

Fire Interdisciplinary Research on Ecosystem Services: fire and climate change in UK moorlands and heaths (FIRES)

SEMINAR 2

The impact of wildfire on ecosystem services: relationships between wildfire, climate change and people

The University of Manchester, 24th June 2008

Session 2:

'How will climate change affect wildfire risk, hazard and fire regime?'

Rapporteur: Vladimir Krivtsov (Edinburgh University)

Chair: Jonathan Ayles (Manchester University)

Keynote: Climate change scenarios for uplands. Mark Gallani (Met office), replacing Claire Goodess, University of East Anglia¹

Responses: How will climate change, access and wildfire interact? Sarah Haigh (Natural England); 'How will climate change and vegetation vulnerability interact? How will fire regimes change?' Matt Davies (Edinburgh University, FireBeaters).

Keynote

This session started with a very objective (at least as objective as modelling predictions could be) keynote presentation by Mark Gallani (Met Office), who explained various climate change scenarios for the UK. A well-designed sequence of graphs, related to the future changes in T precipitation and wind, was used to illustrate how the patterns of these variables are projected to change under different greenhouse emission scenarios. The main message was crystal clear: it is likely that the future increase in temperature will be accompanied by considerable summer decreases and winter increases in precipitation.

These changes will not be homogenous, and may affect certain location (e.g. Southern England) more than others. In some conditions, soil moisture content in the summer under the medium-high emission scenario may drop by as much as 30-40%. Consequently, this may aggravate fire hazard during the warmest months of the year. Geographical differences are also likely to be important for changes in uplands *versus* lowlands. For instance, drying of peat bogs could lead to longer fire seasons, especially pronounced in uplands.

There is, however, some substantial uncertainty as regards the exact details of the specific predictions, particularly in relation to wind. Average wind speed would only show small changes (contrary to the perception of many people), although the occurrence of high winds should increase due to the increasing

¹ The pre-circulated keynote paper published in the seminar booklet was written by Claire Goodess.

climate variability and the probability of extreme events. Furthermore, in the South, wind speed is actually projected to drop by approximately 3-4%.

Considering the uncertainty, the presenter emphasised that the earlier modelling scenarios have been rather deterministic. Recently, however, a probabilistic approach has been introduced to provide a more objective view on the likelihood of prospective changes. The future climate change reports will also provide a better account of geographical differences by increasing the spatial resolution of the climatic scenarios.

Response 1

The first detailed response, given by Sarah Haigh from Natural England, pointed out that when considering the changes in climate and fire regimes the following three points should be borne in mind:

- 1) Habitats' resilience to change: what changes in the health of the natural environment are likely to occur?
- 2) How will y this affects peoples' inspiration to value and conserve the natural environment?
- 3) What is the effect on the sustainable use of natural environment?

Proper consideration of these three basic points should help to ensure that land management is carried out in a way beneficial for the natural environment and secure the future of natural environment.

Arising from the above points, a number of interesting facts were pointed out; for instance: that 81% of the UK native species have moved north in the last 25 years; that in most habitats, phenological events typical for Spring occur earlier and those typical for Autumn now occur later in the year. This may eventually lead to a number of problems, such as an overlap between the prescribed burning season with the sensitive period for ground nesting birds.

It was also suggested that, although encouraging people to visit the natural environment will lead to an increase in accidental fires, the number of instances of arson should actually decrease. That perhaps should be taken into account whilst evaluating the performance of the CROW act, which concentrates purely on prevention <Sarah, here and elsewhere, please check that I've not misinterpreted what you've said>. Finally, Sarah has drawn attention to the 4P objectives important for the policies of Natural England <pls insert a link>.

Response 2

The second response, given by Matt Davies (Edinburgh University), concentrated on the complexity of possible responses (in terms of vegetation dynamics, fuel structure and moisture, and consequently fire occurrence) to the projected climate change. Matt pointed out that the uncertainty of climate predictions is not only translated into uncertainty of vegetation and fuel characteristics, but is also augmented by the complexity of biological

processes. Consequently, it would be too simplistic to conclude that hotter summer would directly translate into an increased fire hazard.

A series of thought-provoking examples of uncertainty and potentially counteracting effects was then presented (for details, see a very interesting Table, available in the conference booklet). This posed a number of questions to the floor related, for instance, to seasonal changes in fuel moisture content, earlier curing *versus* lush green growth, impacts on the moss/litter layer, impacts of possible changes in representative species and in land use (which may well be interlinked, in particular in relation to the red grouse), and successional changes in the ecosystem types.

At the end the speaker quite rightly concluded that taking account of such numerous and various counteracting effects is not easy, and warranted further research funding.

Discussion

The following discussion was skilfully guided by the chair – Jonathan Ayles (Manchester University), and elicited fruitful comments from a number of people (too many to mention personally) of many different backgrounds. It has been re-emphasised that although the point about uncertainties is a valid one, conditions in the UK *will* almost certainly get warmer. British climatic conditions may, therefore, change somewhat towards current conditions in the Mediterranean region. However, that may not necessarily lead to the development of a similar vegetation and fire regime, as the British Isles have important differences in atmospheric circulation, geology, relief, and soil type. Differences in fuel structure are important; even with considerable warming in Southern Britain there is so far no sign of establishment of Mediterranean-type higher shrubs like *Erica arborea* and *Cupressus sempervirens*, which provide continuity between the lower level and the tree crowns, thus acting as a ladder fuel. Further differences may relate to the plants' chemical composition, e.g. the content of oily substances, and the detailed characteristics of the fuel, such as the fraction of fine fuels.

The peculiarities of British conditions have been illustrated using the example of the occurrence of heathland fires, in particular in Scotland. Many of these fires occur in mid spring reflecting a minimum in moisture content (caused by the difficulties that heather plants, weakened during the previous winter, have in extracting water from cold, and often still frozen, ground). In summer, however, most plants are lush and healthy, and do not burn that well even during the hottest months. Fire behaviour of gorse (*Ulex europeae*) is, however, very different, and is more akin to Mediterranean conditions, where a similar species (*Ulex parviflorus*) is often dominant. However, gorse fire may often be caused through negligence during recreational activities, and peaks in occurrence may therefore happen at Bank Holiday weekends; for example, in Dorset they are particularly frequent during Easter holidays.

Comparative analysis applying the methods of, for instance, geography, ecology, climatology and mathematical modelling (and drawing not only on the analysis of contemporary situations, but also on paleo-studies) are needed to enhance our understanding. However, there was also a view that

whilst it is all very well to speculate on possible future changes, there are some certain things (e.g., accumulation of dead fuel, immediate effects on the currently representative plant and animal species) which should be tackled with a greater priority. The most important effect is the rise in temperature, and that translates into an increase in the occurrence of wildfires. For instance, the model developed by the NERC Centre for Ecology and Hydrology (CEH) can be used to calculate an increase in fire frequency per degree of rising temperature under specific environmental conditions.

Finally, the discussion finished with recognition that the difficulties in projecting future changes in climate and relating them to changes in vegetation, fuel loading and fire characteristics, stem from the fact that the methodological theory of analysis of indirect effects in ecology and environmental sciences is currently still under development. Despite the fact that the existence of such effects has been recognised for a long time, their consideration is notoriously difficult. Many indirect effects are separated from the cause spatially and/or temporally, and are always superimposed on the multitude of other direct and indirect interactions occurring in an ecosystem. Their investigations are therefore not straightforward, and should always involve an interdisciplinary approach. The discussions initiated within the FIRES seminar series appear to provide good opportunities in that respect.