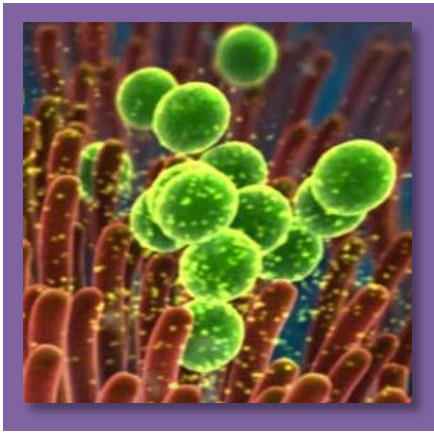


**Monitoring and
modelling freshwater
biodiversity...
What for?**



Isabelle Durance, Cardiff University





+ Overview

Freshwaters and the opportunity created by the ecosystem service approach

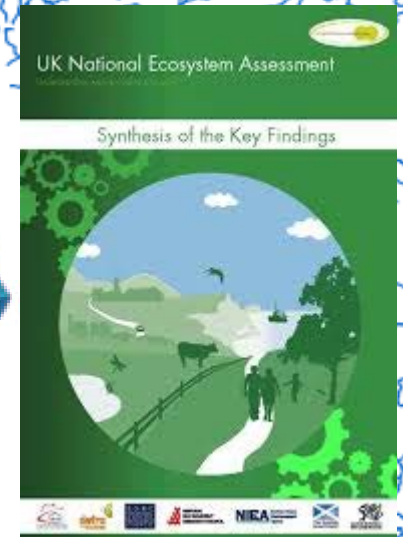
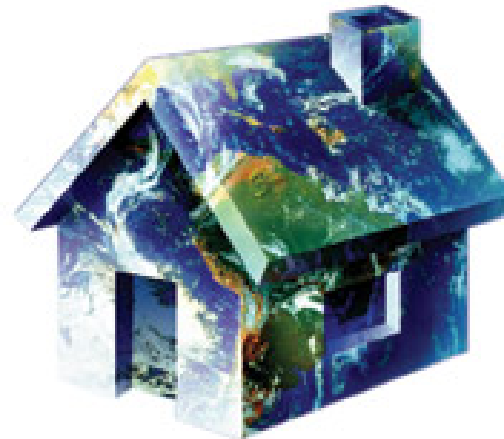
Do we really need freshwater biodiversity?

Tools to monitor and model biodiversity in a changing world

Hot spots of biodiversity, multiple users, under multiple pressures



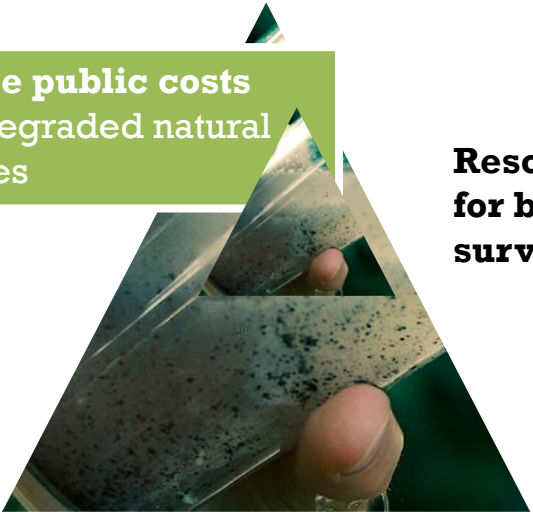
Link biodiversity to human wellbeing





Freshwater services, an opportunity for freshwater biodiversity to be valued?

Reduce public costs
from degraded natural
services



**Resources
for basic
survival**



**Contribution
to good
health**



**Social,
cultural and
educational
benefits**



**Reduce risks from
failing natural systems**



Failing



**Protection
from hazards**

**Support for a
strong economy**



**Management
for services
with high
market value**

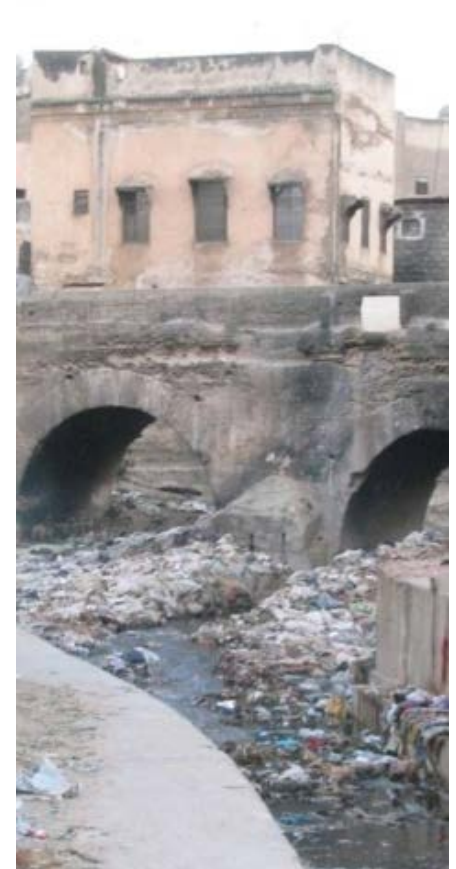
Increase service flows
Quantity, quality, resilience



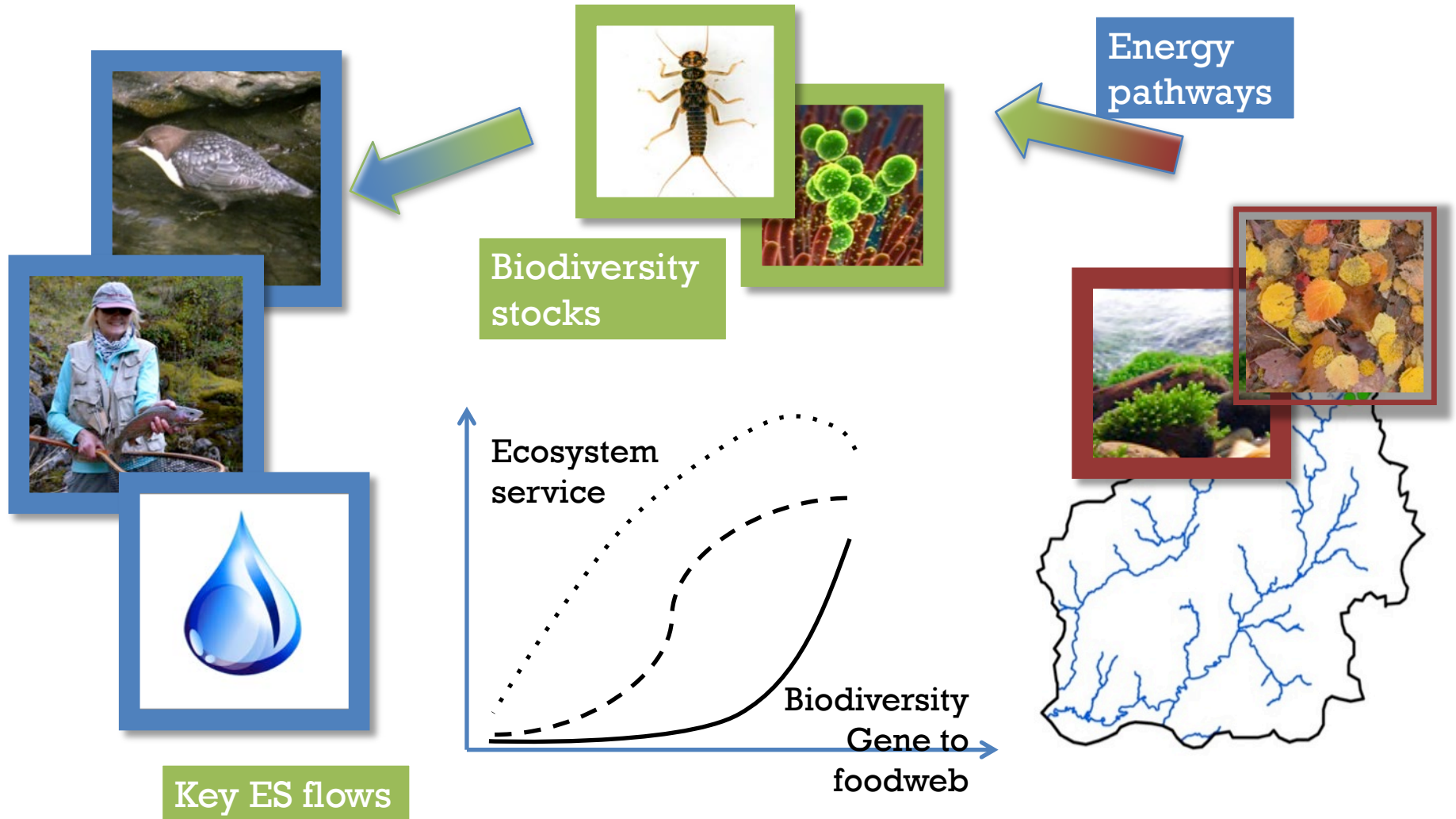


Do we really need river biodiversity?

Biodiversity to human well being, the missing link



Role of biodiversity



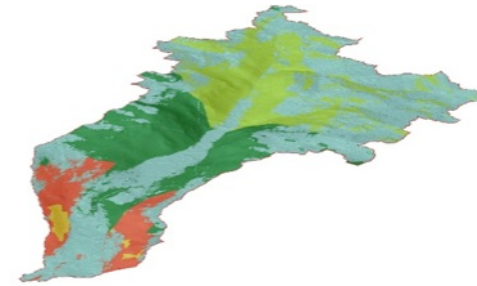
Quantitative approach, insitu experiments and large scale models

Exploring a range of futures, at a range of scales, throughout the food chain



Using local knowledge

Catchment scale:
>4,000 sites



Reach scale: >50 representative sites

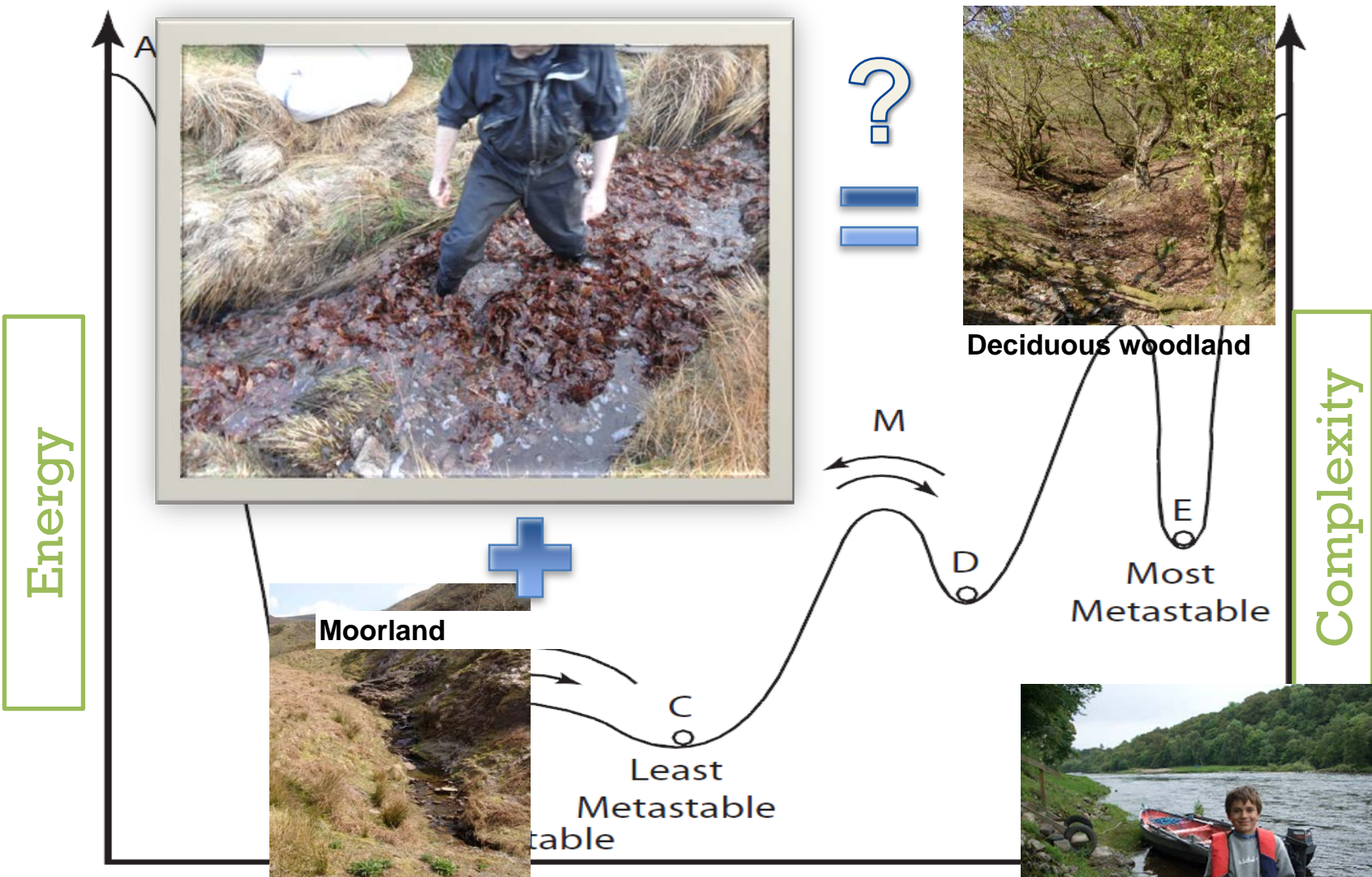


Mesocosm scale, 16 channels



What are the biological attributes most likely to promote quantity, quality and resilience of ES

What happens if we experimentally transform a simple, low energy system into a higher energy system, e.g. planting broadleaves?



From Leuven et al. 2002. *Freshwater Bio*

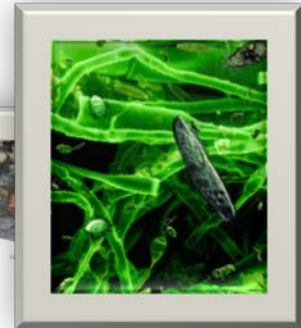
Does it sustain more fish?



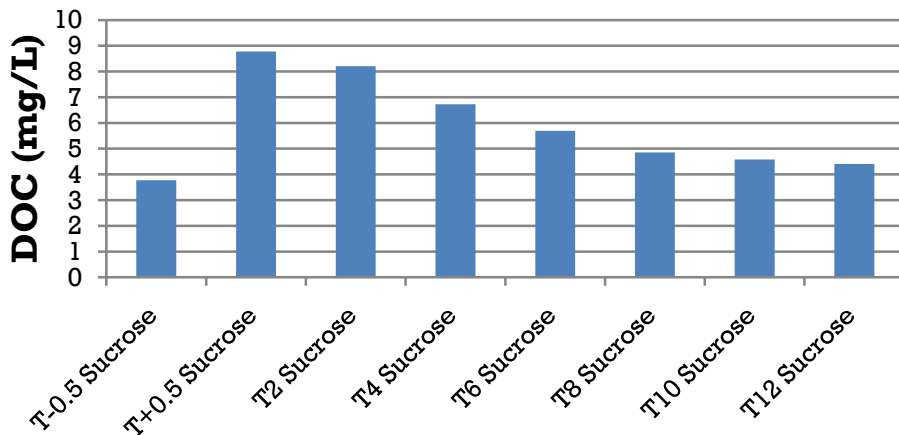
How much does river biota contribute to reducing water bills?

Quantitatively assessed DOC uptake (peat juice) by river biota,

To estimate cost saving in water discoloration treatment per km length of river



L3-conifer forest

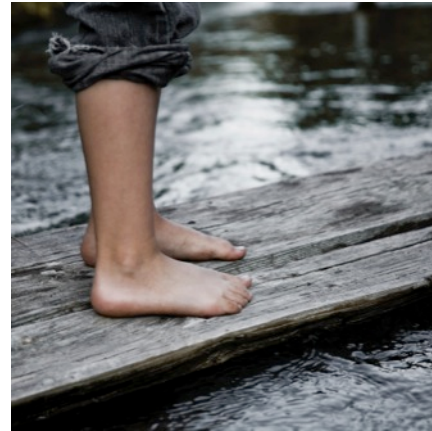




Tools to monitor and model freshwater biodiversity under global change



dreamstime.com



Classical Tools

Sampling, weighing, measuring and identifying



15,951 fish

>240
birds



18,000 diatoms

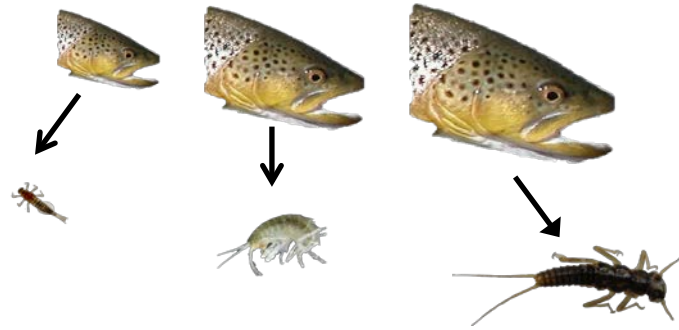
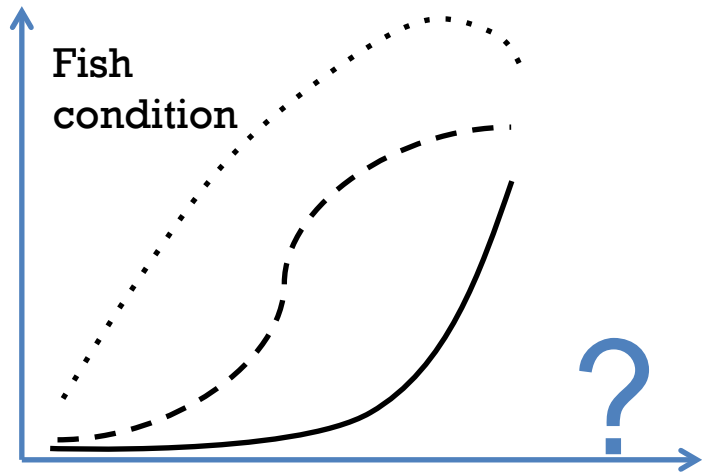


245 biofilms



34,786
invertebrates

Tested range measures of biodiversity

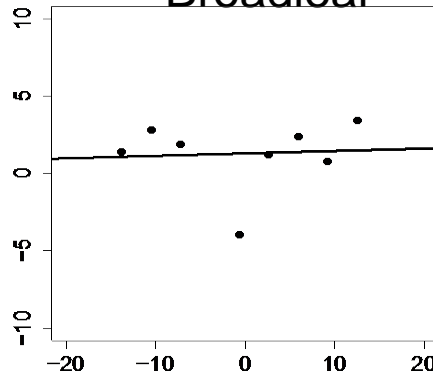
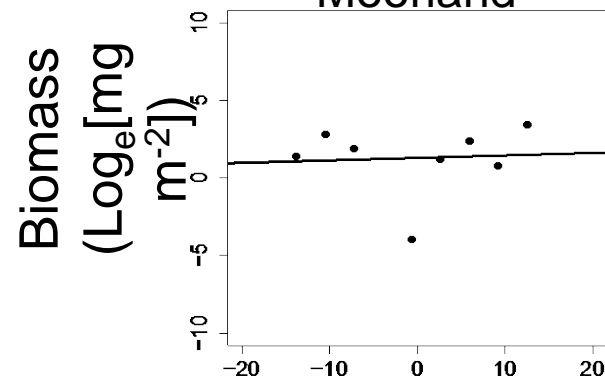


Moorland



Broadleaf

e.g. based on energy transfers, foraging efficiency, prey lipid content, traits....



Body mass (Log_e [mg])

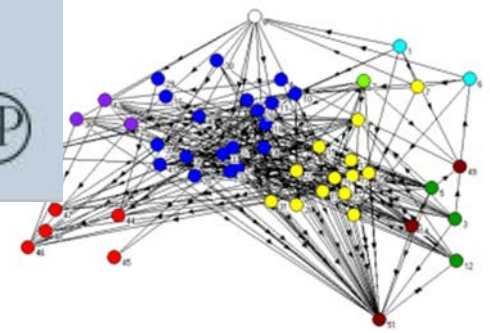
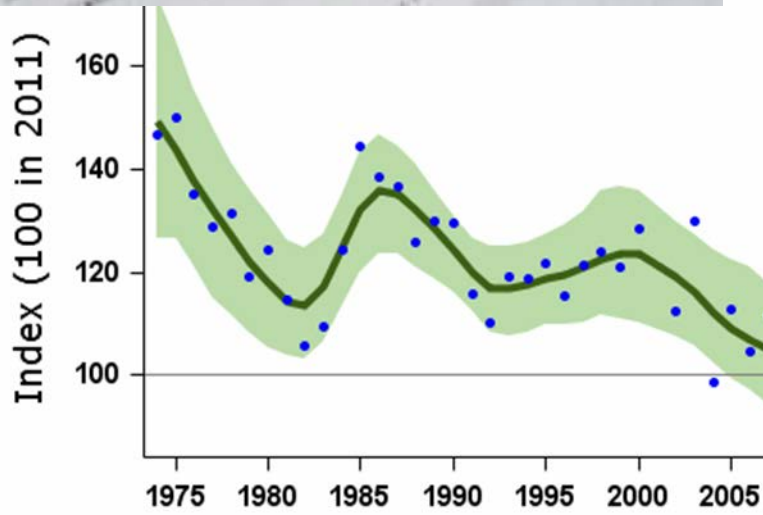
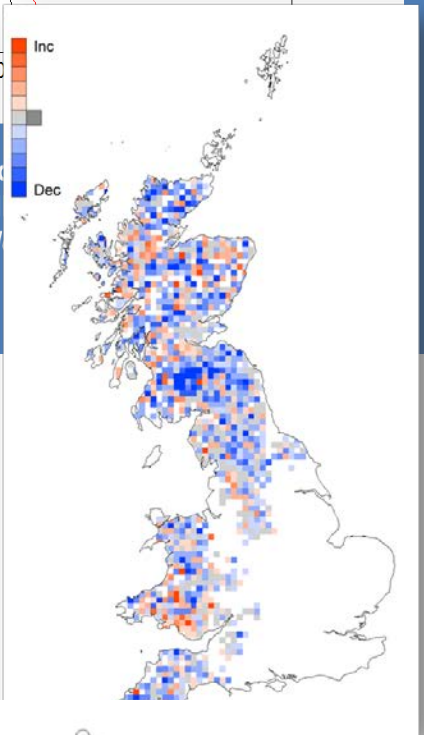
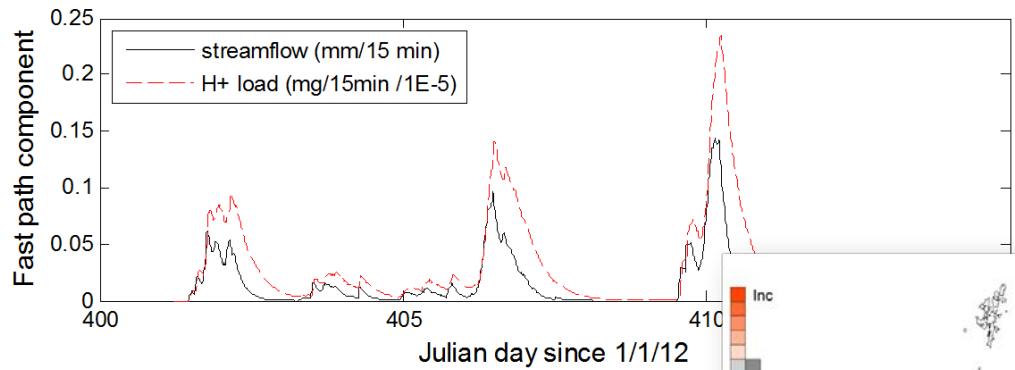
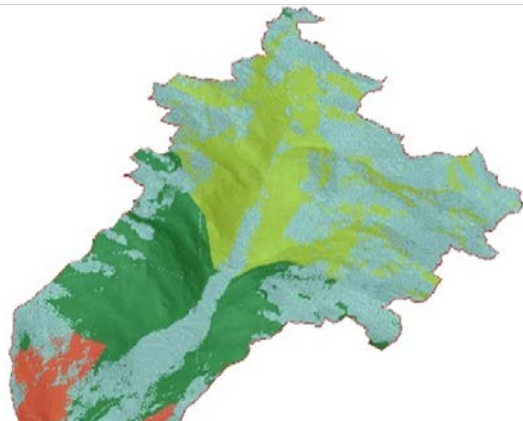
Measures based on genetic make-up



16S RNA: Linking specific microbial activities with ecological processes underpinning ecosystem service delivery

DNA: Linking demographic processes (e.g. resilience, bottlenecks) in invert, fish and bird populations to ES attributes such as fish condition, stock health, productivity...





So, modelling and monitoring, what for?

Modelling:

- Freshwaters great ecosystem model to test biodiversity tools
- Shifts focus from biodiversity or habitat to service – engages both natural and social scientists
- Importance of long term data and big data (eDNA)
- Microbial black box needs investigation

Monitoring:

- Legislation in EU based on measures that are not easy to relate to processes
- + • Need more holistic approach
- Current measures rarely relevant to ES approach

step out of our zones of comfort

