

# Moorland Wildfire

## Mapping and Modelling in the Peak District



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Wildfire is increasingly threatening the moorlands of the UK uplands biodiversity and it's ability to deliver valuable ecosystem services including carbon storage, erosion prevention, water quality regulation and recreation opportunities. Wildfire risk is a complex function of physical and human factors. Physical factors determine the spatial and temporal 'flammability' (or vulnerability) of the landscape; however, a source of ignition is required for a fire to actually start. In the UK this is predominantly of anthropogenic origin and can be either accidental or malicious. Risk of fire outbreak is therefore a spatial and temporal function of both physical (vulnerability/flammability) and human (ignition) elements.

### Wildfire in the Peak District National Park

In the Peak District National Park (PDNP) there have been over 400 fires recorded by National Park rangers over the last 33 years. The moorlands in the Peak District are extremely accessible and as a result receive very high annual numbers of visitors and are therefore at risk from accidental and malicious sources of ignition. Additionally, prescribed fires used for grouse moor and grazing management sometimes burn out of control, although when well-managed, they can also help to prevent a build up of fuel load. The Peak District moorland landscape comprises large areas vulnerable to ignition as a result of, for example, their peat soil or vegetation type and condition. The high density of potential access-related ignition sources combined with vulnerable habitats make the PDNP extremely susceptible to wildfire during prolonged dry periods.



Figure 1. Fighting fire: beaters mobilised to slow the fire fronts

### The need to understand the risk of wildfire

As the environmental consequences of wildfire are great and fighting moorland fires is both dangerous and expensive, the Peak District Fire Operations Group (FOG) and Moors for the Future worked with geography researchers at the University of Manchester to create a stakeholder informed map of wildfire risk across the moorlands of the PDNP. The wildfire risk map was based on the reported locations of past fires recorded by Park rangers. The aim of this work was to identify areas at risk of wildfire outbreak based on past fires recorded by Park rangers, that would directly inform a strategic planning response, such as planning fire-fighting rendezvous points and access routes to 'at risk' areas. Indirectly, it would also inform a management planning response, for example, by using the map to identify of areas at high fire risk yet not adequately covered by existing sources of water available for fighting fires. Such information is also critically important for the formulation of land management plans that integrate wildfire risk reduction.



Figure 2. Heather on fire in the Peak District National Park

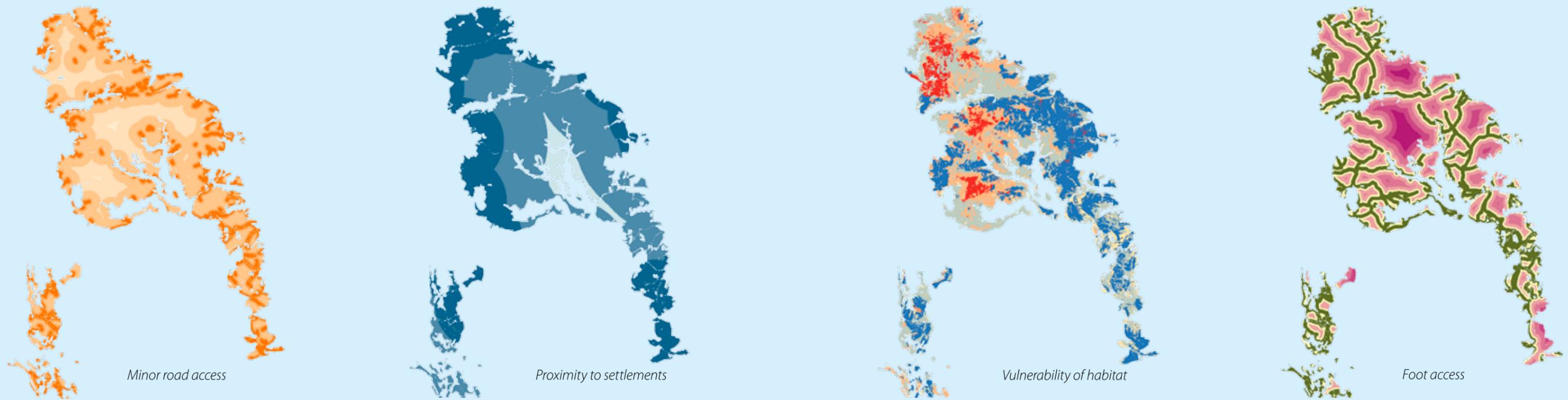


Figure 3. Sample input data for the multi criteria evaluation GIS model. The area shown is the moorlands within the Peak District National Park; variation in colour represent different spatial risks associated with the factor.

### Creating a map of wildfire risk

In the Peak District wildfires are mainly caused by accidental or deliberate setting; out of control managed fires are an occasional but less frequent cause of major wildfire events. The maps in Figure 3 illustrate some of the human factors incorporated into the Peak District Moors fire risk map. Risk of ignition increases with proximity to access points. The physical factors input into the model included habitat type as a proxy for vulnerability of the vegetation and underlying soil. The vulnerability score for each habitat type was based on the number of actual past fires relative to the number expected by area. Human and physical map layers were combined, with the weighting of each layer informed by expert opinion on wildfire risk. The risk maps produced were tested against a sample of fires not used in the analysis. An average of the results from the best models is shown in Figure 5.

### Future wildfire risk

Protecting the highest risk areas is especially important given the increased pressures faced by fragile ecosystems associated with a changing climate. The Peak District could be regarded as an analogue for future fire risk in more northerly peatlands as they experience increased drying and higher visitor pressure from climate change.

Hot, dry summer spells in the UK have long been associated with higher probability of fires. Yet the expected increase in the frequency of extreme conditions like the summer of 2003 is not the only factor increasing future wildfire risk. Milder, wetter winters would result in a longer growing season and more biomass (or fuel load) to burn. Higher summer evapo-transpiration, soil moisture deficit and plant stress would then make it more vulnerable to ignition. Water sources to fight wildfires would also be scarcer.

Figure 4. High pressure hose system employed mounted on vehicles adapted for traversing moorland terrain, minimising damage to underlying vegetation.



However, change would not be one-way; a new fire regime would have feedback effects, producing more fire-tolerant vegetation. This would be superimposed on other long-term responses of vegetation to changing climate.

The biggest uncertainty is the future role of human factors, as the ultimate cause of wildfire ignition. Hot dry weather would potentially bring more visitors onto the moors, increasing ignition sources and wildfire risk. Climate change would also have indirect effects; for instance, moving to a low carbon economy with more UK-based holidays would potentially increase wildfire risk. Managing moorland to maximise carbon capture or storage is liable to affect wildfire risk. Indeed, any land management, rural land use or socio-economic policy which indirectly changes fuel load or the number of ignition sources would have a knock-on effect on wildfire risk, so policies should not be seen in isolation.

Only with improved understanding of these interrelationships, increased awareness and active management will the Peak District, like many UK moorlands, be able to retain its essential character and critical environmental roles.

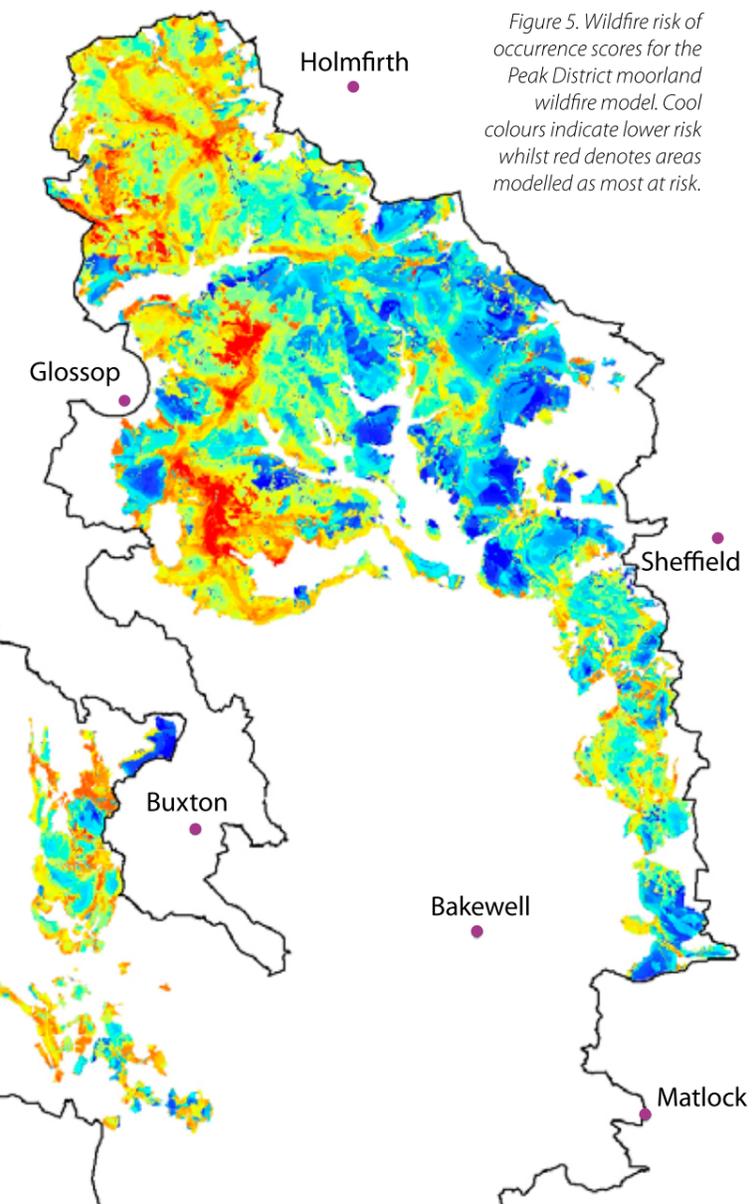


Figure 5. Wildfire risk of occurrence scores for the Peak District moorland wildfire model. Cool colours indicate lower risk whilst red denotes areas modelled as most at risk.



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### Acknowledgements/Data availability

Copies of the research reports are held in the Moors for the Future library.

Views expressed in this research note do not necessarily reflect those of all Moors for the Future Partners.

### References / Links

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### The Moors for the Future Partners are:

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