

Wildfires

- Uncontrolled vegetation fires occurring accidentally or due to arson (Figure 1).
- Not a new problem (Anderson 1997). Derbyshire fire brigade alone recorded 700 moorland fires in the first 11 days of September 1959 (Radley 1965).
- Exacerbated by hot dry summers (curing of vegetation), especially if preceded by followed by wet winters (build up of biomass).



Figure 3: Helicopter collecting water for fire-fighting.

Climate change and wildfire risk

Climate change is likely to increase probability of wildfire outbreak by:

- Lowering environmental capacity and increasing visitor numbers
- Longer-term ecosystem response e.g. reduction in peat-forming species and increase in fire-tolerant communities
- Climate-related policy change affecting land use or management, transport infrastructure, UK-based holidays, etc. (Figure 4).



Figure 1: Moorland wildfire.

Significance

Rarely cause loss of human life in the UK but a significant economic and environmental problem in the uplands:

- Fire-fighting costly and dangerous in remote areas
- Damage to peatland ecosystem services, e.g. loss of soil carbon store, wildlife, rural livelihoods, peat erosion
- 844 ha of peat moorland burned on Bleaklow moor in the Peak District National Park (PDNP) over Easter Bank Holiday weekend 2003.

Climate Change in PDNP

UKCIP02 climate change scenarios for the PDNP in the UK suggest up to 5°C warmer and drier summers (Hulme *et al.*, 2002; McEvoy *et al.*, 2006) (Figure 2).

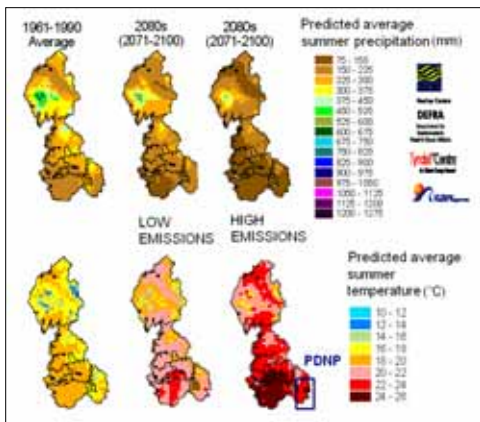


Figure 2: High and low climate change scenarios for Northwest England using UKCIP02 models.

Responding to moorland wildfire risk

- PDNP Fire Operations Group is a successful multi-agency partnership approach to wildfire risk management.
- Zero tolerance to wildfires by some major landowners, using costly but effective helicopter surveillance and fire-fighting (Figure 3).
- Full wildfire suppression can increase risk of severe fires by allowing fuel to build up (Fire Paradox 2006). Managed fire, grazing or cutting can help to reduce fire risk by controlling fuel load and continuity (Bruce, 2006).

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Where fires occur

- Multi-criteria evaluation to model and map where risk of wildfire occurrence is greatest based on Rangers' Fire Log
- Habitat type used as a proxy for vulnerability to ignition. Fewest fires per unit area on heather. Most on bare peat.
- Human access factors used as proxy for availability of ignition sources. Fires clustered close to popular footpaths, especially Pennine Way (McMorrow & Lindley, 2006)
- Outputs developed with 60% of fires and tested against remaining 40%
- Map (Figure 6) used to position fire watches and new fire ponds.

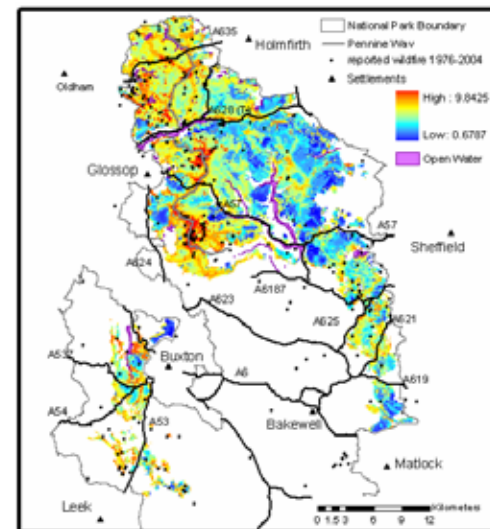


Figure 6: Risk of wildfire occurrence in PDNP. Produced by multi-criteria modelling, using reported fires in Rangers' fire log 1976-2004 and stakeholder-informed weighting. Other versions produced, specific to stakeholder groups' perception of relative factors weights.

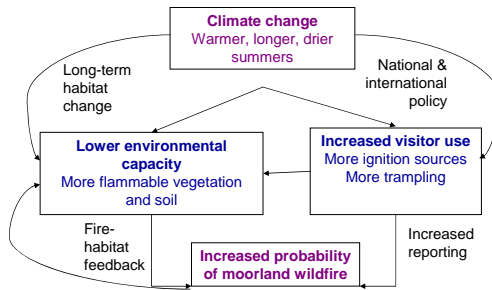


Figure 4: Climate change and wildfire risk relationship

When fires occur

- Mathematical model developed to predict when wildfire risk likely to be highest
- Based on statistical relationship between local daily weather and fire occurrence. Fire data from reported wildfires in the PDNP Rangers' Fire Log, 1976-2004.
- Non-linear Probit modelling used to assess chance of fires at different times of the year, days of the week and preceding weather conditions.

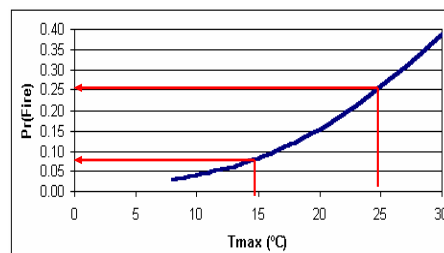


Figure 5: Increase in probability of wildfire in PDNP ($Pr(Fire)$) with maximum temperature for a Spring Bank Holiday Monday (T_{max}). All other variables held constant at average values.

- Risk of fire outbreak increases disproportionately with temperature, notably on a Spring Bank Holiday -- from 8% at current average temperature of 15°C, to 26% at 25°C, and 50% at 30°C (Figure 5).
- Model complements Met Office Fire Severity index because customised for PDNP. Forecasts combined direct effect of weather on biophysical risk and indirect effect on increased visitor numbers.

Acknowledgements

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References

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