



Conserving Natural Heritage

Exploring environmental policy with coupled natural and human system modelling

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Biodiversity in context

The following kinds of question are important considerations when deciding how to conserve rural biodiversity whilst enabling a sustainable rural economy:

- How can policy influence biodiversity at various spatial scales amidst a range of other influences on land managers' behaviour, including other policies?
- How sensitive is biodiversity to changes in policy?
- Should conservation policy focus on particular species, habitat provision or species mix?

Agent-based coupled natural and human system modelling can be used to explore these questions.



Coupled socio-ecosystem modelling

The challenge with coupled modelling is to create a viable integrated model from components that are credible models in their own right. FEARLUS, a published agent-based model of land use change has been coupled with a biological community model of species and habitats (SPOM), carefully designed to operate at consistent spatio-temporal scales using compatible concepts without duplicating sub-processes (Figure 1).

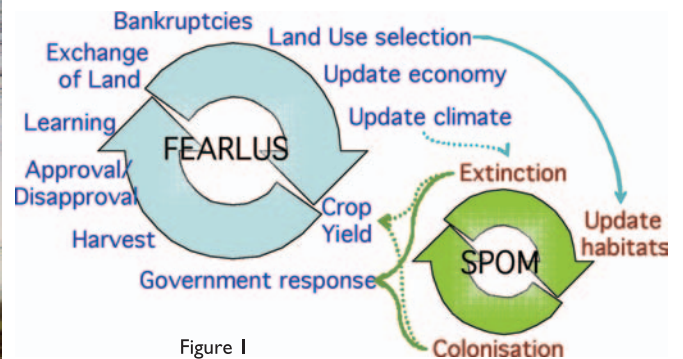
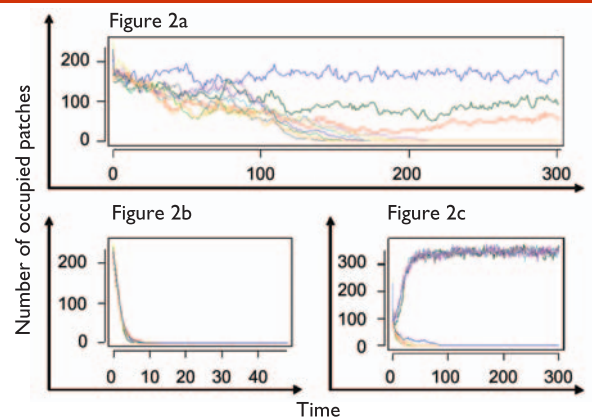


Figure 1

Interpretation

Using the coupled modelling software, we are able to explore scenarios pertaining to the behaviour of the species in the biological community model and the decision-makers in the agricultural social system model. Preliminary results based on stylised scenarios suggest that policy measures can influence biodiversity through farmers' actions.

Figure 2a shows the dynamics of the biological community without coupled social interactions, in which a few species survive in the long term. Compare this with the effect on the biological community when farming is introduced between effective and ineffective policies: local extinction (Figure 2b) or enhanced biodiversity (Figure 2c).



These graphs use one line for each species to show the number of patches of land occupied by that species at each time step during the simulation to which they pertain.

Implications for management and conservation policy

This work demonstrates how models can be used to explore potential outcomes from policy scenarios. Though the results shown are preliminary, based on stylised parameter settings, we expect to be able to work with particular scenarios in the not too distant future. We should then be able to explore possible impacts on biodiversity from various forthcoming changes in policy.