

Towards a resilient ecological network: a case study from national plans in England

Georgina Mace

University College London

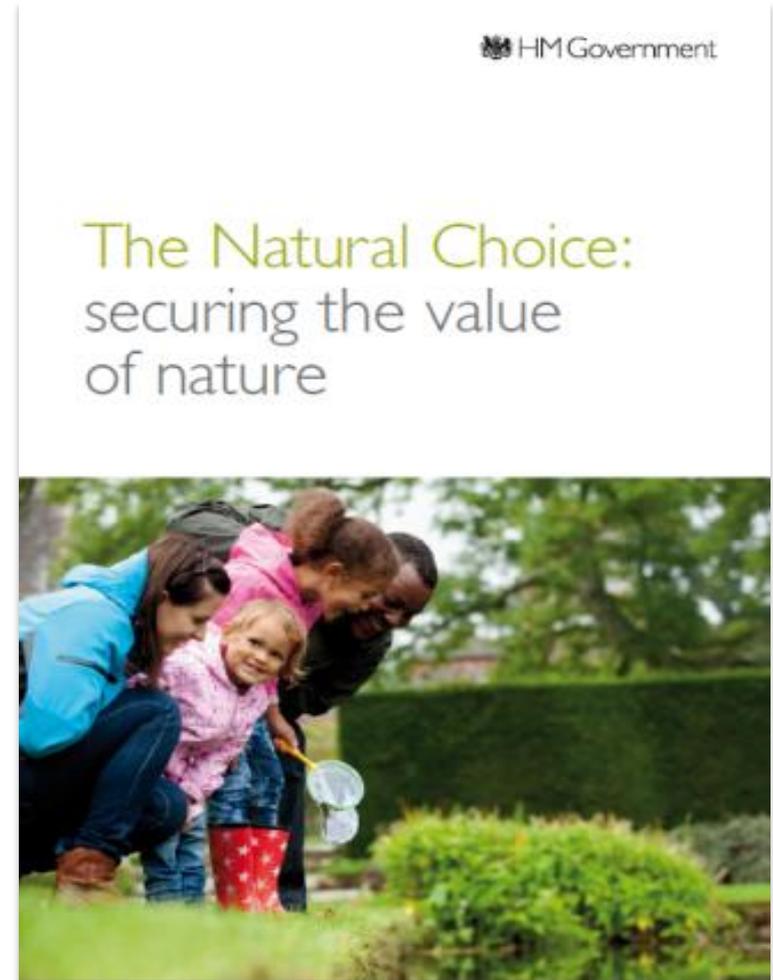
CIEEM Autumn Conference

Glasgow

20th November 2018

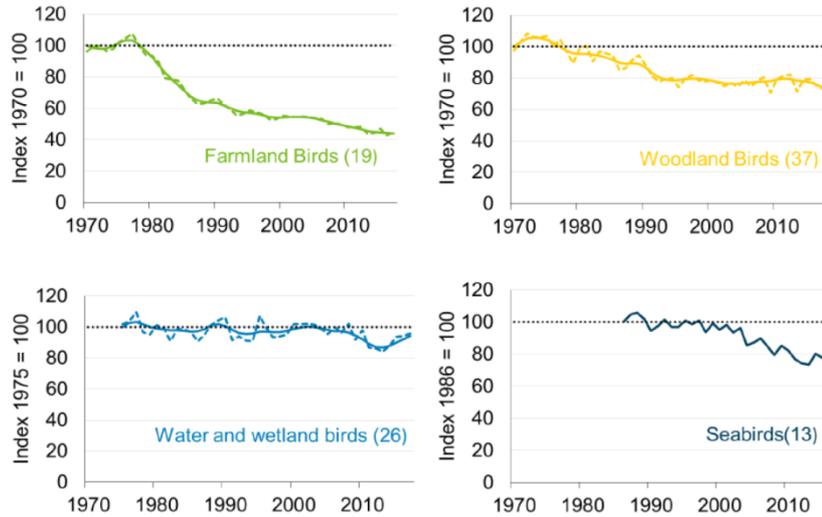
The Natural Environment White Paper 2011

“to be the first generation to leave the natural environment in a better state than it inherited”



UK Species trends since 1970

Figure 1a: Populations of wild birds in the UK by habitat, 1970 to 2017




Department
for Environment
Food & Rural Affairs

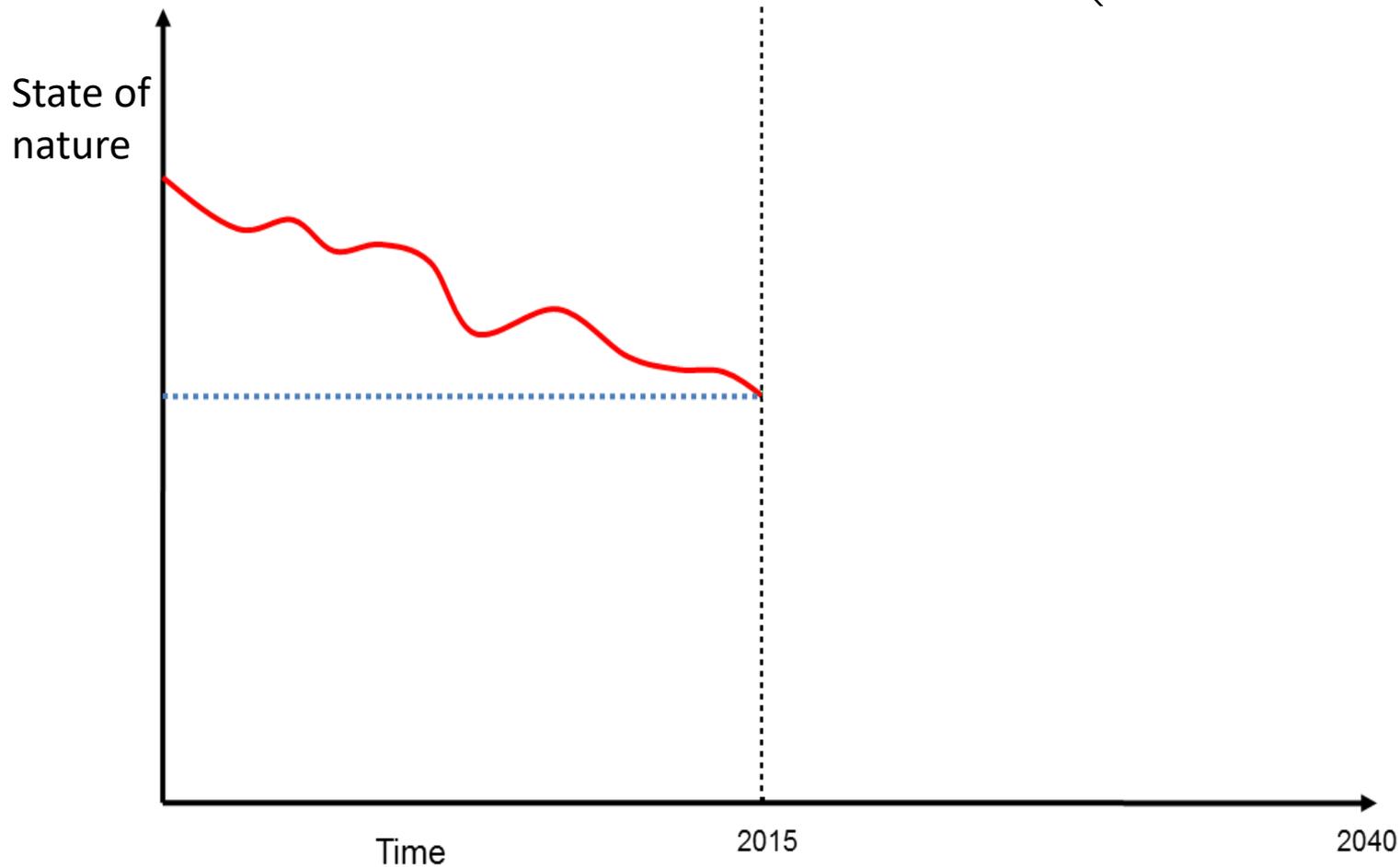


Wild Bird Populations in the
UK, 1970 to 2017



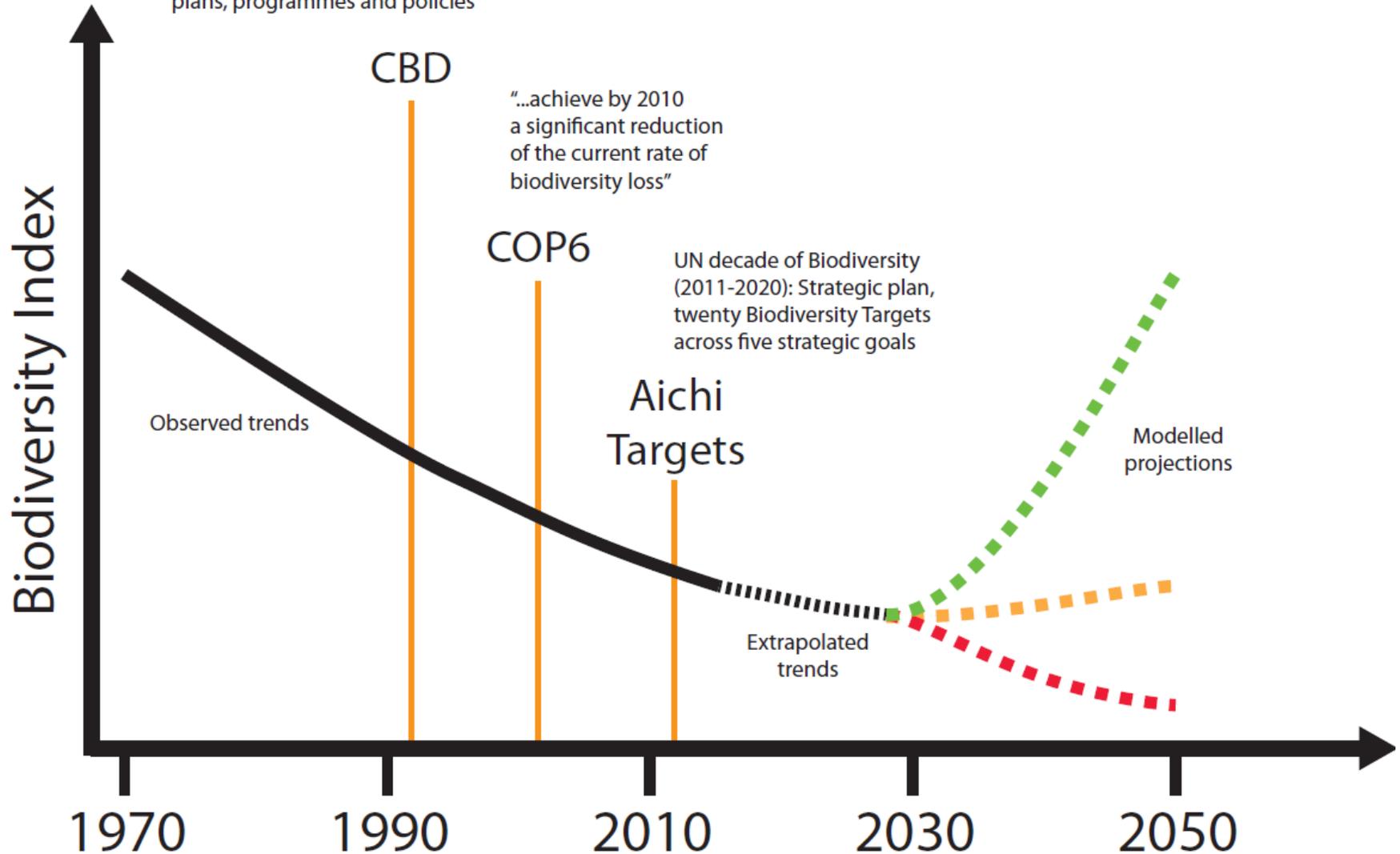
The goal: *“to be the first generation to leave the natural environment in a better state than it inherited”*

To improve the environment within a generation



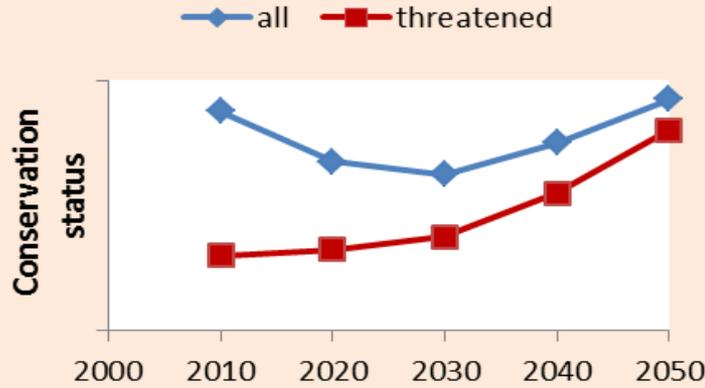
Biodiversity trends at the global level

“Develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity; Integrate [...] the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies”

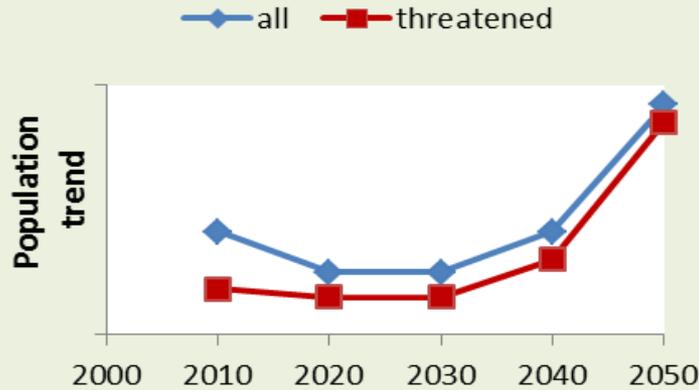


Bending the curve Of biodiversity loss after 2020

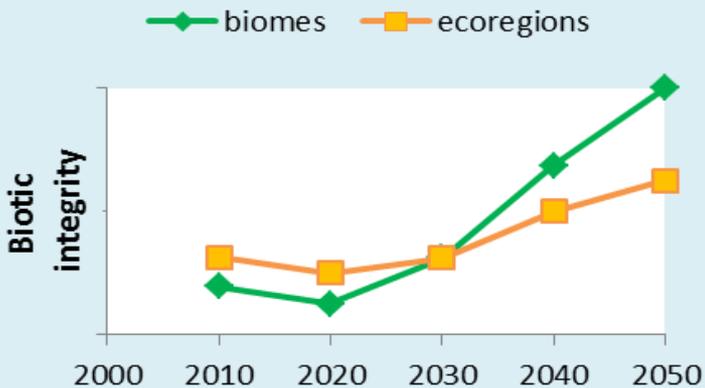
e.g. Red List Index



e.g. Living Planet Index



e.g. Biodiversity Intactness Index



25 Year Environment Plan

published by Defra, UK Gov. 11th January 2018



25 Year Environment Plan

Our 25-year goals

We will achieve:

- Clean air
- Clean and plentiful water
- **Thriving plants and wildlife**
- Reduced risk of harm from environmental hazards such as flooding and drought
- Using resources from nature more sustainably and efficiently
- Enhanced beauty, heritage and engagement with the natural environment

We will manage pressures on the environment by:

- Mitigating and adapting to climate change
- Minimising waste
- Managing exposure to chemicals
- Enhancing biosecurity

Our policies will focus on:

- Using and managing land sustainably

From the 25 year environment plan (2018)

“Through changes in the way we manage our land, we will develop a Nature Recovery Network ... Such a network will deliver on the recommendations from Professor Sir John Lawton: recovering wildlife will require more habitat; in better condition; in bigger patches that are more closely connected.”

“We will identify what a network could look like and the steps that are needed to make this happen.”

Lawton Report 2010 to HM Government

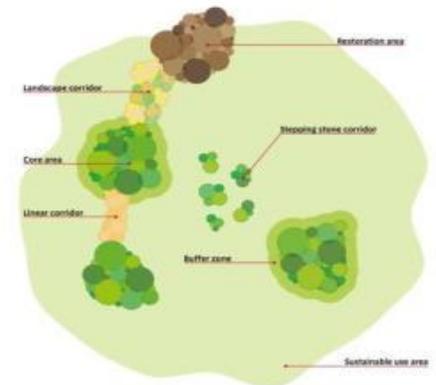
Making Space for Nature

Do England's wildlife sites comprise a coherent and resilient ecological network? If not, what needs to be done?

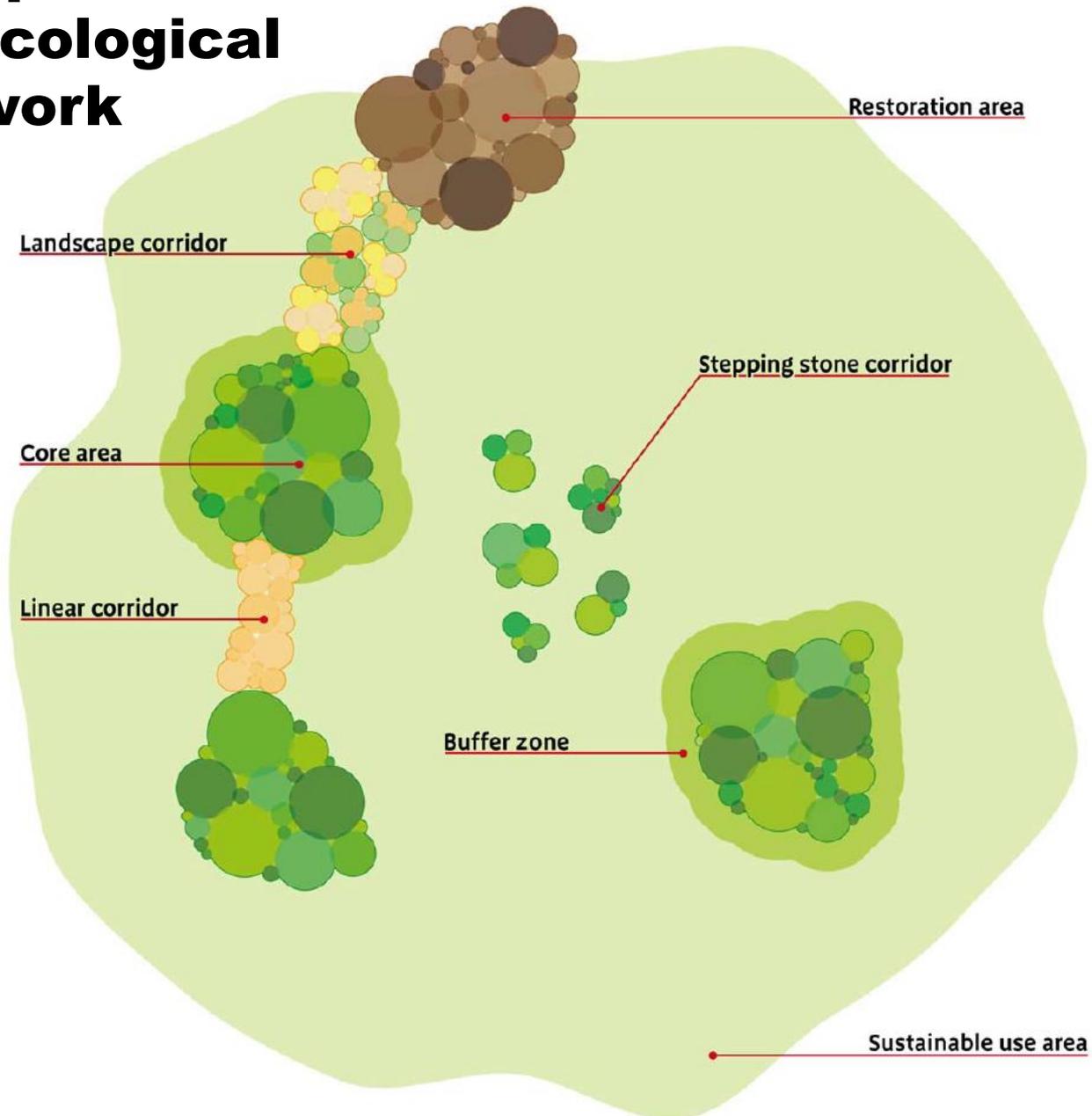
**Making Space for Nature:
A review of England's Wildlife Sites and Ecological
Network**

Chaired by Professor Sir John Lawton CBE FRS

Submitted to the Secretary of State, the Department for Environment, Food and Rural
Affairs on 18 September 2010



Components of an ecological network



Lawton et al. 2010 Making Space for Nature. UK Government

The Lawton vision for 2050

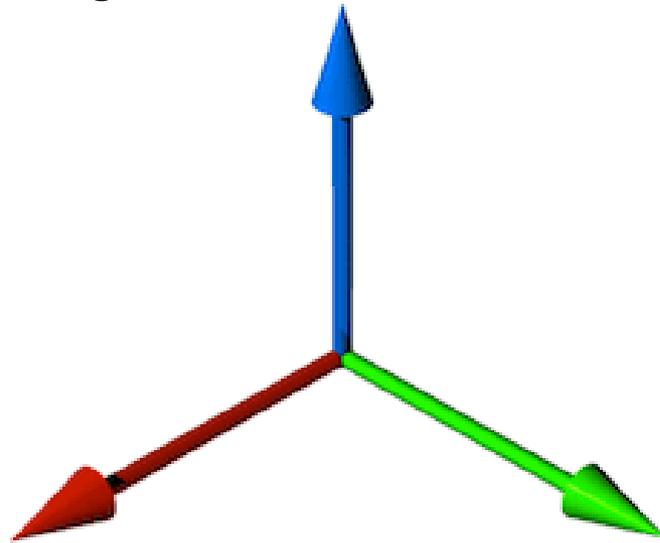
Compared to the situation in 2000, biodiversity is enhanced and the diversity, functioning and resilience of ecosystems is re-established in a network of spaces for nature that can sustain these levels into the future, even given continuing environmental change and human pressures.

Objective 1

To restore species and habitats appropriate to England's physical and geographical context to levels that are sustainable in a changing climate, and enhanced in comparison with those in 2000.

Perturbations have several dimensions

specificity:
whether a single site is affected,
through to all sites in the network



covariation:
whether multiple sites are
impacted simultaneously

intensity:
the magnitude of impact

Relative effectiveness of different BBMJ strategies to different types of perturbation

| | Global Change | Global Perturbation | Local Perturbation | Local Stochasticity |
|--------|---------------|---------------------|--------------------|---------------------|
| Better | + | ++ | ++ | +++ |
| Bigger | ++ | + | ++ | +++ |
| More | + | +++ | ++ | + |
| Joined | +++ | ++ | + | + |

Bigger, better, more and joined (BBMJ)

“The essence of what needs to be done to enhance the resilience and coherence of England’s ecological network can be summarised in four words: *more, bigger, better and joined.*”

Key concepts – coherent and resilient

A **coherent** ecological network is one that has all the elements necessary to achieve its overall objectives; the components are chosen to be complementary and mutually reinforcing so that the value of the whole network is greater than the sum of its parts.

A **resilient** ecological network is one that is capable of absorbing, resisting or recovering from disturbances and damage caused by natural perturbations and human activities (including climate change) while continuing to meet its overall objectives of supporting biodiversity and providing ecosystem services.

Designing a Resilient Network for persistence & resilience

Classic metapopulation theory

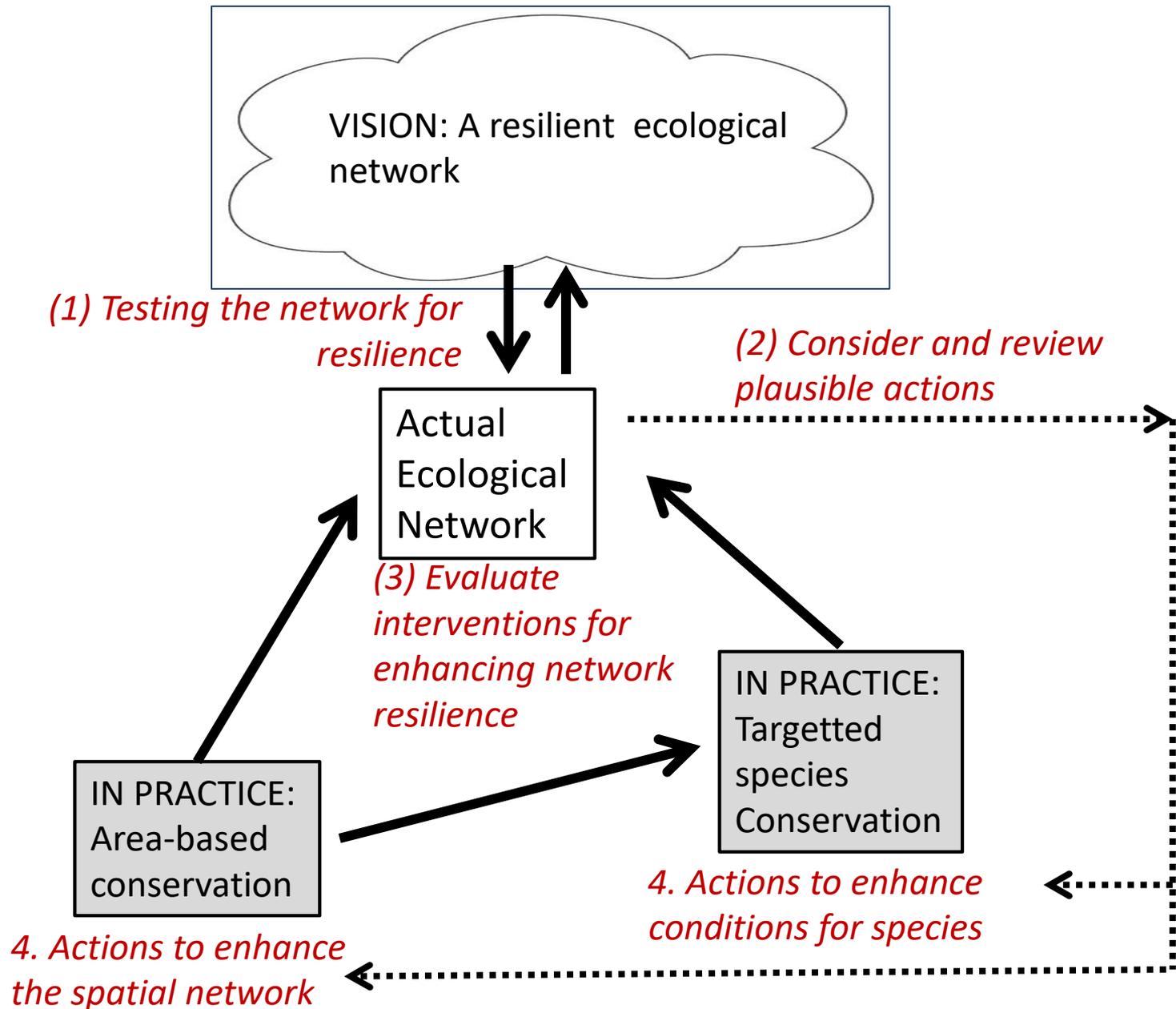
- Metapopulation structure (related to BBMJ strategies)
- Metapopulation capacity - the ability of a single-species network to support a viable metapopulation.

Spatial network theory

- the distribution of nodes (habitat patches or populations) and the links
- overall connectedness and connected sub-systems (modules),
- Least-cost path analysis, least-cost corridors, graph theory, circuit theory.

Spatially-realistic simulations

- the dynamics of multiple species across real landscapes can be projected in space and time (although data-hungry and time-consuming)



Plausible actions

1. **Improve the condition of protected areas (=Better)**
2. **Improve the condition of landscapes that are not currently protected for nature conservation but have broader roles (e.g. recreation, landscape and preserving natural beauty) (=Better & Bigger)**
3. **Increase the area of habitats under long-term protection for nature. (= Bigger & More)**
4. **Establish large areas of habitat creation and/or restoration. (= Bigger & More)**
5. **Improve the quality and extent of habitat connectivity.**
Targeted habitat creation and improved linear landscape features such as along roads, footpaths, hedgerows, rivers and coasts. **(=Better & Joined).**

Summary

- The resilient spatial network is a concept that has attracted political support
- It provides a positive ecological and conservation goal; recovering species for long term persistence and not simply slowing the rate of decline
- There are scientific challenges in designing and implementing such a network at scale
- An iterative process using periodic re-evaluations seems practical but we need practical metrics

Thanks to:

Nick Isaac (CEH)

Peter Brotherton (NE), Richard Gregory (RSPB),

James Bullock (CEH)

