

Landscape Intervention Decision Support System

- A great deal is being spent on Agri-environment schemes.
- Whilst there is some direction given to these schemes, they essentially depend on the decisions of individual farmers.
- Wildlife conservation works best when coordinated across a landscape.
- This scoping study looks at the feasibility of building tools to direct agri-environmental work to maximise biodiversity gains whilst minimising costs.



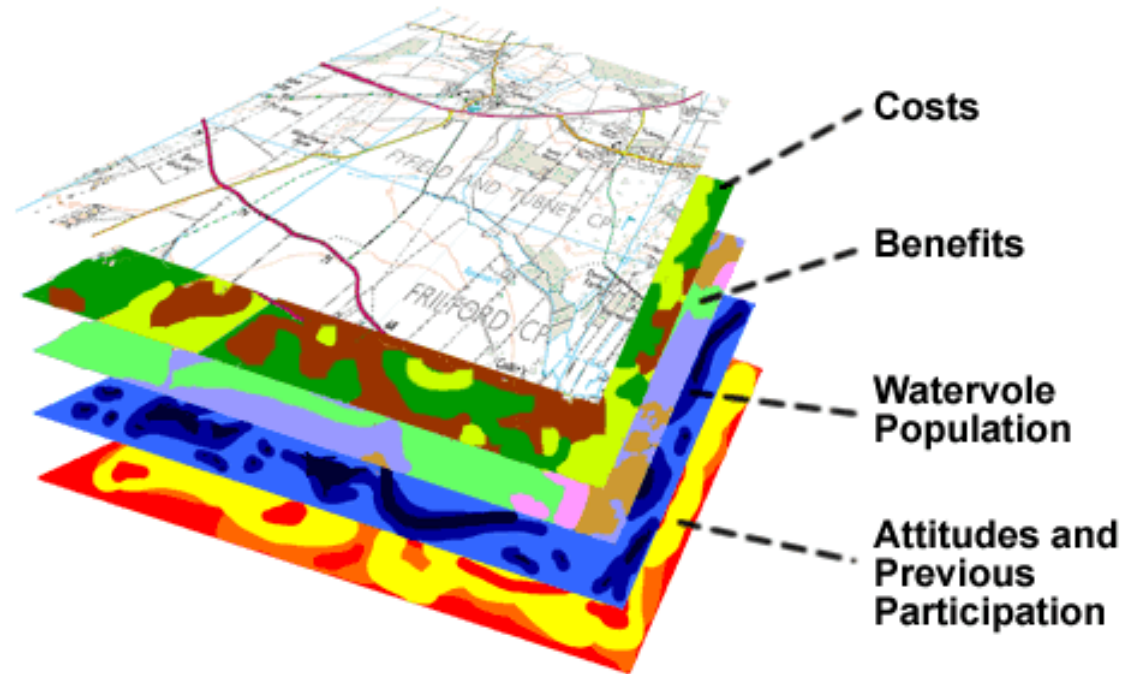
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Maximising the Net Benefits of Conservation work

- The fragmentation of habitats presents one of the largest threats to British wildlife.
- The costs of this work will also vary depending on where it is placed.
- In this project we are measuring benefits, once costs are subtracted, across a landscape.
- We can then target work so as to maximise social benefits.



Overview of the Sums

Farmers

e.g. Fencing costs

Local
People

e.g. Seeing more wildlife

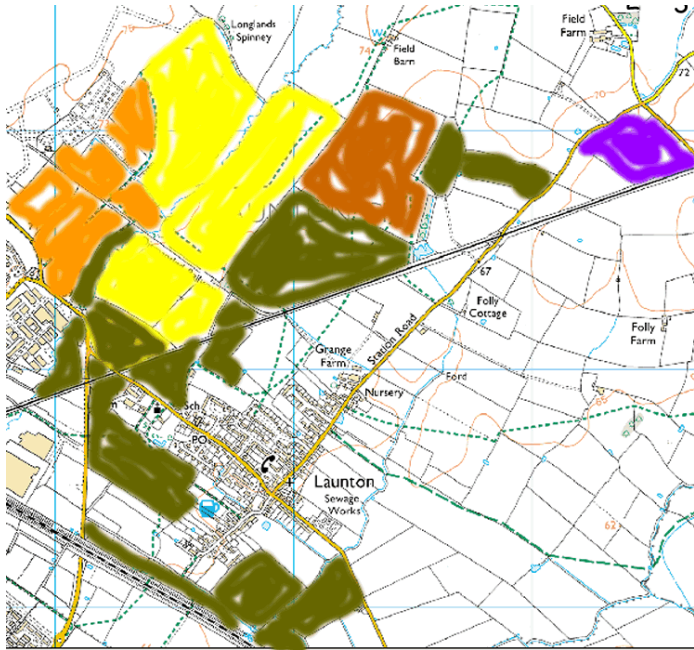
Wildlife

e.g. Simply knowing biodiversity is
being protected

Direct
Values

Indirect/
Non-Use
Value

Farmers: Costs



Opportunity Cost

Strictly defined as the highest value alternative

Here it is what they would have grown

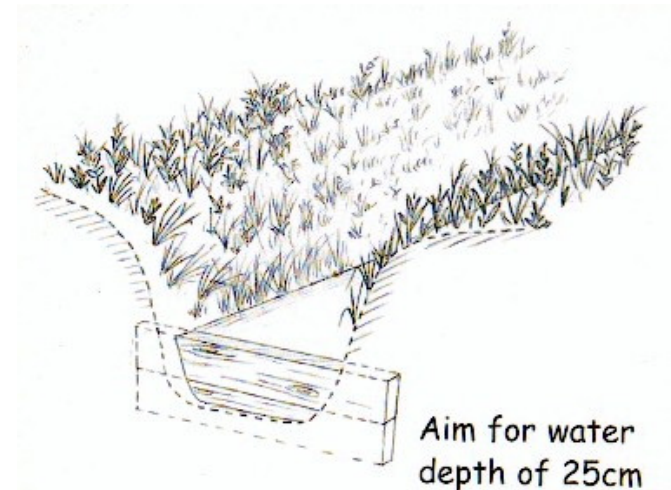
This will vary depending on the size of the enterprise as well as the product

Capital Cost

More straightforward

Cost of fencing, putting in bunds, topping set aside...

Project's cost



Farmers: Can we predict the probability of participation in environmental work?

Previous Participation

Attitudes

Demographics

Stated Preference

Farmer Questionnaire
Work & Potential Participation

Section 4: Potential Participation

Conservation work on farmland is generally tackled on a farm-by-farm basis. This has the effect of creating many excellent but disjoint habitats. In order for wildlife to flourish, corridors need to be built to link populations.

In order to tackle this WACRU are involved in a project intended to link these patches. By working closely with farmers we hope to show what their land could support and what they could gain as income through agri-environmental schemes. Then try to help farmers overcome barriers, which might have curtailed entry so far.

For any farm agreeing to participate we would provide:

- An audit of existing farm habitats and species
- Information on the presence of any protected species
- A plan detailing practices which would build on these features, building on the quality of the habitat while remaining sensitive to the needs of the business
- Help applying for agri-environmental payments
- A nutrient budget to account for the flow of nutrients through the farm to identify losses or surpluses to improve efficiency and save money
- Monitoring of key species

This is a thorough and entirely bespoke service. Where farmers express interest in certain species the plan will show how they can be encouraged. If farmers have problems with specific practices or measurements we try to help the farmer overcome these problems. Finally any small decisions are left entirely to the farmer's judgement.

Before coming into the project we would have a detailed conversation with each farmer, to discuss the type of work which might be involved given the farm's characteristics and whether or not there are likely to be viable.

As a rough estimate these plans usually take about 4 days to complete at about £400 per day. We would only ask that you pay 10% towards these costs, which for the average farm comes to about £100. Would you consider taking part if this project were rolled out to your area?

Yes or No

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This questionnaire has been developed as part of a research project led by WACRU at the Zoology Department of Oxford University. If you require any further information regarding this form or the research it pertains to then please contact Adam Dobson on 01753 507110.

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Yes but...

- **Nobody is anti-environment. Only the priorities alter.**
 - **No easy predictor, requires interview**
 - **Economic indicators are not particularly good**
 - **Their attitudes, previous participation and time in farming can produce a good predictor**
- **Money does not really seem to be the issue.**



How does this benefit the local community?

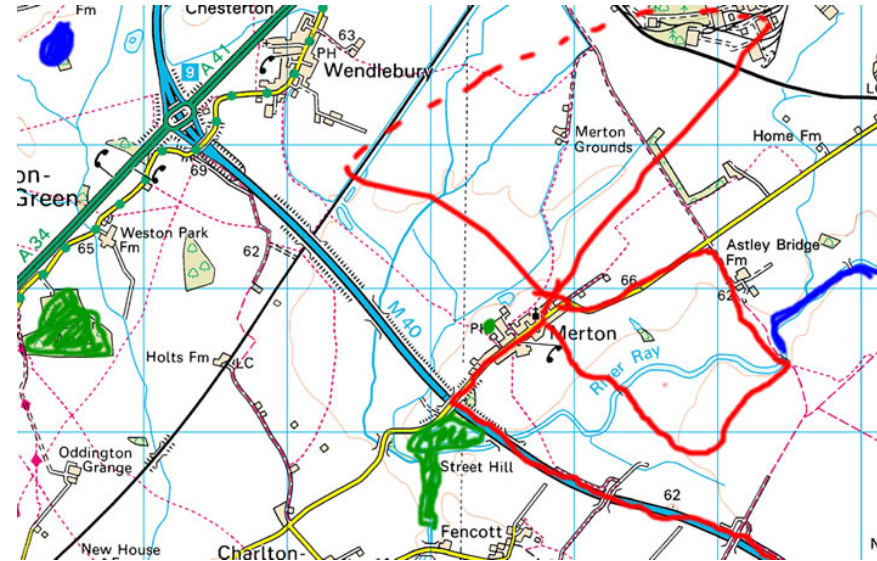
Direct Use Benefits

For local residents these can probably be left out of the calculation.

Spend the vast majority of their time in their villages and towns

Most of what they see will be from their buildings or cars

Might want to consider specific conservation areas, but that includes people from a broader area



Measuring biodiversity benefits: Using flagship species

Breed: March - October
Gestation period: 20-30 days
Litter size: 5-6 young
3-5 Litters per year



Water voles

Declined by 95% in UK in last 20 years (priority BAP species)

Basic premise: – water voles make good colonists

High recruitment and quick to respond to habitat improvement

Fairly Iconic

Territorial

Valuing a Vole: Converting the change in water voles into pound signs

But does it make sense to talk about the value of a vole?

Of course not.

Mean Willingness to Pay values were
Water Vole £7.44

(White et. al 1997)

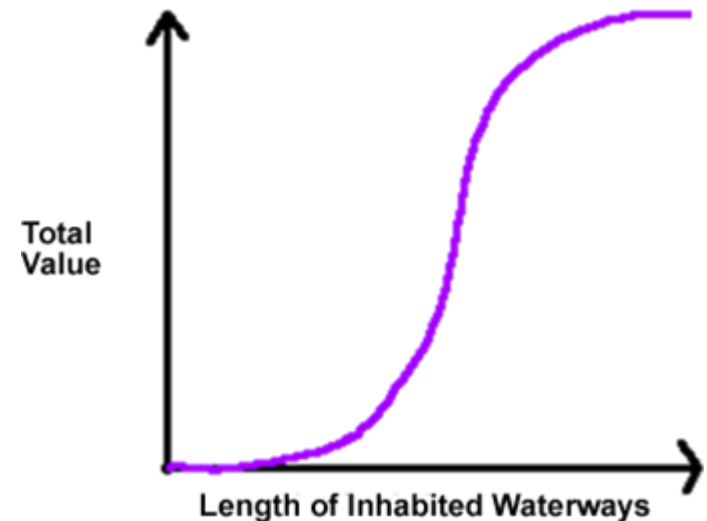


Does it even make sense to talk about the value of a metre of habitat?

Perhaps, but...

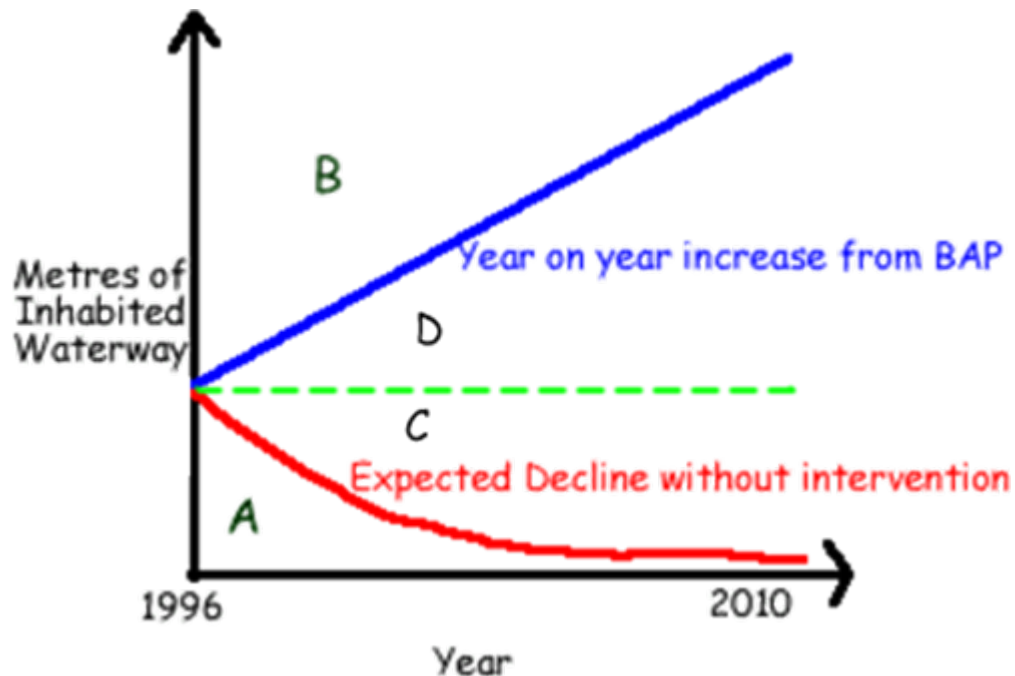
Depends on where we are now

Puts strain on first comers if taken too seriously



Valuing a Vole: Pulling the value for the BAP apart

I instead opted for a flat rate of £X per extra stretch of inhabited waterway.



Willingness to pay of the UK public= **£13.90/metre for new habitats**

A quick cost benefit analysis

This does not represent a full cost benefit analysis, there are many other benefits from this work.

Below are the present values of the cost of creating water vole habitat along a kilometre of waterway.

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Remember that 1 metre of vole habitat is worth ~£13.90 so 1km = £13,900

Through arable land

Opportunity Cost	£3490
Establishment	£150
TOTAL	£3640
Mink control	£8333
With mink control	£11,973

Through dairy farms

Opportunity Cost	£15666
Establishment	£150
Fencing	£2870
TOTAL	£18686
Mink control	£8333
With mink control	£27,019

(farm estimates from Nix Mink control estimates courtesy of the Game Conservancy Trust)

Difficulties of combining these values to derive the most efficient solution: Technical constraints

Scale and data availability are dwarfed by computational complexity.

The most appropriate set of fields to work with could be 1 field, all of them, or any combination in between.

$$= \sum_{M=1}^N \left(\frac{N!/(N-M)!}{M!} \right)$$

Brute processing power will never properly solve these problems.

A simple population model

We are looking for the cheapest way to de-fragment water vole habitat

To estimate the effect of any work on the water vole population:

- Calculate the viability of different carrying capacities
- Assume different lengths of non-habitable corridor to join these populations or, with more accurate ecological data, you could create a function of likelihood of movement given distance
- Estimate the carrying capacity based on the length of waterway, buffers around it etc.



In Conclusion: results

- Direct use can probably be ignored in terms of any spatial bias. Large/popular wildlife parks could conceivably be included
- Participation could be predictable (~80%) with 7 variables, but requires interview.
- Any population model must be easily calculable.
- Social prices can be created for small changes in habitat.

In Conclusion: moving forward

- *This could potentially provide a mechanism for Cost Benefit Analysis.*
- *These models can be built and provide significant efficiency gains but will they be?*
- *What could this be used for?*
- *What else could be considered?*