

Dealing with Uncertainty and Scale in Valuation



Interdisciplinary quantitative ecosystem services team: INQUEST

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Aim

- How can we value what we take from nature (e.g. food, water, visiting the mountains or relaxing on a beach)?
- How certain can we be of that value?
- How can we use that value, and our understanding of its uncertainties, to help society make better decisions?



Research

8 academics, 8 research scientists and 6 stakeholders formed the team investigating two specific challenges in valuing nature:

1. How can you account for **uncertainty**?
2. How to factor in **scale** differences over time and space?

We collected evidence from stakeholders in the Tamar Estuaries Consultative Forum and from two different land managers within the Cairngorms National Park.



The Cairngorms National Park, 450,000 ha (left); commercial farm at Balliefurth, 170 ha (top); RSPB Abernethy National Nature Reserve, 14,000 ha (bottom)

Findings

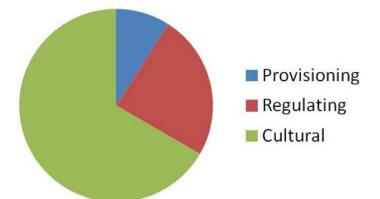
- Our stakeholders commonly use uncertainty in their normal business decision processes, and, as it is always possible to estimate uncertainty, ecosystem services valuations should provide that information.
- Ecosystem services data will often not be available at the spatial and temporal scale of the valuation, and it was difficult to change scales for many sets of ecosystem services where there were multiple interactions – e.g. changing water flow also changes the physical, chemical and biological responses of many services.
- Hierarchical statistical models and improved GIS (geographical information system) provide possible solutions to these problems.

- Sometimes the only data available came from expert judgement rather than formal measurements and often the values for ecosystem services in our studies were not monetary.
- Bayesian Belief Networks are a decision tool which, in a traceable fashion, can combine different types of data and values, use measurements alongside expert judgement, and provide a rigorous estimate of uncertainty.
- The main limitation in applying BBNs is the loss of detail when including the more complex ecological or social models relevant for some ecosystem services.

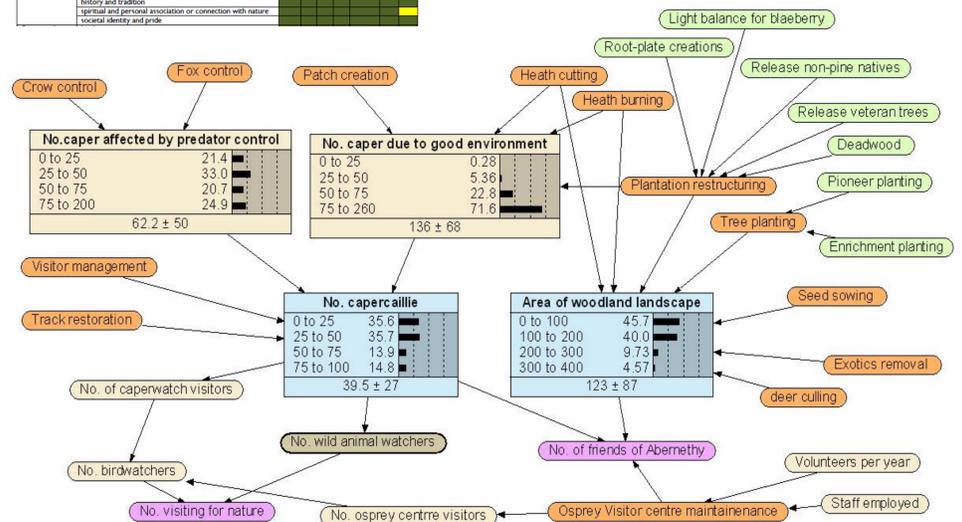
Lists of ecosystem services from the Cairngorms National Park Partnership Plan 2012-2017

Table 2: The importance of ecosystems services in broad habitats of the Park.

Importance of the ecosystem service	High	Medium-High	Medium-Low	Low	Enclaved Woodland	Open waters	Moorland	Grassland	Mountains	Urban
Provisioning ecosystem services										
Food (crops and livestock)										
Fuel (logs, trees, wood etc)										
Fresh water										
Dispersive wild species										
Regulating ecosystem services										
Climate regulation (local temperature regulation, emission and storage of greenhouse gases)										
Hazard regulation (eg flooding, landslides, wildfires)										
Disease and pest regulation										
Soil quality										
Water quality										
Seed dispersal										
Air quality and noise										
Pollination										
Cultural ecosystem services										
Knowledge: ecological and geological										
Recreation: engagement, physical and mental health										
Patterns and forms of settlement										
Aesthetic: experience of landscape										
Sense of place										
Traditions										
Awareness and appreciation of the historic environment										
Spiritual and personal association or connection with place, history and tradition										
Spiritual and personal association or connection with nature										
Societal identity and pride										



66 ecosystem goods and services were identified within the RSPB Abernethy National Nature Reserve



A preliminary BBN for a management policy to improve Capercaillie numbers within the RSPB Abernethy National Nature Reserve. Delivery of two selected ecosystem services (blue) are embedded within a series of options to improve the habitat for the birds.

Conclusions

- The task of valuing nature is possible, but generating a rigorous comprehensive value is difficult. Valuing change is more achievable than providing an absolute value.
- It is misleading to provide (a) a value for the benefits from nature that pretends to be more accurate than it really is, or (b) one that is actually relevant for a different area or time than the decision that you want to make.
- Stakeholders understand the problems of scale and uncertainty in ecosystem services, and can use relevant information on both to improve future decisions.

Next steps

- Further development of tools for rescaling data and implementing models better within BBNs would be relevant to any manager or policymaker with a requirement to provide values for human use of natural resources.