer those as "offsets" and so have them funded through the development system.

- Defra and Natural England are working closely with the Department for Transport and High Speed 2 (HS2 Ltd) to look for opportunities to address the effects of loss of habitat during construction of the new line. Compensatory habitat created will seek to maintain and enhance existing ecological networks, by enhancing existing

core areas, providing new core areas, and/or promoting links between remaining areas of habitat. This will include compensatory habitat that will be suitable for a range of pollinator species including butterflies and bumble bees.

- The creation and management of pollinator habitats along the 109 km of High Speed 1's railway line from St Pancras Station through Kent to the Channel Tunnel. This includes 45ha of grass and wild flower meadow, 1.2 million native trees and shrubs and 40km of new hedgerow among other plantings.

- Initiatives taken by government departments in the management of their premises and wider estate, such as the Ministry of Justice whose Ecology Team has implemented a number of pollinator actions including at their custodial sites.

- Thames Water's partnership with the Bumblebee Conservation Trust to introduce bee friendly planting and habitat at water treatment works and other operational sites.

- A range of initiatives and ongoing campaigns by national and local groups to promote pollinator-friendly planting in our towns, cities and wider environment, such as the Co-operative, Friends of the Earth, the Soil Association, the Wildlife Trusts, the RSPB and others such as Garden Organic's emerging work with Sustain to promote pollinator friendly spaces in London boroughs. Case studies are available on how local authorities are currently changing their planting schemes to help pollinators such as those included in the Bumblebee Conservation Trust's local authority pack.
  http://bumblebeeconservation.org/images/uploads/Local_authorities_pack_full.pdf

Annex 3 Management of towns, cities and public land – examples of agreed actions by land managers

Chapter 3's section on actions to support pollinators in towns, cities and public land indicated that several businesses and organisations have agreed to take actions to support pollinators. Details of these actions are:

- The Highways Agency will look for opportunities to expand pollinator-friendly planting and management across their green estate based on 'Call to Action' essential pollinator requirements. Their second biodiversity action plan (2014) will include specific needs of insect pollinators. They will look for opportunities in their contracts for new planting for major works to include essential pollinator requirements.

- Network Rail will look for opportunities to incorporate pollinator-friendly good practice in its line-side management based on 'Call to Action'.

- As part of the pilot transport green corridors project in two Nature Improvement Areas in Northern England, Network Rail, the Highways Agency and Natural England will look at the potential for managing and enhancing the soft estate to benefit pollinators and their supporting habitats within the pilot areas.

- Subject to an agreed monitoring and sampling protocol, Network Rail and the Highways Agency have agreed that their estates could be considered for sample plots as part of any coordinated monitoring programme on pollinators.

- The Environment Agency is aiming to establish pollinator-friendly vegetation management and cutting regimes as operational policy across all its assets, such as sea walls and flood defences, based on the 'Call to Action' package.

- Ministry of Defence Estate Managers have agreed to build on their existing vegetation management practices across their 238,500 ha estate (30% of which has formal designations under environmental protection legislation such as Sites of Special Scientific Interest), including expanding pollinator-friendly planting and habitat improvement (as far as practicable and within operational constraints). They have also agreed to participate in any coordinated monitoring programme on pollinators.

- The Association of Local Government Ecologists (ALGE) and the Local Government Association will circulate advice and guidance to local government groups and to other specific local government groups with an interest in biodiversity and the natural environment.

- ALGE has also agreed to identify a suitable clause on pollinator-friendly vegetation management and habitat improvement/establishment for inclusion in local authority contracts, and in 2014 will circulate to ALGE members across local authorities for inclusion in these contracts.

- The Landscape Institute (the Royal Chartered institute for landscape architects which is a professional body and educational charity with 6000 landscape architects as members – a profession which includes designers, scientists, managers and planners. It works to protect, conserve and enhance the natural and built environment for the public benefit) has agreed to share the Strategy and the 'Call to Action' package to its members including through their journal and fortnightly e-news, as well as through their Twitter account which currently has almost 12,000 followers from the fields of landscape, ecology, planning and architecture.

Annex 4 Additional information on proposed evidence actions described in Chapter 3

Proposals to develop a fit-for-purpose and sustainable long term monitoring programme

1. We are not starting with a blank sheet of paper as the UK is already well served by many insect monitoring programmes, although most are not pollinator-specific and tend to focus on occurrence of species (not abundance). Most records are collected by skilled and dedicated volunteers through recording schemes such as the Bees, Wasps and Ants Recording Society and the Hoverfly Recording Scheme. Records are also collected through Local Record Centres funded by Local Authorities, Wildlife Trusts and Government Agencies. National coordination of recording schemes is undertaken by the Biological Records Centre (BRC), funded through a number of routes including the Natural Environment Research Council, EU, Defra and JNCC. The BRC promotes and enables non-native species recording and testing of systematic monitoring approaches. In addition, the National Biodiversity Network provides a national network for the exchange of biodiversity data. There is also a number of nationwide surveys, such as the Countryside Survey and Environmental Change Network. On honey bees, the British Beekeepers Association carries out a winter survival survey every year as an indicator of the health of honey bee colonies, and the NBU carries out an annual husbandry survey which includes questions on colony losses. A fuller overview of current monitoring in the UK is given in the supporting document published alongside this consultation document (link).

2. As part of implementing Biodiversity 2020 and assessing its impacts, Defra has been working over recent years with key organisations from the volunteer and professional monitoring community to identify shared priorities and to ensure better coordination of action and investment in data collection, management and assessment. The next stage will be to consider how to work with the community to refine current schemes to provide a greater focus on pollinators

Factors to consider in designing a monitoring programme

3. In designing a pollinator monitoring programme to assess the current status and how it is changing, it is important that we build on current programmes to support an approach that combines voluntary (citizen science) and systematic monitoring if it is to cover the breadth and depth needed and be sustainable. Additional questions to consider in designing a sustainable programme are:

- Which species are the most important as pollinators and what is/are the most important metric(s) for assessing the status of pollinator service provision? A sustainable programme cannot monitor all of the 1600 or so species of pollinators in a meaningful way. Therefore, on the grounds of cost effectiveness, it is important to identify the subset of insect species that are most important as pollinators and hence require enhanced monitoring compared to other insects.

- What do we want monitoring to tell us about the current status of pollinators and changes in status over time, and hence which parameters of pollinator populations to monitor? It is easy to think of abundance, i.e. simple numbers of insects, but this might tell us little when comparing areas around the country if the species make up of one area differs significantly from another and a given number of one species cannot directly substitute for the same number of another, i.e. 20 honey bees may not be equivalent to 20 hoverflies in terms of pollination service. Consequently, it is necessary to consider other metrics that may be correlated with abundance but give a better measure of pollination value. Such metrics may include frequency of flower visits, diversity, species abundance and functional diversity.

- How best to ensure that voluntary contribution to monitoring and built up and supported as a valuable part of the flow of high quality information about the status and trends in pollinators over the longer term? This recognises that voluntary monitoring will have an important role sitting alongside some systematic monitoring on an ongoing basis. There are a number of areas where taking a pollinator-centric view could have a significant impact on the usefulness of the data from voluntary citizen-based recording schemes, and these are described in the next section.

4. We recognise that we need to anticipate new developments in identification technology as this could lead to reductions in the costs of monitoring in the longer term. It is not currently cost effective to screen large numbers of insect specimens using molecular techniques such as DNA analysis. However, such technologies are constantly being improved in terms of throughput rate and lower costs per sample. It is likely that over the next 10-15 years such approaches will be viable for making species determinations from large-scale mixed-catch samples. In anticipation of these developments, we are collaborating with the Natural History Museum and the members of the Insect Pollinator Initiative to support long-term preservation and stable storage for specimens. Where possible we will support and encourage innovations in new technology and in rapid methods for insect identification in collaboration with other funding bodies.

Developing citizen-based approaches to monitoring insect pollinators

5. As described in Chapter 3 to design a sustainable monitoring programme we need to look at how best to bolster the contribution of citizen-science. There are a number of areas where taking a pollinator-centric view could have a significant impact on the usefulness of the data from citizen-based recording schemes:

    - Validating models that predict abundance from the occurrence data (of which there is a wealth). The Biological Records Centre is currently implementing a programme of work on this topic and we will look for opportunities to accelerate this work.

    - Improving scheme coordination. There is an ongoing programme of work on on-line data capture and consolidation into a single data infrastructure. We will continue to encourage uptake among recording schemes. Additionally, as the technology improves for web-posting of images to receive either an automated or expert determination, a single entry point will facilitate triaging of submissions to maximise the efficient use of taxonomic expertise.

    - Building and maintaining expert taxonomic capability. We propose a tiered approach to taxonomic capability with activities to impact each part of the structure. At the pinnacle are professional experts, these will always be relatively few in number, but in collaboration with other funding bodies we will seek to sponsor taxonomic studentships to ensure succession planning as well as widening of expertise. The next tier will consist of volunteer expert taxonomist “champions”. For this group we will look to supporting the provision of training and identification materials to improve and broaden their skills. The champions will be expected to engage the foundation tier, the interested amateur, to develop their skills and ultimately move up through the tiers.

    - Developing understanding of the citizen-science resource base. Different types of monitoring require people with different motivations. For example, volunteers may wish to monitor a species-rich semi-natural area to make the first records of particular species, whilst others may be prepared to survey more degraded habitats as part of the contribution to an overall picture. It is important to understand this diversity of drivers for citizens and to use this knowledge to ensure all monitoring requirements that can be covered by citizens are supported.

Proposals to improve our understanding of the benefits from pollinators

6. Pollinators are valued for a wide range of reasons (environmental, economic, cultural and social or intrinsic value to the public), however, the relationships between these values and the status of pollinator populations are poorly understood and in many cases the magnitude of the value is unknown or at best highly uncertain. In relation to economics as mentioned in Chapter 3, we currently have no evidence of a deficit in pollination services or in crop yields.

7. The relationship between the economic benefits from pollination and the status of pollinators is likely to be highly variable depending on the prevailing conditions in any area/time period and will be confounded by a large number of factors. In practice it may not be possible to define the relationship between pollinators and their economic impact precisely enough to be of practical use. Similarly, even if it is scientifically possible to describe the relationship, the costs of acquiring the necessary data may far outweigh the benefits that can be gained from the information produced. Consequently, we will undertake a feasibility study to investigate the viability and cost-benefits of generating data in this area. This work will contribute to our further understanding of valuing how changes in pollinating services impact on changes in production.

8. The proposed feasibility study will build on work already undertaken on the direct economic values of pollinators taking into account the options both for substituting crops within the UK, should they become unviable through pollination deficit, and the costs of importing such crops from elsewhere. The benefits of pollinators (e.g., hoverflies) as predators of insect pests would also need to be considered. The feasibility study will also catalogue the data that would be required to be collected and provide putative, costed, designs for the field studies that would actually answer the question. Depending on the outcomes of the feasibility study we will aim to either commissioning follow-on research or reassess how we can proceed in the absence of the data.

9. Given the difficulty in determining the relationship between crop outputs and pollination service it is not surprising that the analogous gaps in knowledge about pollination service and effects on wild plants are even greater. It is likely that other major factors, such as habitat loss, are driving changes in populations much more than pollination deficit. However, there is a fundamental lack of knowledge on the basic ecology of wild plants and their interactions with pollinators. We will therefore look at undertaking a scoping study to elucidate the precise nature of the evidence gaps and whether basic research on the ecology of the relationships between pollinators and wild plants might be warranted.

10. Valuing pollinators must be about more than simple economics and the indirect benefits that citizens gain from pollinators and their contribution to natural ecosystems needs to be better explored. Again, this is not a simple question as it ranges from pollinators' contributions to pollination of fruits and berries (including wild species), which can help with providing a healthy balanced diet, to the benefits that are not typically valued by the market, including aesthetically pleasing landscapes that are important in the general wellbeing of humans.

11. To identify these indirect benefits and to consider methodologies for assessing their relative, if not absolute, worth, we will undertake a scoping study and develop a framework for assessing the socio-cultural value of pollinators. By developing such values, this will help us to understand how value may be changing naturally. It will also provide a tool that allows for assessing changes in value resulting from different pollinator actions. This will enable a comparison of changes in value to be considered alongside the costs across society of different actions – and will therefore act as a useful tool to prioritise actions.