DYNAMICS AND THRESHOLDS OF ECOSYSTEM SERVICES IN WOODED LANDSCAPES

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bess biodiversity & ecosystem service sustainability

Objectives

The project aims to test the following hypotheses:

i. The provision of ecosystem services in wooded landscapes subjected to anthropogenic disturbance displays threshold responses;
ii. Current pressures on forest ecosystems could lead to catastrophic declines in the provision of ecosystem services, as a result of threshold effects;
iii. Early warning indicators of thresholds can be identified as predicted by current theory, enabling those landscapes that are particularly at risk to be identified.

Approach

The project will focus on analysing the dynamics of ecosystem services in the New Forest National Park, which is located in southern England. Research activities will be grouped into four discrete Work Packages:

1. Gradient analysis (Fig. 1);
2. Modelling dynamics and thresholds (Figs. 2-3);
3. Aesthetic and recreational values assessment (Fig. 4);
4. Analysis of long-term monitoring data (Fig. 5).

Outcomes

Project outputs will include:

i. Spatial database incorporating measures of biodiversity, ecosystem function and associated services for the New Forest National Park;
ii. Long-term monitoring dataset for a site that has undergone a regime shift;
iii. Spatially explicit model of forest dynamics and ecosystem functions parameterised, calibrated and tested;
iv. Scenarios developed of the potential impacts of multiple pressures on biodiversity, ecosystem function and services;
v. Indicators of biodiversity, ecosystem functions and services developed and tested, for early warning of potential thresholds.

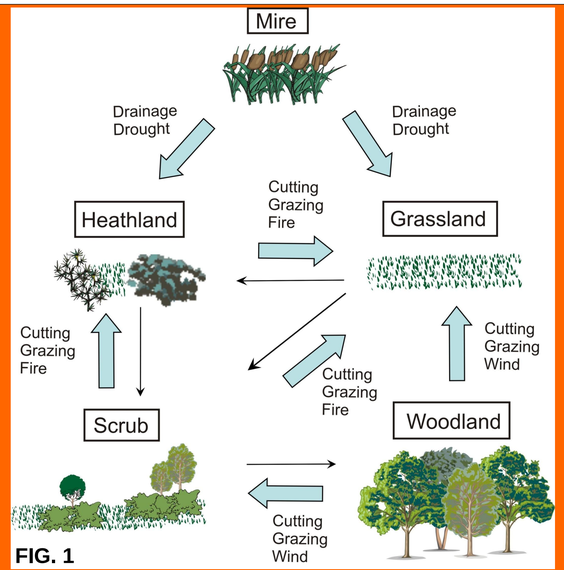

FIG. 1

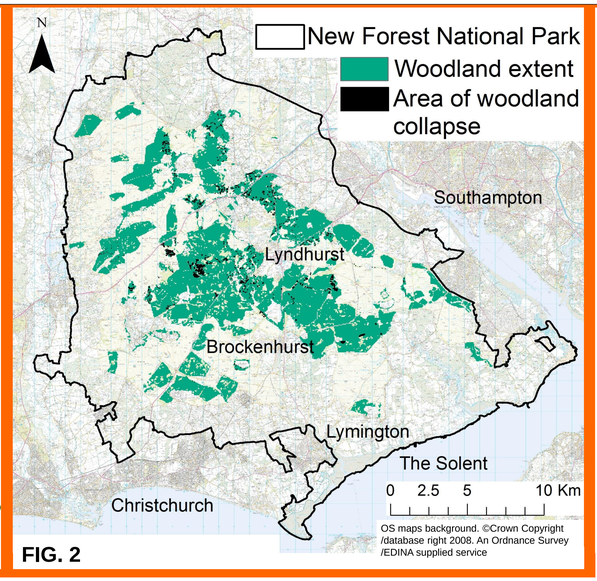

FIG. 2

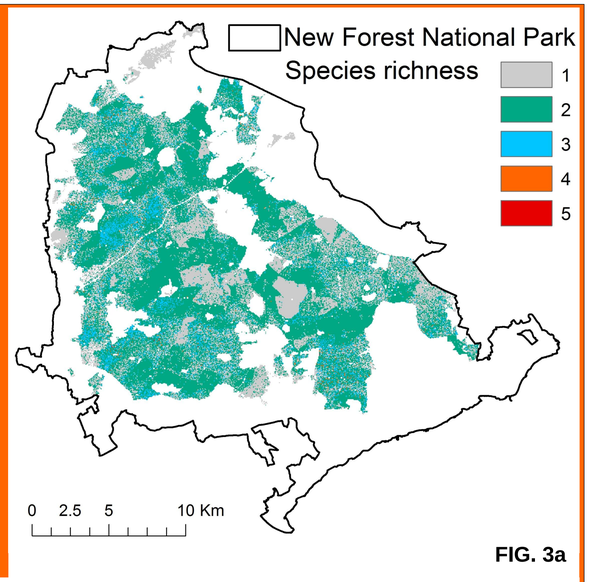

FIG. 3a

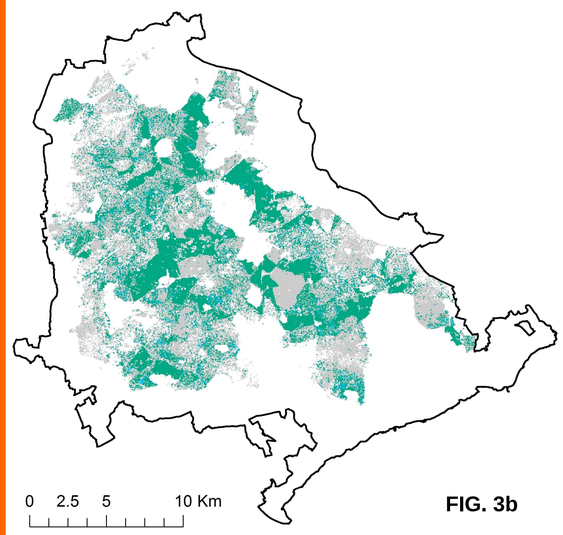

FIG. 3b

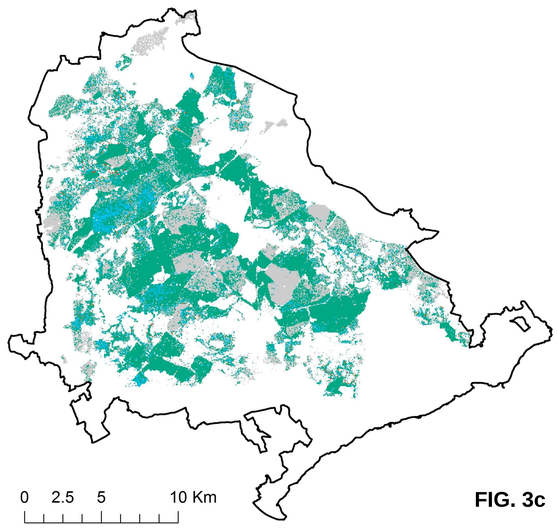

FIG. 3c

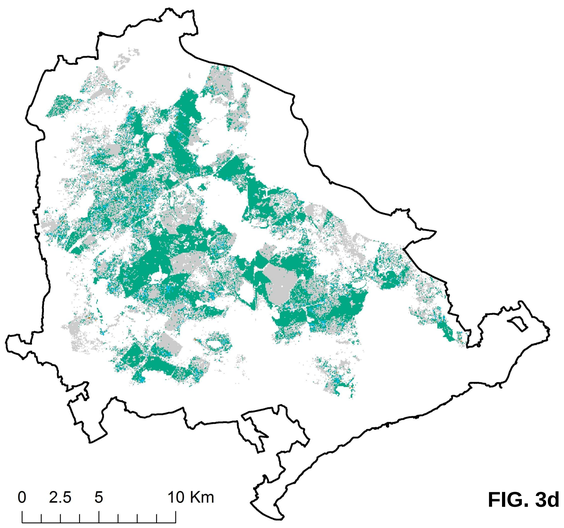

FIG. 3d

Fig 1. Schematic diagram indicating the different ecosystem states and transitions in the New Forest (Newton, 2011). **Fig 2**. Woodland extent at the onset of the Landis-II model simulations, and areas of forest collapse (from Peterken et al., 1996). **Fig 3**. Projected woodland extent under different disturbance regimes after 300 years of model simulations. Values presented are the areas occupied by one or more of the five principal tree species (*Betula pendula*, *Fagus sylvatica*, *Ilex aquifolium*, *Pinus sylvestris*, and *Quercus robur*), as individuals ≥10 years old. (**a**), no disturbances; (**b**), browsing only; (**c**), fire only; and (**d**), fire plus browsing (Newton et al., 2013).

FIG. 4

Fig 4. Eyeworth pond, one of the New Forest popular areas for recreation.

Fig 5. Denny Wood, site of permanent sample plots (Mountford and Peterken, 2003), illustrating the canopy collapse that has occurred in some New Forest beechwoods.

FIG. 5

References
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Peterken, G.F., Spencer, J.W., Field, A.B. (1996). Maintaining the Ancient and Ornamental Woodlands of the New Forest. Forestry Commission, Bristol.

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