The Role of Ecological Restoration and Habitat Creation in Creating Effective Ecological Networks

Ian Crosher & Humphrey Crick, Natural England

Acknowledgments *on National Habitat Network Mapping Project:*
Created By Jeff Edwards; Michael Knight, Sarah Taylor & Ian Crosher

Acknowledgments *on Nature Network Handbook*- written by working group: in addition to authors: Sarah Taylor; Nick McGregor; Andy Wharton; Jane Lusardi; Pippa Langford & David Appleton.

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The Guardian

Insects

Warning of 'ecological Armageddon' after dramatic plunge in insect numbers

Three-quarters of flying insects in nature reserves across Germany have vanished in 25 years, with serious implications for all life on Earth, scientists say

www.theguardian.com/environment/2017/oct/18/warning-of-ecological-armageddon-after-

Environment

UK facing 'ecological apocalypse', Chris Packham warns

'We need to wake up and smell the extinction brewing,' says Springwatch presenter

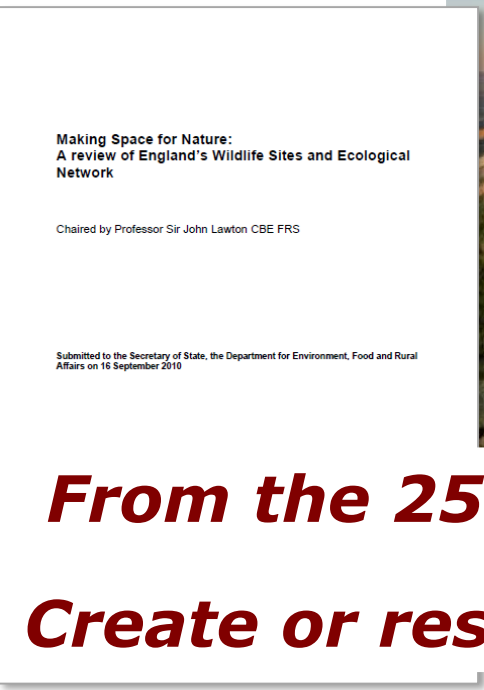
Josh Gabbatiss Science Correspondent | @josh_gabbatiss | Monday 11 June 2018 14:00 | 20 comments

Yet its most remarkable aspect is this: people still do not perceive it.

for the public at large, and indeed for most politicians, it is simply not on the radar; we are faced with a sort of mass cognitive dissonance, a nationwide unawareness of what is obvious.

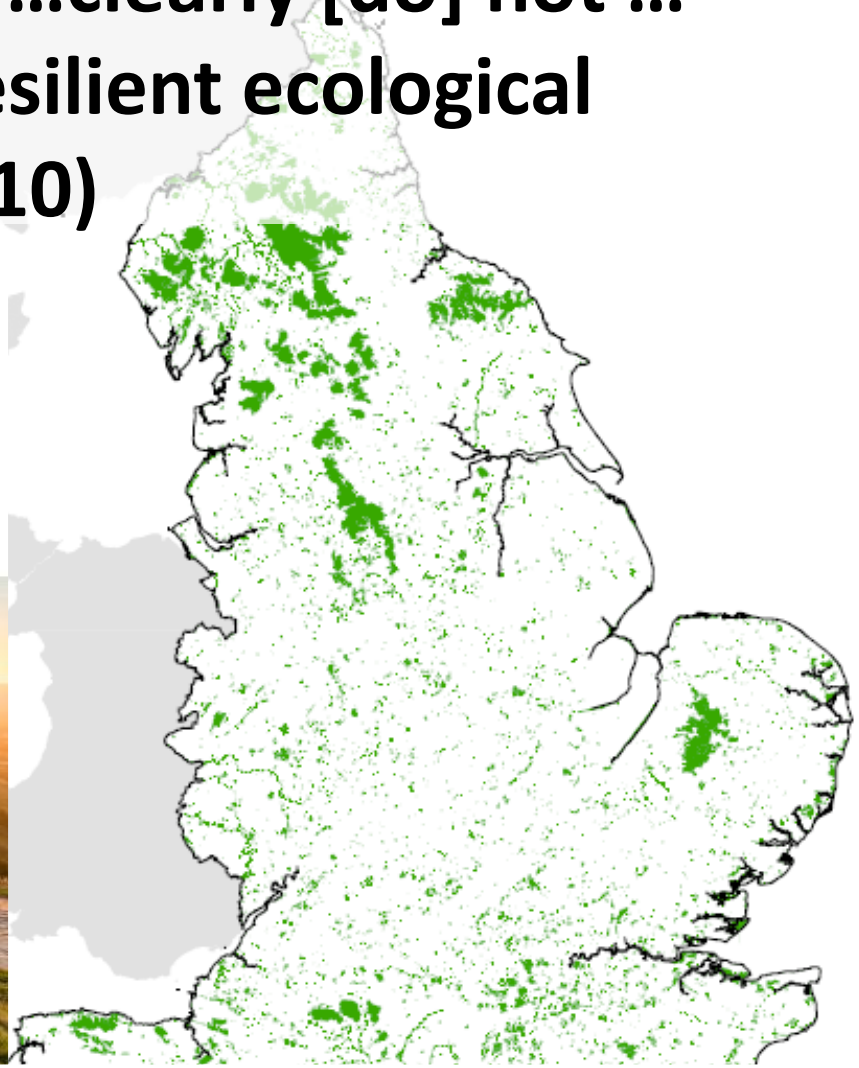
Michael McCarthy (2018)

England's protected areas "…clearly [do] not … comprise a coherent and resilient ecological network" (Lawton et al. 2010)



HM Government

A Green Future: Our 25 Year Plan to Improve the Environment



From the 25 year plan

Create or restore 500,000 ha of wildlife-rich habitat

Today !

- Two Main Products
  - National Habitat Network Mapping Project
  - Nature Network Evidence Handbook

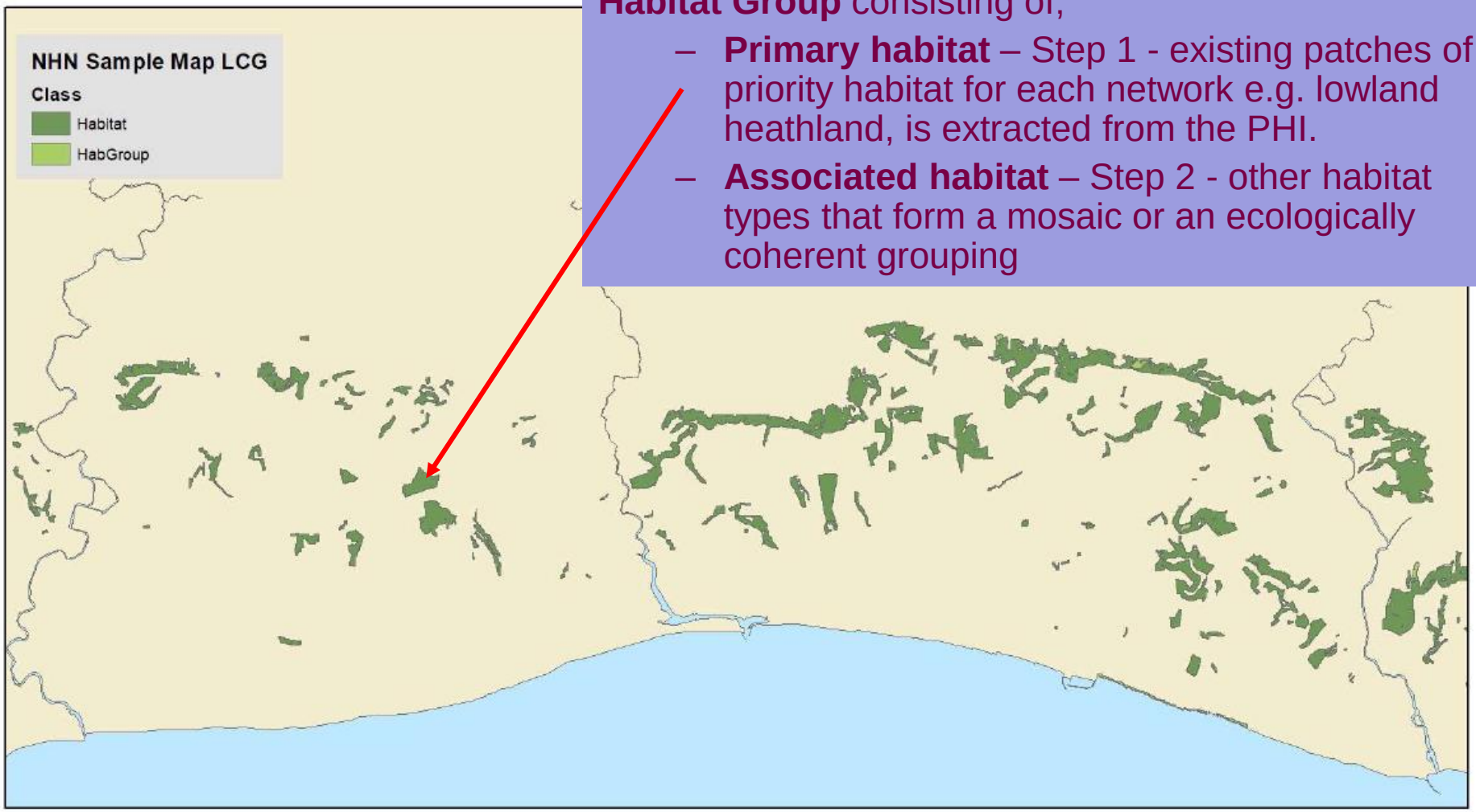
National Habitat Network Mapping Project

Natural England Project Team
Jeff Edwards , Michael Knight, Sarah Taylor & Ian Crosher

What habitat already exists?

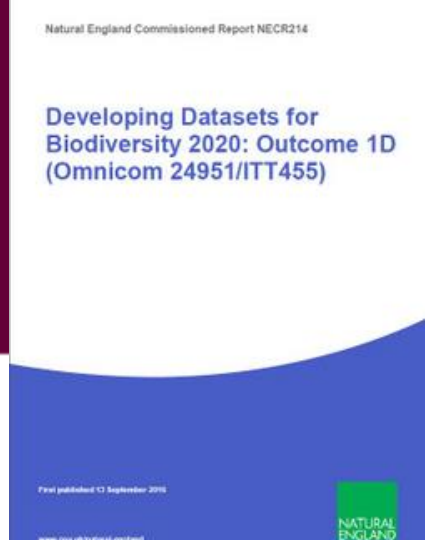
Habitat Group consisting of;

- **Primary habitat** – Step 1 - existing patches of priority habitat for each network e.g. lowland heathland, is extracted from the PHI.
- **Associated habitat** – Step 2 - other habitat types that form a mosaic or an ecologically coherent grouping



What Could Potentially exist in future?

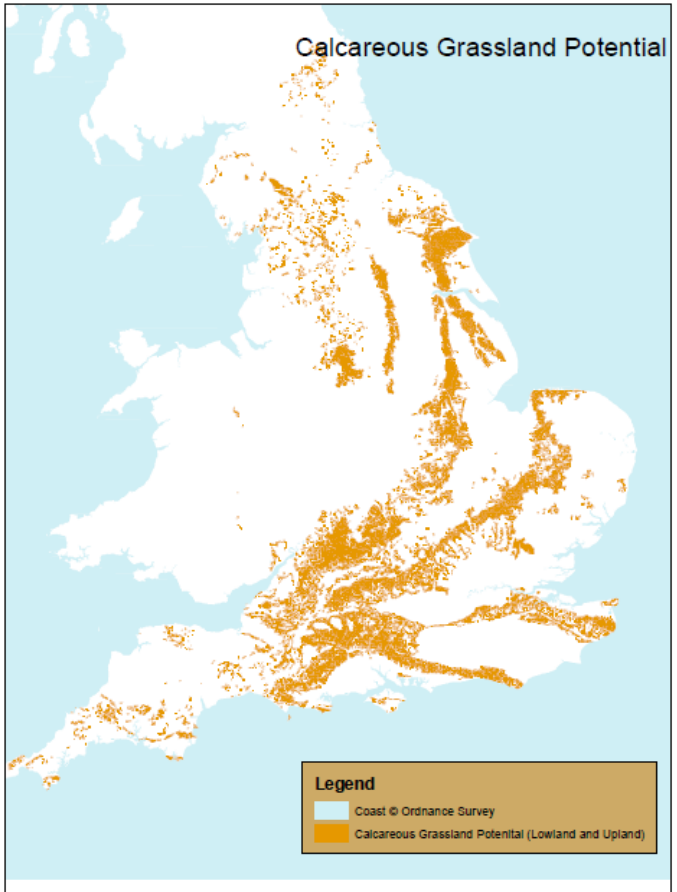
The Concept of Habitat Potential Maps



http://publications.naturalengland.org.uk/publication/5109098148790272

Habitat Potential Maps…..

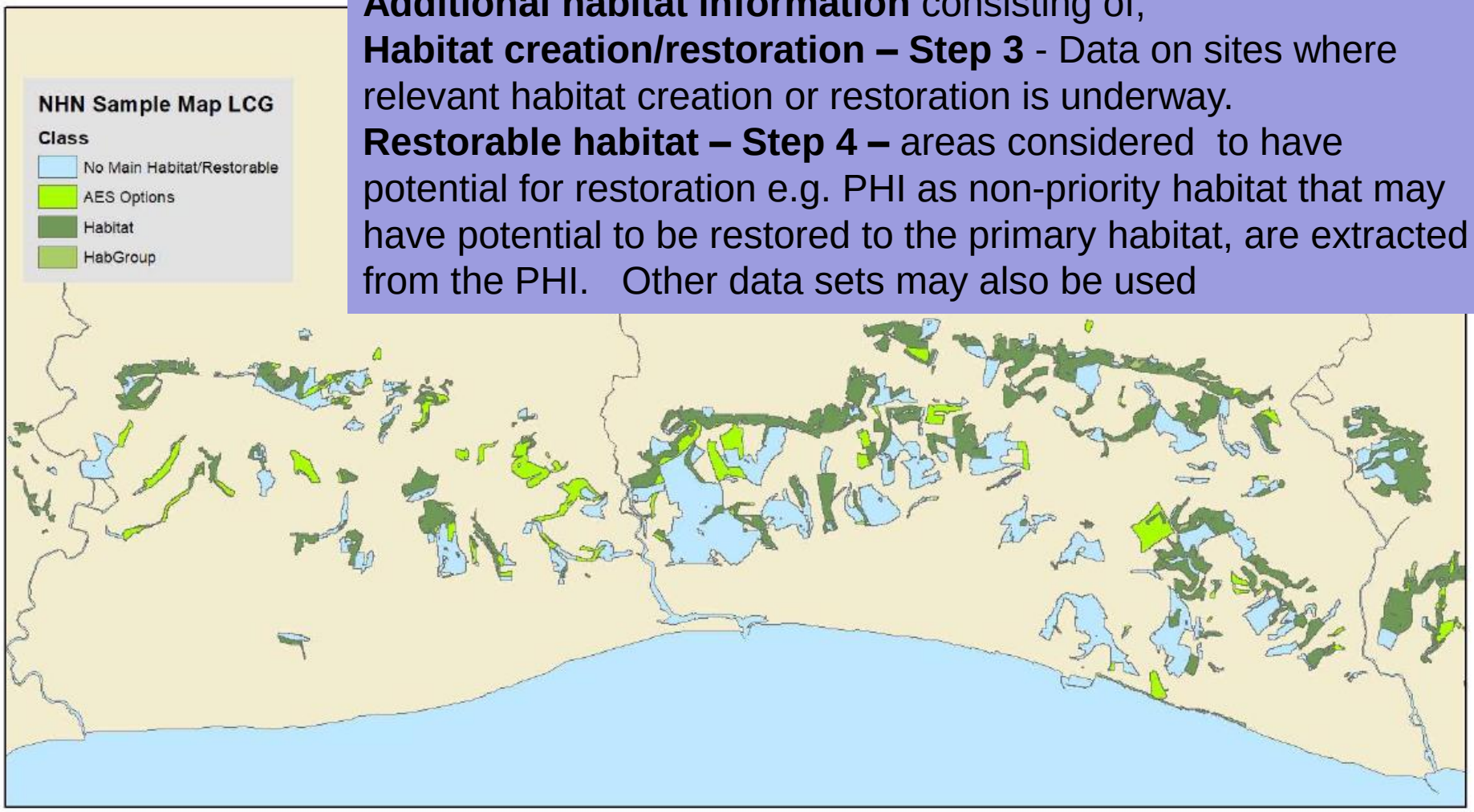
- Indicate where appropriate conditions exist to support habitat creation and/or restoration
- An attempt to represent what was previously lost or degraded?
- Help to understand the maximum potential area for habitat restoration.
- Will highlight where habitat restoration priorities may be targeted even though little of the habitat still exists.
- Provides a link to key locations for ecosystem services/Natural Capital and identify opportunities to deliver wider societal benefits



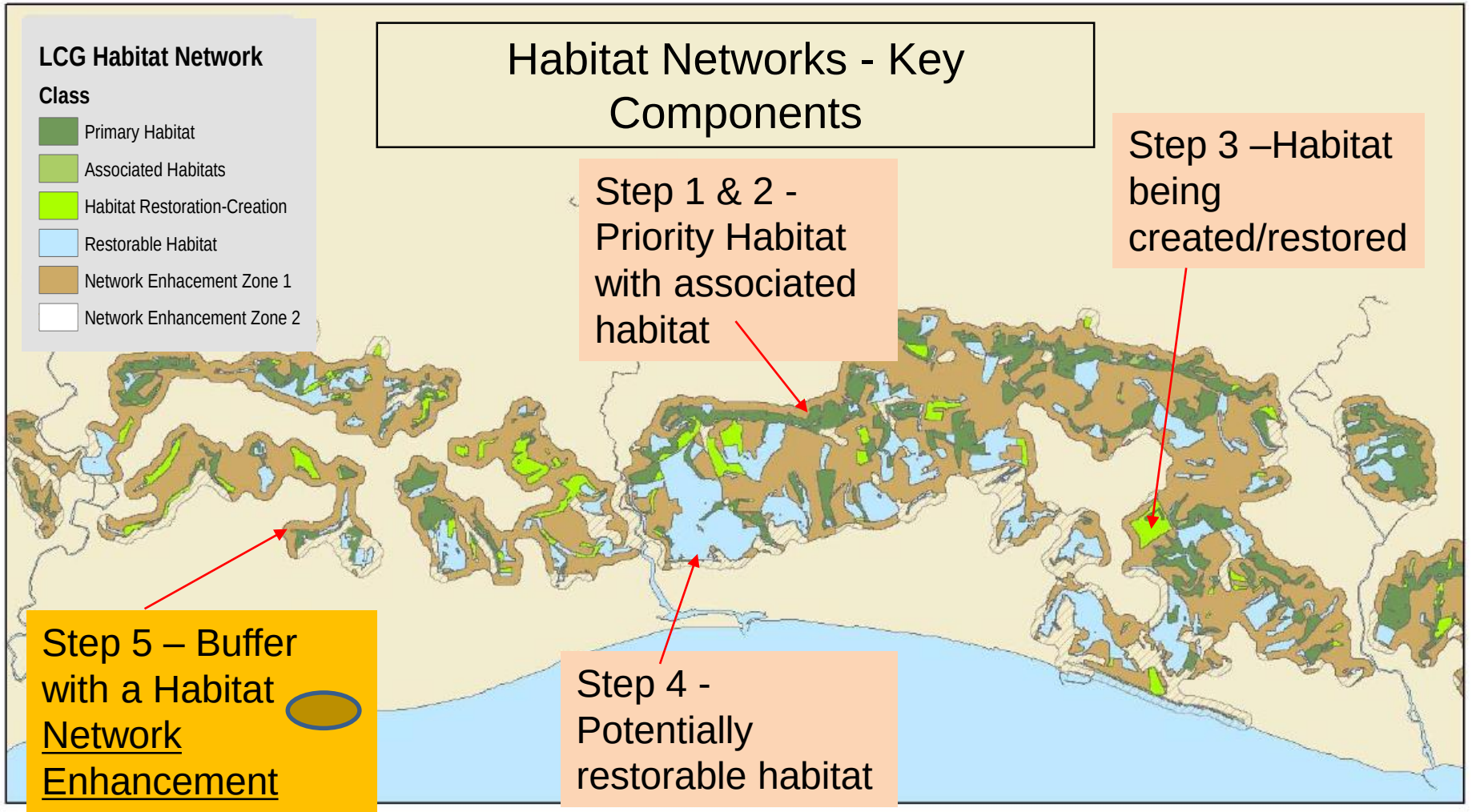
Where has Habitat Creation or Restoration already started?

What other data tells us about restorability.

Additional habitat information consisting of;
Habitat creation/restoration – Step 3 - Data on sites where relevant habitat creation or restoration is underway.
Restorable habitat – Step 4 – areas considered to have potential for restoration e.g. PHI as non-priority habitat that may have potential to be restored to the primary habitat, are extracted from the PHI. Other data sets may also be used



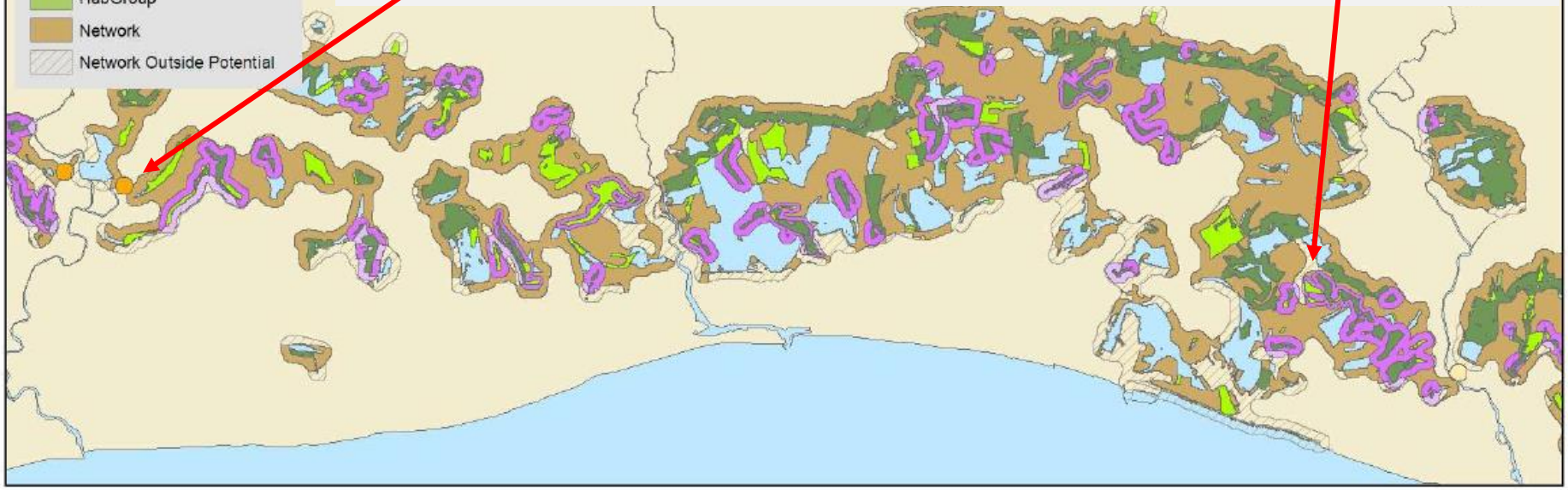
Habitat Networks - Key Components



Priorities for Restoration

– **Step 6** - identifies priorities for restoration to address fragmentation,

- smaller fragmented areas of habitat that have the potential to be enlarged or joined with other habitat patches
- Network Links – potential locations for action to link network segments



Other Actions within the Network Enhancement Zone

- Restore degraded habitat
- Increase habitat extent and permeability

Habitat Network Maps & the habitats we have so far covered.

Upland calcareous grassland
Lowland calcareous grassland
Reed-beds
Lowland meadows
Upland hay meadows
Purple moor-grass and rush pastures
Lowland dry acid grassland
Lowland heathland
Upland heathland
Upland flushes fens & swamps

Lowland fens
Lowland raised bog
Blanket bog
Limestone pavements
Coastal sand-dunes
Coastal shingle
Maritime cliff & slope
Saltmarsh
Ancient Semi-natural Woodland

Combined all habitats Network

(excluding woodland)

- **to help give an overview at a local landscape scale**

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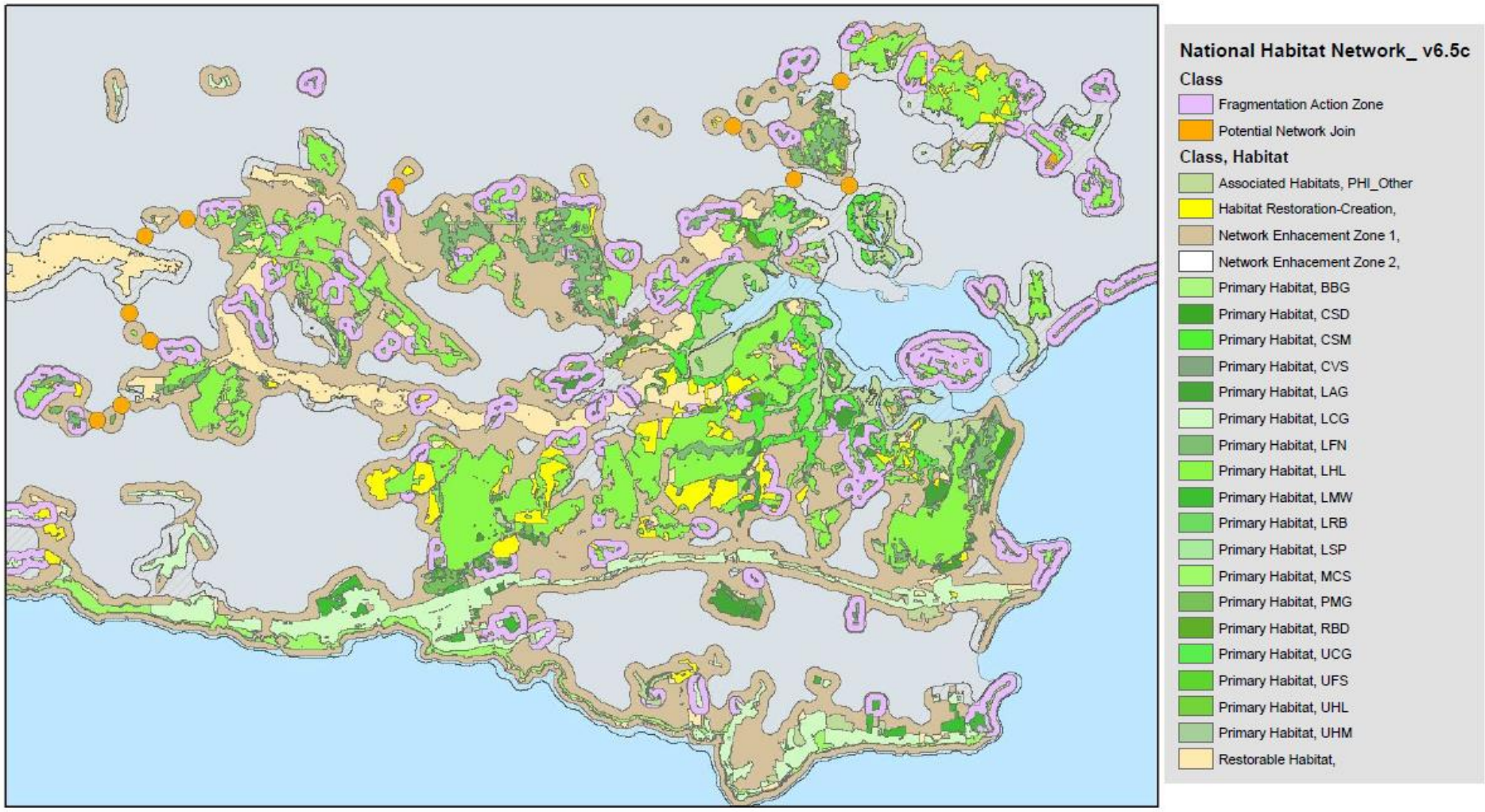
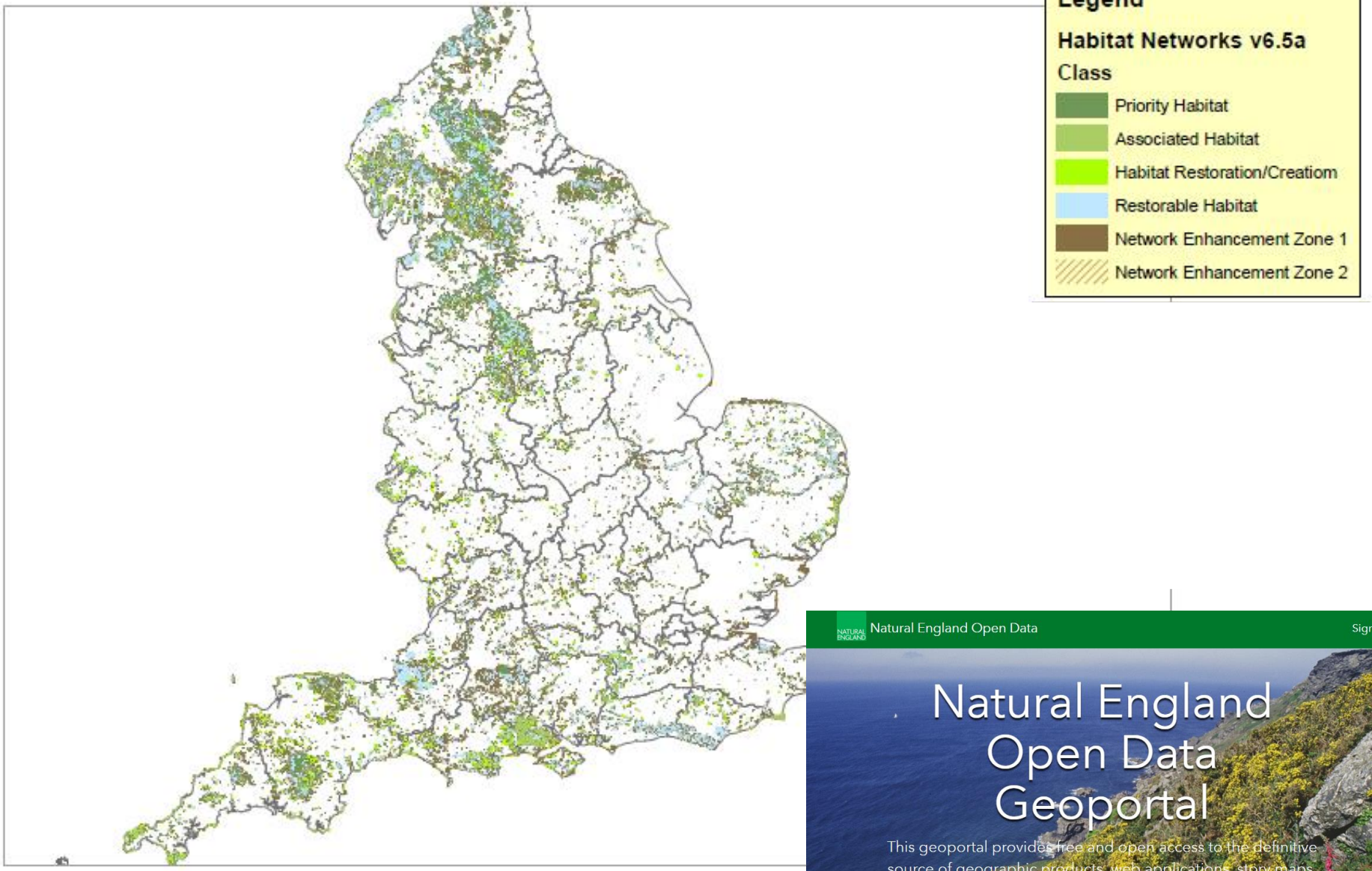


National coverage of combined all habitats network



Available as Open Data from:
http://naturalengland-defra.opendata.arcgis.com/

Nature Networks Evidence Handbook

Aims

- To produce a clear and accessible summary of practical recommendations to help practitioners design landscape specific Ecological Networks.

- To review & communicate key concepts around ecological network thinking from theory to practical application so supporting delivery of Biodiversity 2020 Strategy, the Natural England Conservation Strategy (C21) & the Government 25 year environment plan.

Some fundamental questions that kept coming up as stumbling blocks.

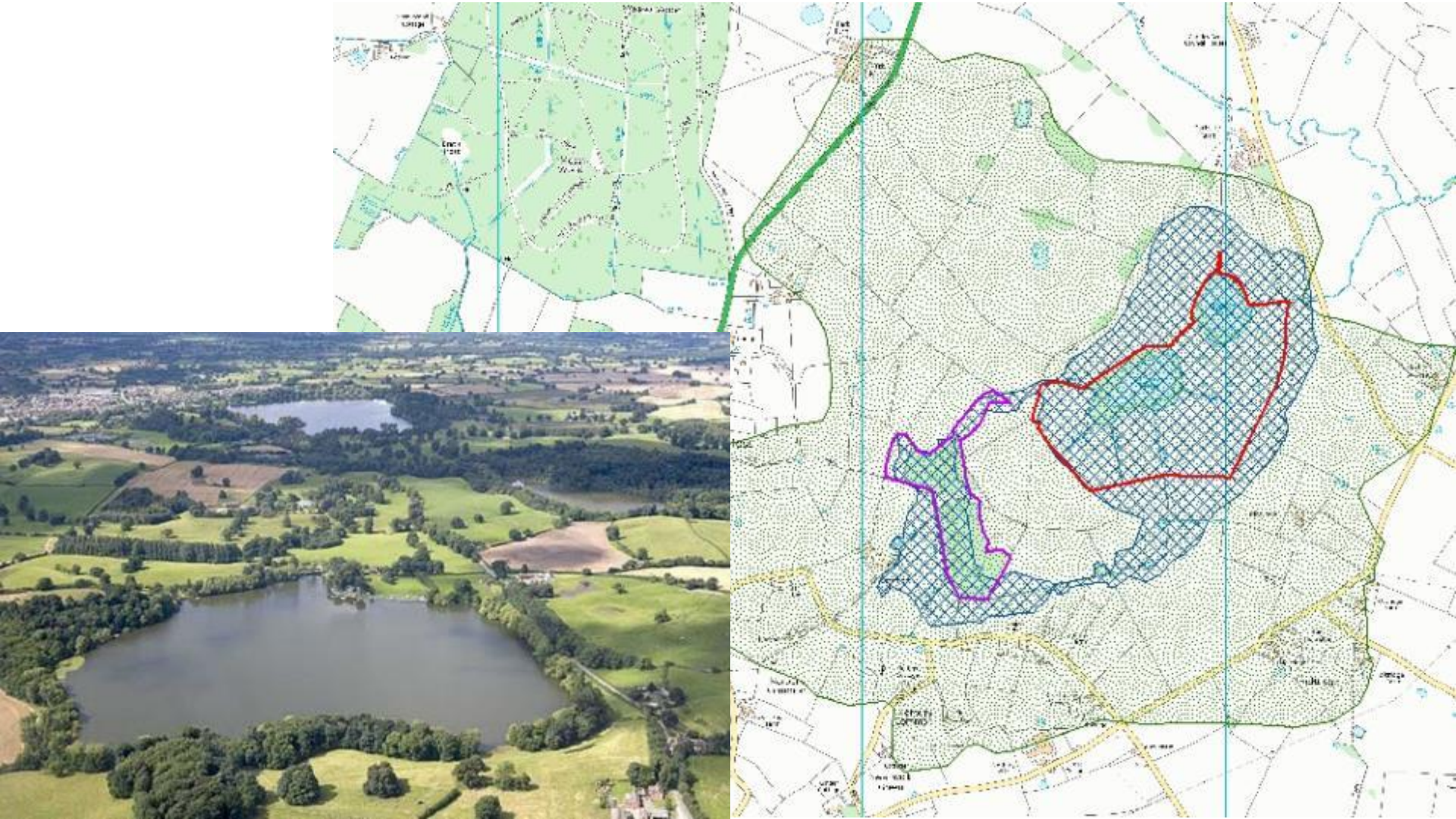
- How many *more* sites do we need?
- How *big* do we need those sites?
- How do we make them "*better*"?
  - How might Natural Processes fit in here?
- What sort of *connectivity* is best?
- How do we *buffer* the sites from outside pressures?

Four principles for making sites "better"

Peter Wakely Natural England

1. "Big enough" (Functional ecological units)

meres & mosses
Landscape Partnership Scheme and Nature Improvement Area



Functional Ecosystem restoration is key !

A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community …. It is wrong when it tends otherwise

Aldo Leopold – Sand Country Almanac.

- ***Restore at the Ecosystem Level –*** *so abiotic and biotic process*
- *Create* ***More Habitat around and buffer*** *existing assets.*

2. “Messy” (Heterogeneous physical structure)

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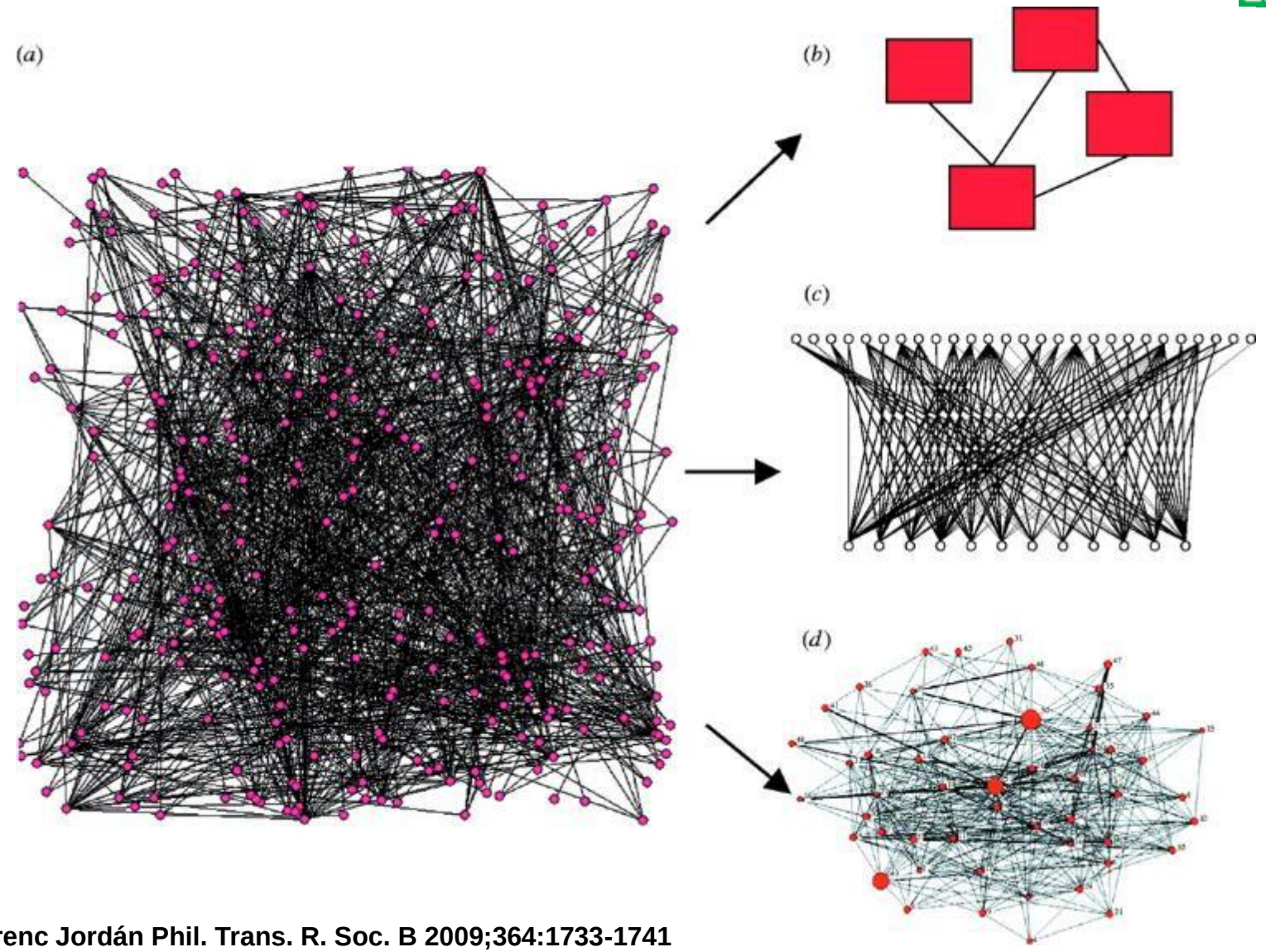
3. “Complex” biologically



Ferenc Jordán Phil. Trans. R. Soc. B 2009;364:1733-1741

4. “Dynamic”

John Malley, National Trust

Rules of thumb: a broadly accurate guide or principle, based on practice rather than theory.

Better site quality	>	Bigger sites	>	More sites	>	Stepping stones & permeable matrix	>	Corridors
• Encourage natural processes • Encourage habitat mosaics • Create more niches for more species – use "ecosystem engineers" and welcome ecological disturbance. • Increase messiness (variation of physical structure within sites). • Restore missing biodiversity by increasing niches or by reintroduction • Maintain rare species • Encourage climate colonists • Reduce edge effects by buffering sites and encouraging graded ecotones to "soften the edge" • Buffer sites with at least a 50-100 m buffer strip • Maintain ecological continuity of management to protect soils		• Big enough to encourage natural processes – include areas that ensure functioning ecosystems • Provide space for ecosystem dynamism supporting mosaics and to encourage succession • Reduce edge effects by decreasing the edge: area ratio • Join habitat fragments; choose the ones that will create the biggest site • Restore degraded habitat surrounding the site. • ↑ sites to >40 ha (or >100 ha for wide-ranging species)		• Add larger sites in preference to many smaller sites • Target areas of irreplaceable habitat or with a long ecological continuity of land management • Target areas with complex or additional topography & geomorphology and with a potential to be climate change refugia • Target areas of important habitat potential in the surrounding area. • Target degraded areas with high ecosystem service delivery • Ensure connectivity is good for new site.		• Sites should be < 1km from each other and < 200m apart for highly specialised species within a habitat • Expand sites towards existing habitat to reduce space between patches. • Increase the cover of semi-natural habitat in landscape to at least 20% • Reduce the intensity & Increase the diversity of landuse in the surrounding countryside • Stepping stones should provide appropriate resources not to be ecological traps		• Natural corridors are better than human designed corridors • Use linear landscape features • Ensure corridor habitat matches core sites • Minimum width of corridors = 100 m, preferably wider

Principles for creating networks for wildlife and people

We think that the following 9 principles provide a helpful summary of what is known about how to design ecological networks in an integrated way. These principles have been developed as part of the Nature Network Evidence Handbook which will be published later on this year (or Early next).

Key Principles for Networks for wildlife & people.

1. Involve People: People both benefit from and create ecological networks.

2. Understand the place: Recognise where the ecological network recovery sits.

3. Create core sites: Build ecological networks around existing high quality sites**.**

4. Build resilience: through restoration that reinstates natural processes.

5. Embrace dynamism: ecosystems and landscapes change and are inherently dynamic.

6. Encourage diversity of habitats and Landscapes:

7. Think "networks": planned at multiple spatial scales & address multiple issues.

8. Start now but plan long-term:

9. Monitor progress

What is in the Nature Network Handbook?

- **Integrated Framework for creating Ecological Networks for Wildlife & People.**
- **Ecological Networks for Wildlife**
  - **Ecological Networks for species**
  - **The role of natural processes and natural ecosystem function**
- **Ecological Networks for People.**
- **A guide to map-based models and tools for planning ecological networks.**




Not Just Wildlife !

Ecological networks for people

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- **The social & cultural context of the area.**
- **The landscape context for networks and people's relationship with 'place'**
- **Enhancing natural capital and ecosystem services**
- **Connectivity and access for people**
- **Understanding participatory engagement and collaborative delivery**
- **How the UK Planning system relates to Ecological Networks developments.**

A guide to map-based models and tools for planning ecological networks

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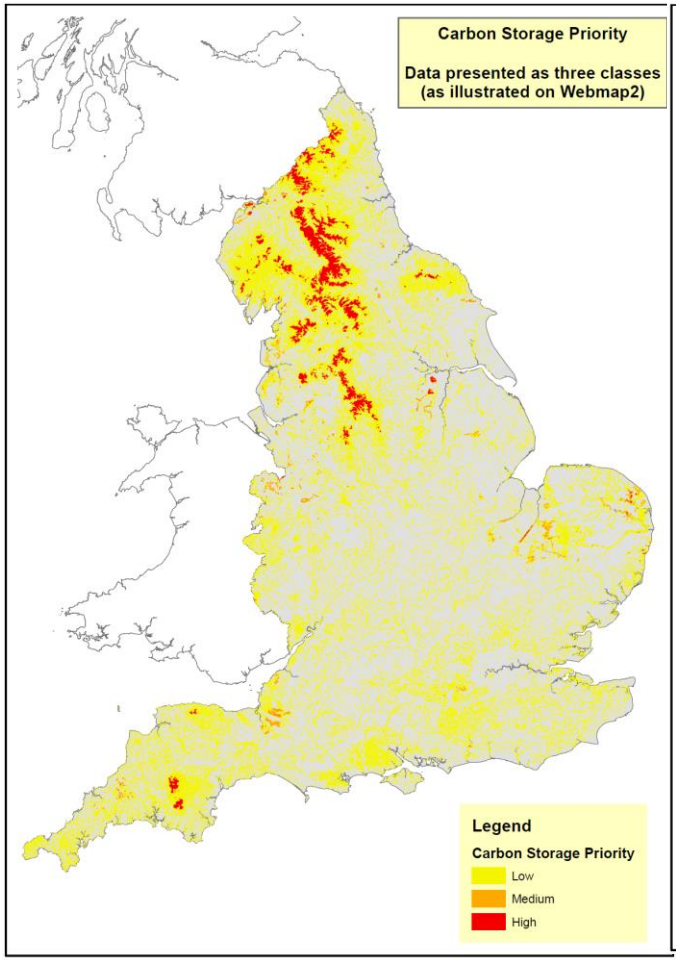
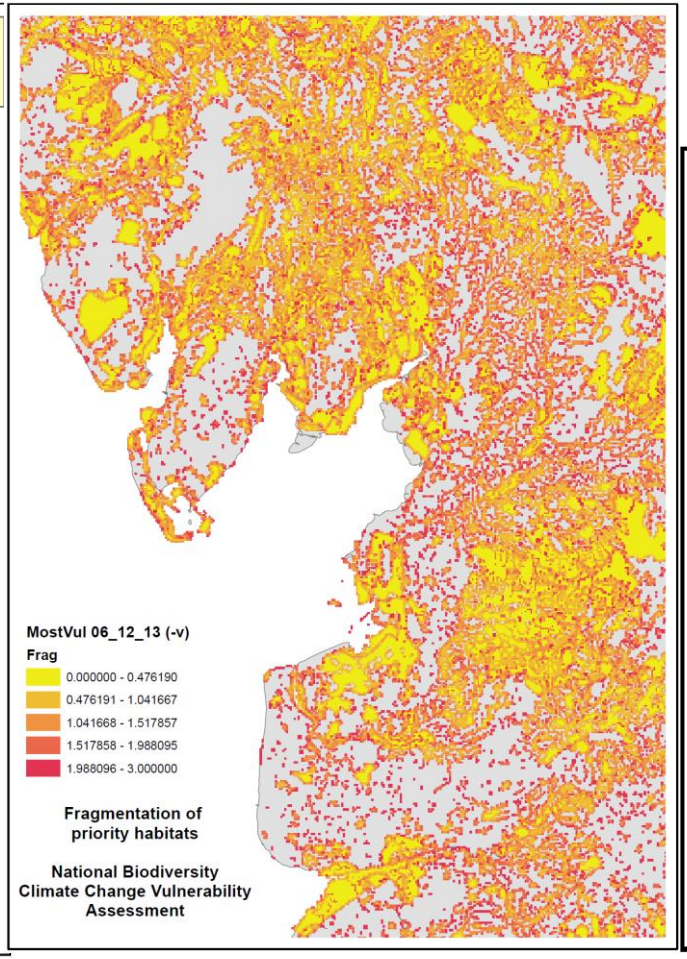
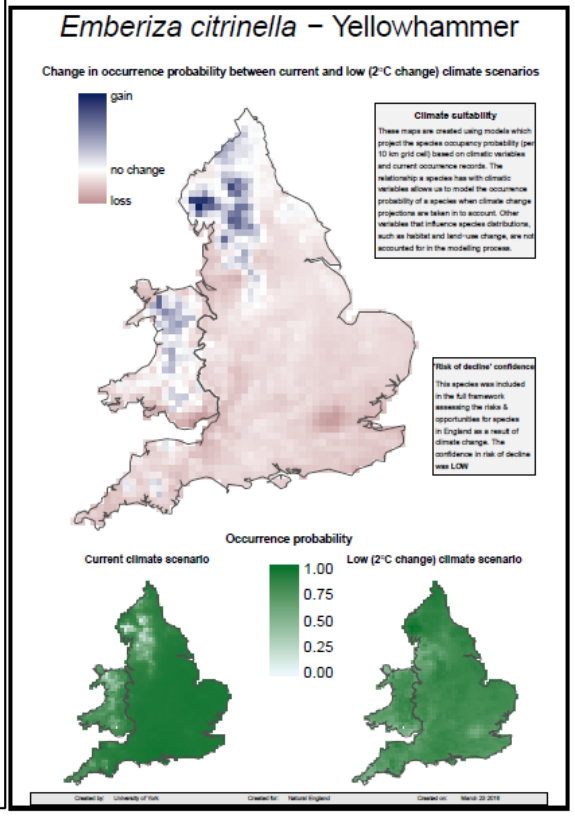
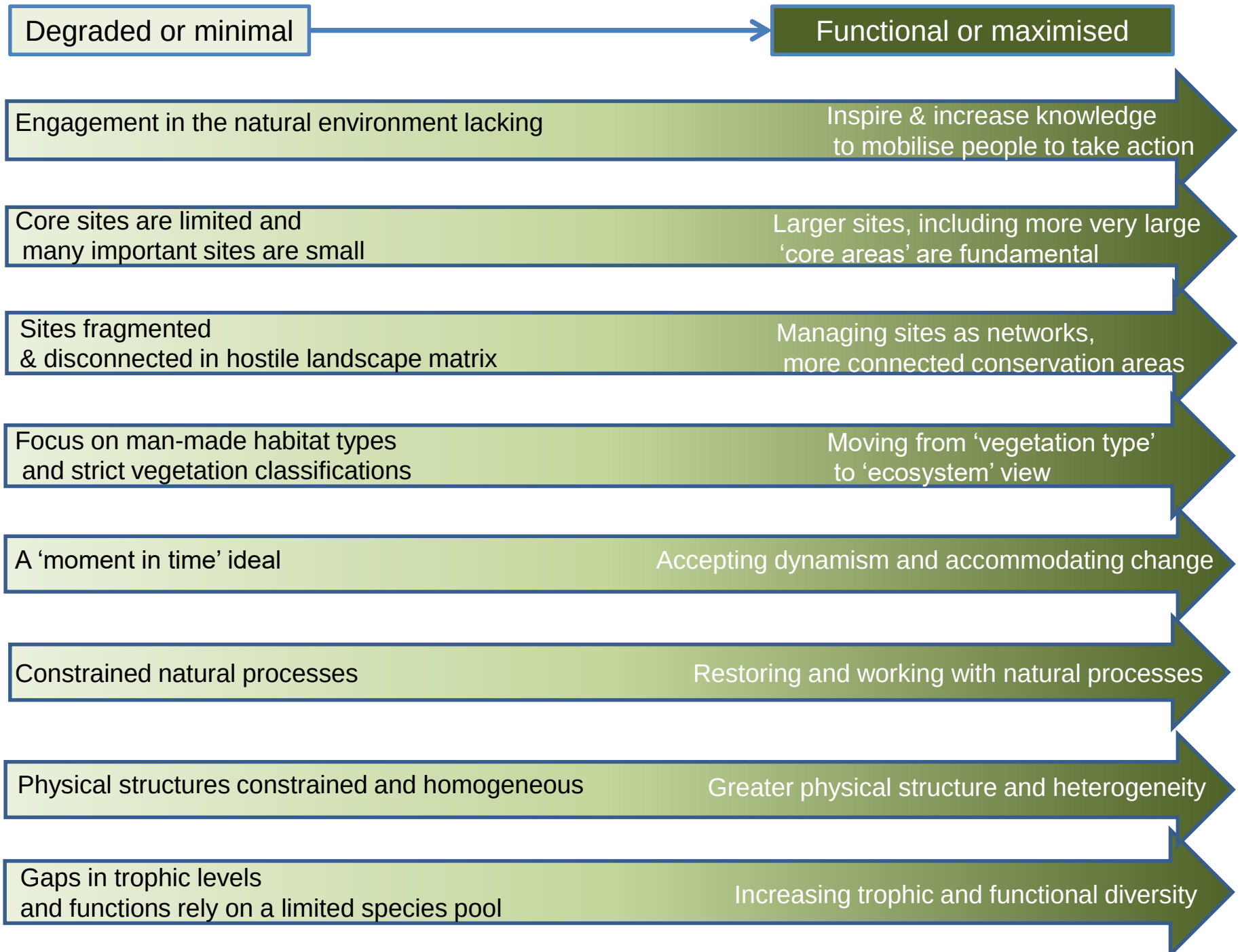
Highly recommended if you have GIS capacity.

Identifying spatial priorities for Ecological Networks








Degraded or minimal
Functional or maximised
Engagement in the natural environment lacking
Inspire & increase knowledge to mobilise people to take action
Core sites are limited and many important sites are small
Larger sites, including more very large 'core areas' are fundamental
Sites fragmented & disconnected in hostile landscape matrix
Managing sites as networks, more connected conservation areas
Focus on man-made habitat types and strict vegetation classifications
Moving from 'vegetation type' to 'ecosystem' view
A 'moment in time' ideal
Accepting dynamism and accommodating change
Constrained natural processes
Restoring and working with natural processes
Physical structures constrained and homogeneous
Greater physical structure and heterogeneity
Gaps in trophic levels and functions rely on a limited species pool
Increasing trophic and functional diversity