

# A combined monitoring and modelling approach to maximise the impacts of agri-environment payments at a national scale

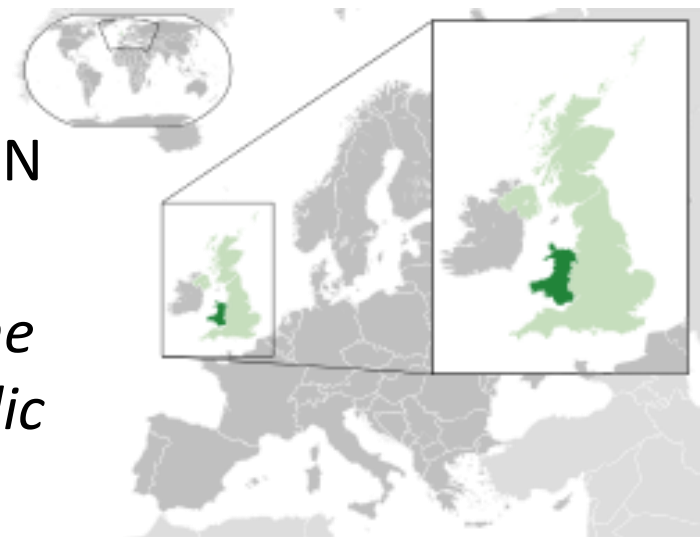
BA Emmett<sup>1</sup>, S Anthony<sup>3</sup>, S Astbury<sup>1</sup>, M Botham<sup>1</sup>, D Chadwick<sup>3</sup>, B J Cosby<sup>1</sup>, F Edwards<sup>1</sup>, P Henrys, B Jackson<sup>5</sup>, L Maskell<sup>1</sup>, N Pritchard<sup>1</sup>, D Robinson<sup>1</sup>, S Smart<sup>1</sup>, R Swetnam<sup>6</sup>, G Siriwardena<sup>4</sup>, J Skates<sup>7</sup>, B Williams<sup>1</sup> and the GMEP team

<sup>1</sup>Centre for Ecology and Hydrology, <sup>2</sup>ADAS, <sup>3</sup>Bangor University, <sup>4</sup>British trust for Ornithology, <sup>5</sup>Victoria University of Wellington, <sup>6</sup>Staffordshire University & <sup>7</sup>Welsh Government

*Wales is one of only 3 nations with sustainable development enshrined within its constitution*

John Griffiths, Environment Minister, UN Climate Change Conference, DOHA 2012

*“Wales will become the first country in the world to make it legally binding for all public bodies, from health trusts to libraries and schools, to take account of the environment and social issues when they make a decision”*



# EU Agricultural Fund provides a mechanism for delivery

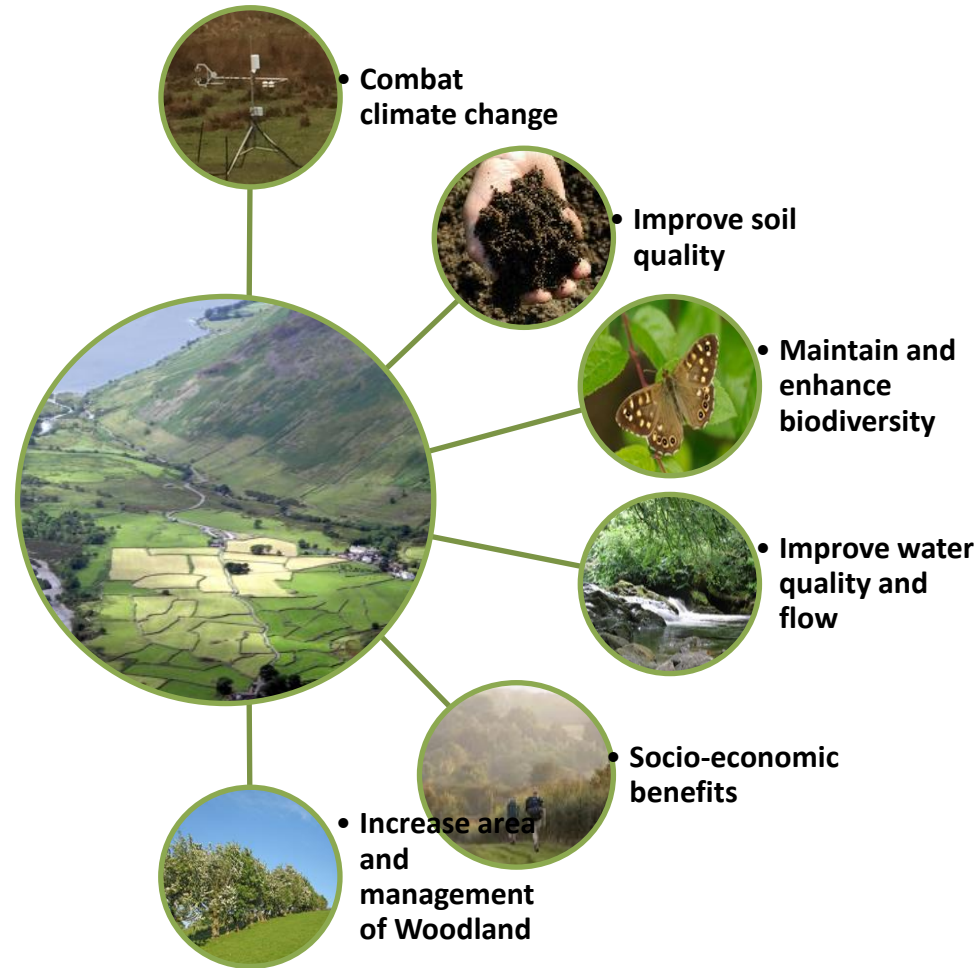
- The 'European Agricultural Fund for Rural Development' provides funding to farmers for improving the environment and countryside.
- Effectively this becomes payment for 'Environment Goods and Services'
- Each country has to develop a 'Rural Development Plan (RDP)' to deliver these funds **AND** monitor and report outcomes back to the EU

# Glastir: A single payment scheme with 6 high level aims

> 150 management interventions eligible for payment

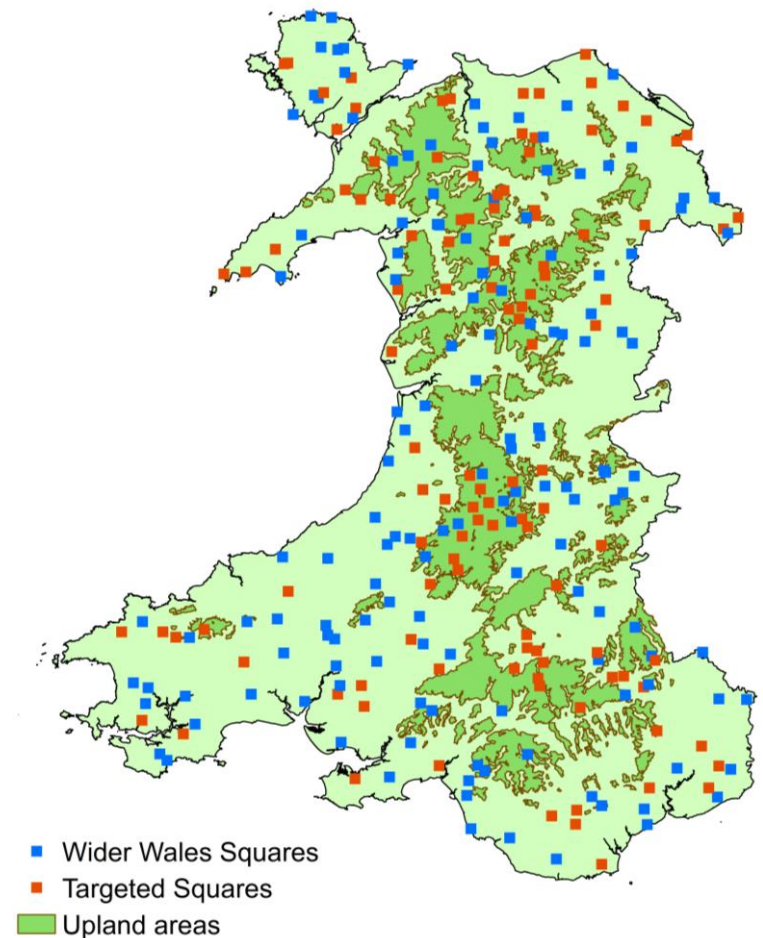
Capital grants for structural changes to increase efficiency

Commissioning of an independent monitoring and evaluation programme to allow for fast feedback



# Glastir Monitoring and Evaluation Programme (GMEP)

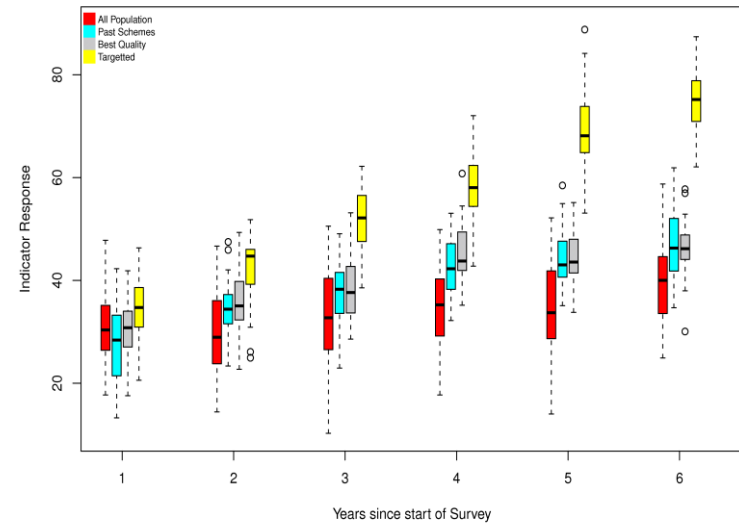
- **National field survey** of 300 1km squares on a 4-year rolling cycle
- **Co-located measurements:**
  - Plants; birds, pollinators, water, soil, greenhouse gas emissions, landscape, historic features, social & economic impact
- **Modelling** to integrate data, explore trade-offs and co-benefits and forecast impact of land management
- **Public data and modelling portal**



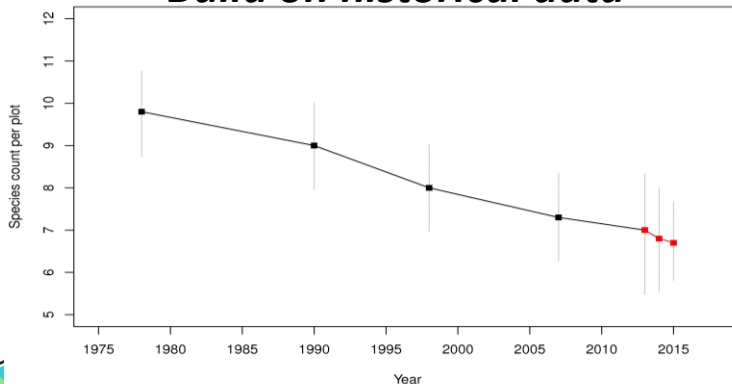
# Robust statistical design

- Stratified sampling for efficient sampling
- Power analyses to identify number of sites required
- High level of quality assurance using independent surveyors
- Use of established field methodologies enables use of historical data

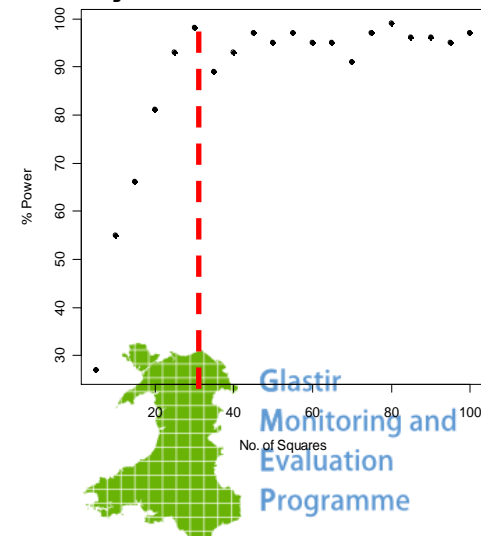
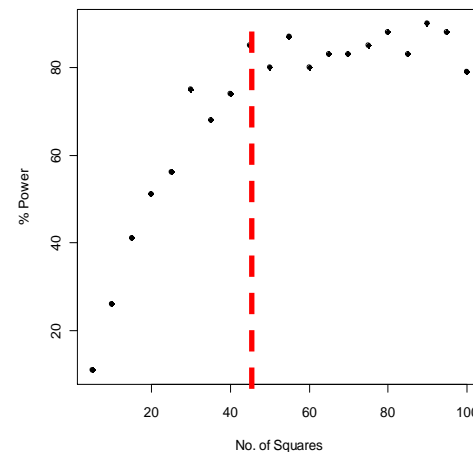
## *Flexible population approach*



## *Build on historical data*



## *Power analyses*



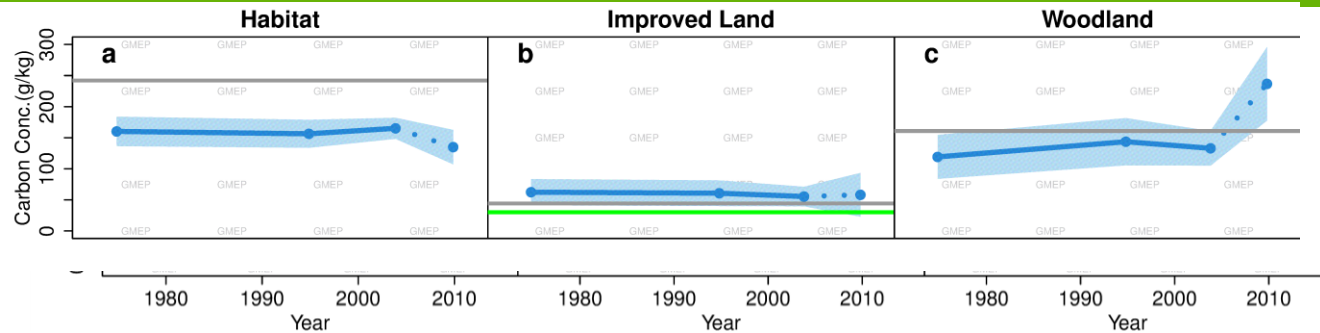


# Co-located measurements allow for inter-dependencies to be explored (ecosystem approach) + models



# Findings (1): Ongoing change in Natural Capital

Soil  
carbon





# Findings (1): Ongoing change in Natural Capital

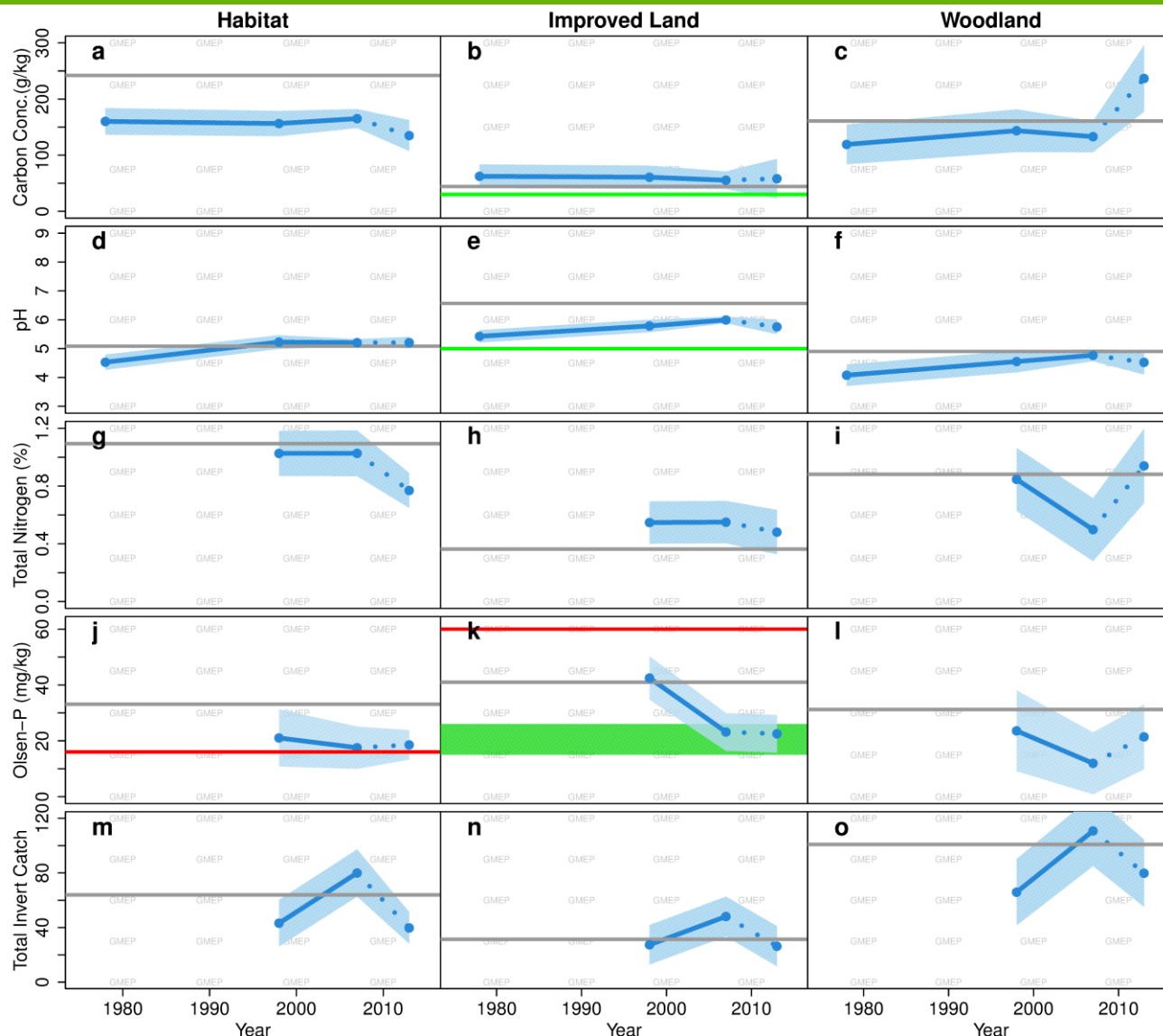
Soil  
carbon

Soil pH

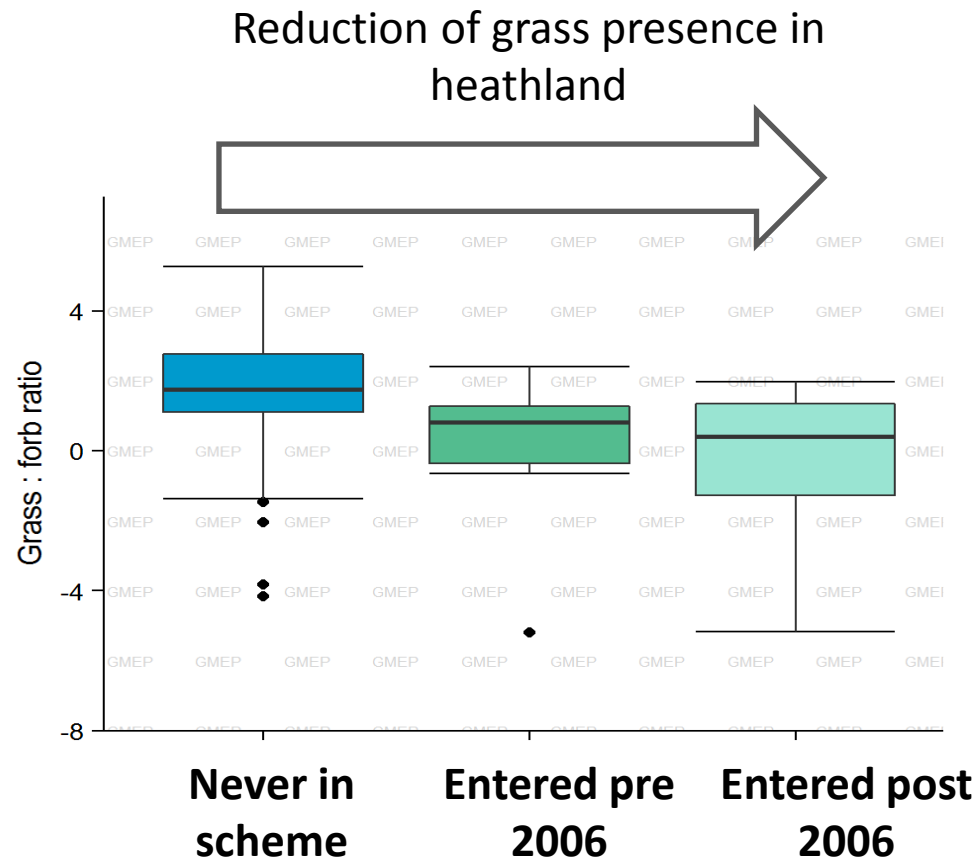
Soil N

Soil P

Soil  
mesofauna

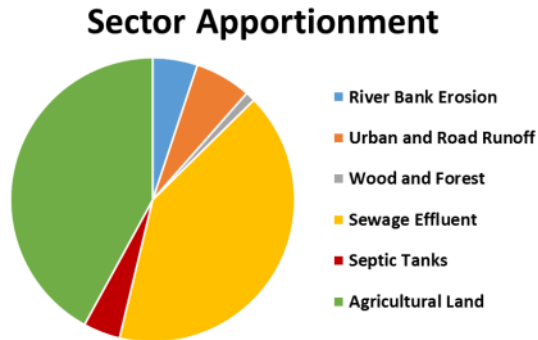
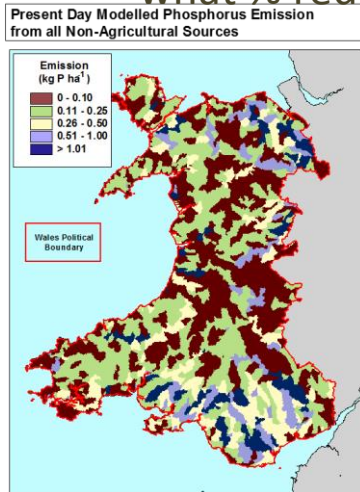


# Findings (2): Legacy effects of past schemes

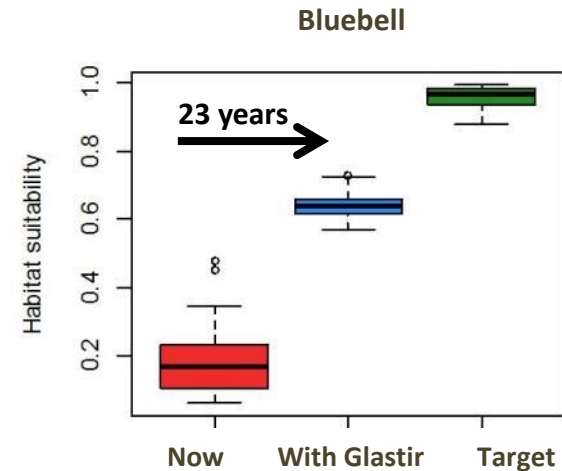


# Findings (3): Modelling for optimising scheme

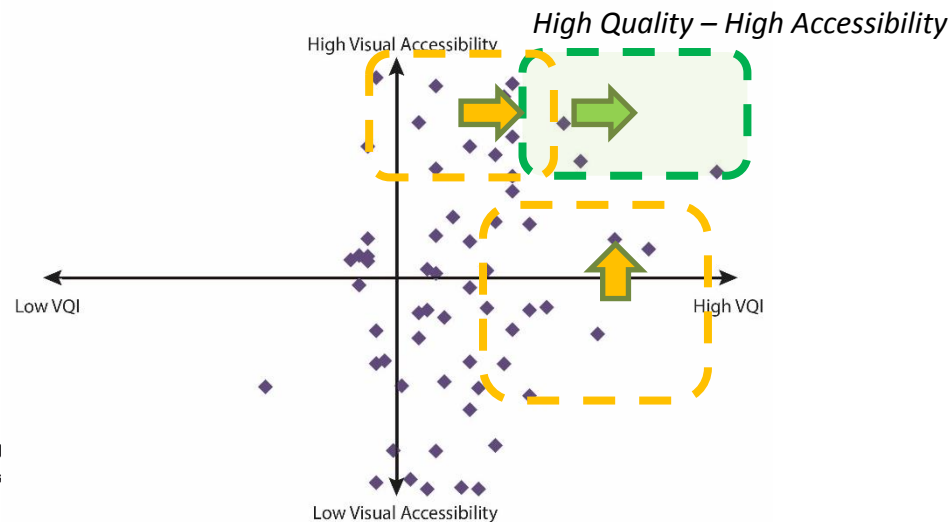
What is causing the problem of phosphorus in this rivers? Who do we target to change and what % reduction can we expect?



How long will it take for this woodland to become suitable for target species if woodland expansion option is introduced?

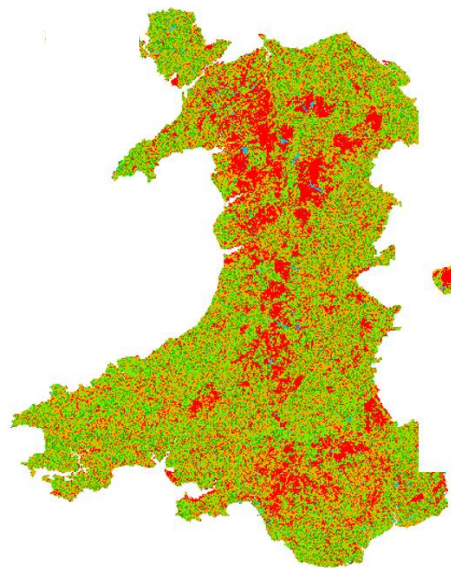


How do we improve benefits of our landscape to the wider public?



# Findings (4) Identifying trade-offs and opportunities using the LUCI model

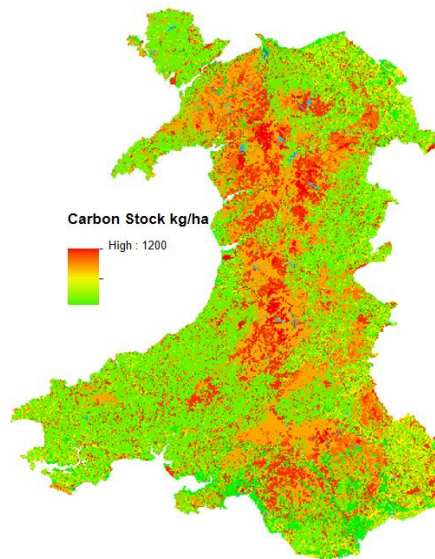
Flood generating and mitigating land



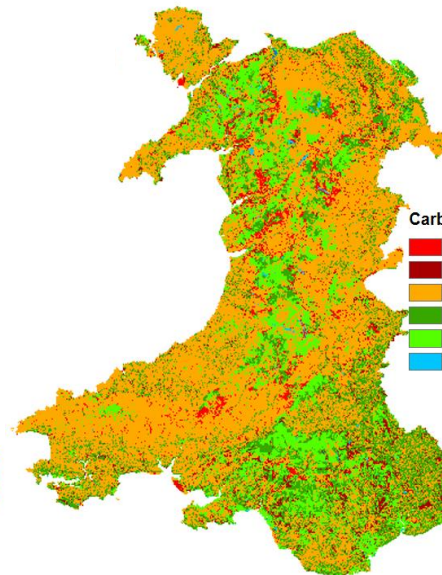
**Legend**

- Mitigating land
- Negligible "fast flow" concentration
- "Fast flow" concentration
- High "fast flow" concentration

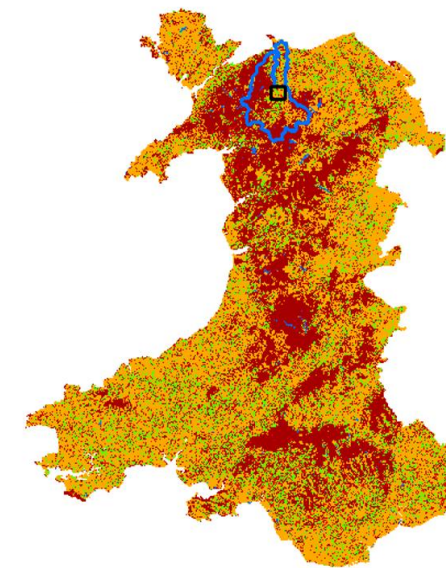
Carbon storage



Carbon emission



Woodland expansion opportunity



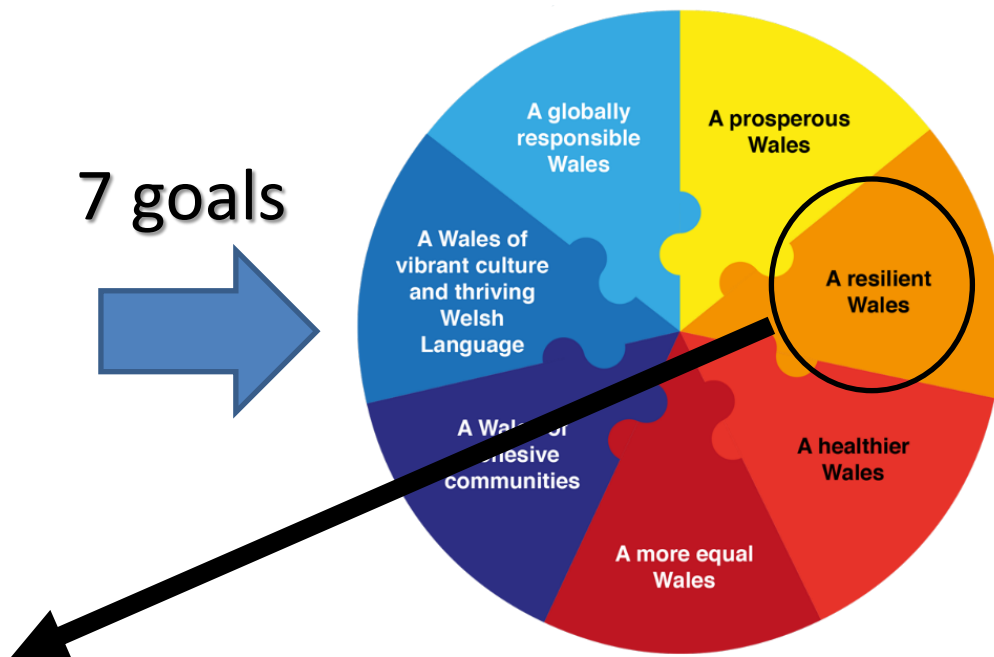
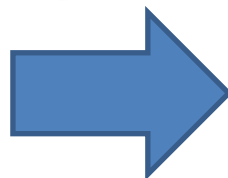
- Study 5km "close-up" area
- Conwy catchment outline
- Existing broadleaf woodland
- Other priority habitat
- Habitat establishment possible
- Opportunity to extend existing habitat
- Water features

# Flexibility as policy changes

Well-being of Future  
Generations (Wales)  
Act

Environment (Wales)  
Bill

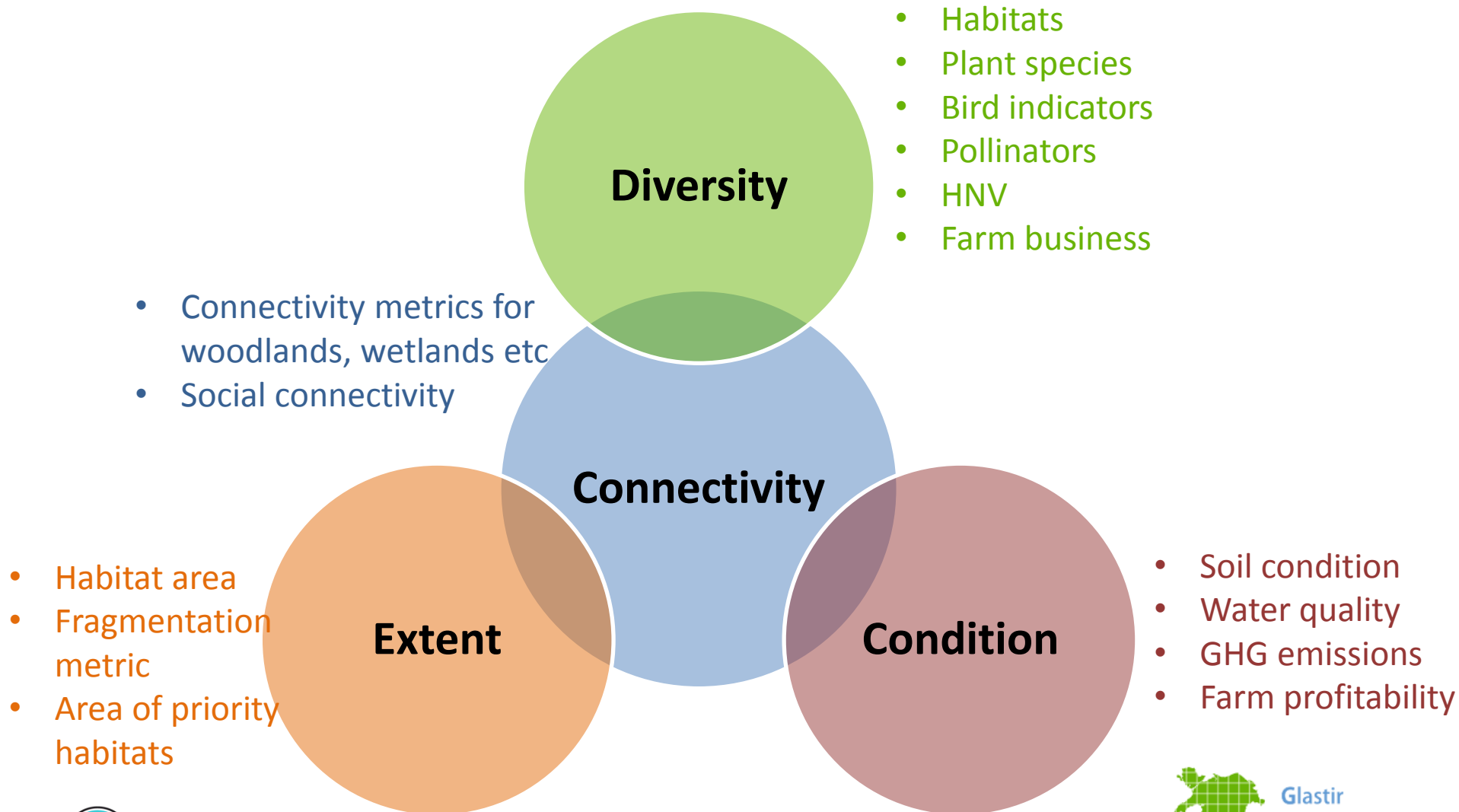
7 goals



## A resilient Wales

A nation which maintains and enhances a biodiverse natural environment with healthy functioning ecosystems that support social, economic and **ecological resilience** and the capacity to adapt to change (e.g. climate change).

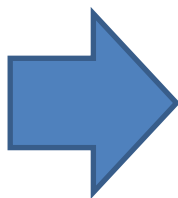
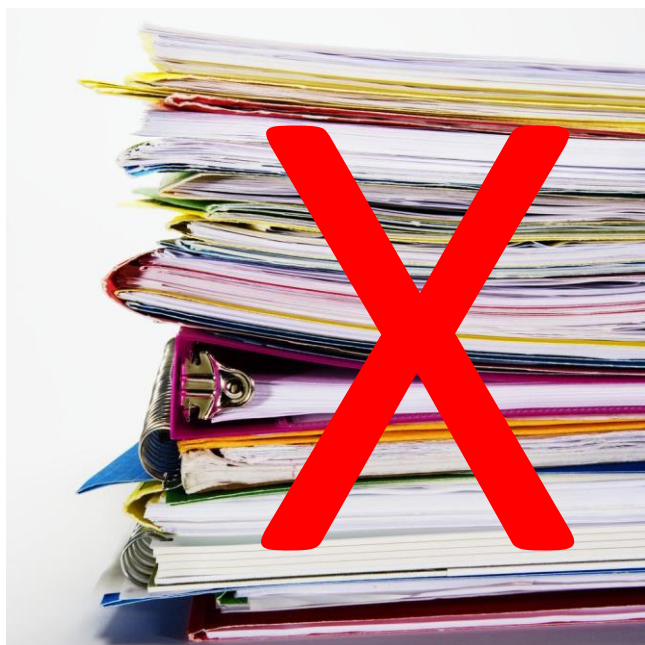
# GMEP measurements can be used to report on ecosystem properties linked to resilience





# A data portal for easy access to data and findings

[www.gmep.wales](http://www.gmep.wales)



**Glastir Monitoring and Evaluation Programme**

Cymraeg

Home About GMEP Summary of GMEP results GMEP Data & Findings Data Management Resources

**Woodland creation and management**

Glastir is the Welsh Government's sustainable land management scheme which pays for environmental goods and services aimed at:

- Combating climate change
- Improving water quality and managing water resources
- Improving soil quality and management
- Halting biodiversity loss
- Managing landscapes and historic environment and improving public access to the countryside
- Woodland creation and management

The Glastir Monitoring and Evaluation Programme (GMEP) has been commissioned by the Welsh Government to assess the performance of Glastir. GMEP was launched at the same time as the Glastir scheme. This provides fast policy feedback allowing for the scheme to be modified to improve efficiency and effectiveness. Click the links below to find out more about the work GMEP is undertaking within the six Glastir objectives.

**About GMEP** **Summary of GMEP results** **GMEP Data & Findings** **Data Management**

**Contact GMEP**

If you have a question or want to be kept up to date with developments within GMEP you can contact us through the GMEP Project Office.

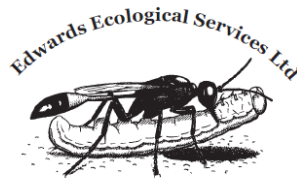
[Read more...](#)

**Centre for Ecology & Hydrology**  
NATURAL ENVIRONMENT RESEARCH COUNCIL

Ariennir gan  
**Lywodraeth Cymru**  
Funded by  
**Welsh Government**

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# GMEP Team (90 scientists from 19 organisations)



# Thank you

# Services currently modelled by

Service	Method
Production	Based on slope, fertility, drainage, aspect, climate
C stock/emissions	IPCC Tier 1 compatible – based on soil & vegetation
CH <sub>4</sub> /N <sub>2</sub> O emissions	IPCC Tier 1 compatible– soils, veg, stocking rate, fertiliser
Flooding	Topographical routing of water accounting for storage and infiltration capacity as function of soil & land use.
Erosion	Slope, curvature, contributing area, land use, soil type
Sediment delivery	Erosion combined with detailed topographical routing
Water quality	Export coefficients (land cover, farm type, fertiliser, stocking rate info) combined with water and sediment delivery models
Habitat Approaches	<ol style="list-style-type: none"> <li>1) Cost-distance approach: dispersal, fragmentation, connectivity.</li> <li>2) Identification of priority habitat by biophysical requirements e.g. wet grassland</li> <li>3) Measures of habitat richness, evenness, patch size etc</li> </ol>
Coast/ floodplain inundation risk	Based on topography and input height of storm surge/long term rise etc: surface and groundwater impacts estimated
Tradeoffs/synergy identification	Various layering options with categorised service maps; e.g. Boolean, conservative, weighted arithmetic, distribution plots

