

Paper presented at:

Creating a New Prosperity: Fresh Approaches to Ecosystem Services and Human Well-being

Royal Geographical Society, London,
4th September, 2009

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FIRES

Fire Interdisciplinary Research on Ecosystem Services

*Fire and climate change in
UK moorlands and heathlands*

**Julia McMorrow, Coordinator,
University of Manchester**

**A series of four transdisciplinary
seminars on the effects of moorland
and heathland wildfires and managed
fires on ecosystem services.**





FIRES programme

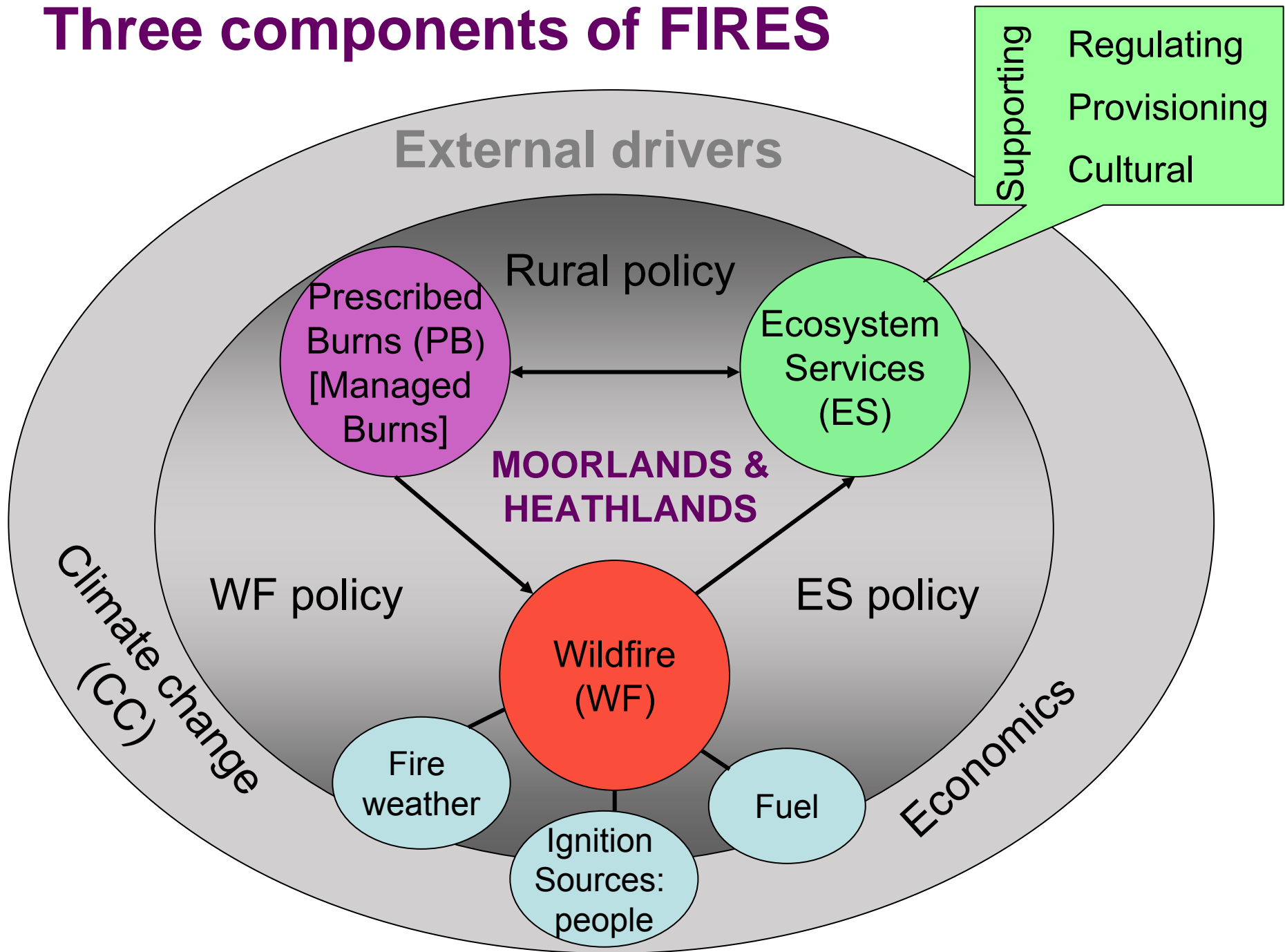
1. The role of managed fire in ecosystem services of UK moorlands and heathlands
Edinburgh, 31 March – 1 April 2008
2. The impact of wildfire on ecosystem services: relationships between wildfire, climate and people.
Manchester, 24 June 2008
3. Forecasting and modelling wildfire risk in UK moorlands and heathlands
Manchester, 31 March – 1 April 2009
4. Economic impacts of wildfires and adaptive land management to reduce wildfire risk and impact
Peak District National Park, 13-14 May 2009

www.fires-seminars.org.uk

Participants

- **Strong stakeholder participation** >60% of the 132 participants were stakeholders. Funding from SNH, GWCT & PDNP enabled 190 places and 6 international speakers
- **Cross-sector** Fire & Rescue Services, land managers, conservation, water companies, National Parks, forestry, etc
- **Capacity building** 20 early career participants
- **60% env science**, but discipline and sector balance in steering group:
 - 2 env scientists: Julia McMorrow (Manchester, Coordinator);
Colin Legg (Edinburgh, Co-I)
 - 3 social scientists: Jonathan Ayles (Manchester, Co-I);
Claire Quinn & Klaus Hubacek, Leeds RELU)
 - 3 non-academic stakeholders
 - Jon Walker, Moors for the Future Partnership (Co-I);
 - Simon Thorp /Marion Thomson, Heather Trust.
 - Mark Jones, Chief Fire Officers' Assoc, Chair of English Wildfire Forum

Three components of FIRES



UK wildfires

- The UK has a wildfire problem; ~1600 grassland fires in a normal year in England & Wales (1996-2004), and over 4000 in droughts years 1995, 2003.
- Poorly recorded. Improved UK-wide standard of recording needed, especially location and cause.
- WF on regional risk registers, but not NERC's natural hazards list, nor Defra's ES impact grid under 'protection against natural hazard'.
- Yet large, long-lived and potentially damaging to all ES and human well-being, especially peat fires

Photo credit: Trevor Johnson, Scottish Wildfire Forum

18 April 2003,
MODIS image.
Active fires
marked as red
dots

**Bleaklow 18-23 April
2003**

Costs of suppression	£550k
Cost to local economy	£ 500k
Costs of restoration	£1.25m
Total	£ 2.3m

Excluding costs to
other ecosystem
services...

- Vegetation fires difficult to tackle, especially on remote moorlands. Gorse fires very intense.
- Challenge resilience of FRS to deal with other incidents
- FRS need to be better equipped & trained for vegetation fires.
- Bias to structural fires because poor evidence base for vegetation fires and relatively low priority of environment:
1 Life, 2 'Property', 3 Environment
→ **Need for costing ES.**



Colne – July 2006, 9 km²

Photo credit: Chris Ruddy, Pennine Helicopters

Fylingdales Moor Fire, Sep 2003

damage to cultural and other ES

- Upland heathland wildfire, burnt 250 ha of SSSI moorland and > 30 Scheduled Monuments.
- Several inches of peat lost in exceptionally intense blaze, destroying the seed bank and leaving a bituminised surface
- 194 ha treated at £1,120 ha for restoration & archaeology, at total cost of £ 235,000



Prescribed burning

- **Controversies** surrounding burning heather for grouse and grass for grazing, highlighted in FIRES, eg,
 - conflicts with biodiversity, clean water & carbon → Legal burn season, Heather and Grass Burning Code.
 - Properly managed 'cool burns' maintain the character of moors and heaths. But should the target ecosystem be heather & *Molinia*?

Relationship to WF

- Prescribed burning (PB) and wildfire are intrinsically linked. PB can reduce wildfire risk by managing fuel loads.
- But PB can become WF. Escaped PB are thought to be major cause of WF in Scotland, but recreation and arson in England and Wales ∴ Need to appreciate *spatial variation* of fire management and WF.

Impacts on ES depend on fire regime

- Research has focussed on single fires. Need to study fire regime (frequency, timing, intensity, size)
- Not all fires are the same – ‘cool’/’mildfires’ less damaging than ‘hot’/intense fires, which can burn into peat, usually in summer.
- Poor understanding of the effects of intense fires on biodiversity, including reptiles and invertebrates
- Need better understanding of:
 - Optimum fire regimes to manage different ES, and how to prioritise between them.
 - Drivers of change in fire regime

Changing rural economy creates a bigger risk of severe WF than climate change. Critical need to manage fuel load in a publically acceptable way which minimises risks to other ES.

Research needed on UK fire behaviour

- Clear need identified for research on behaviour and characteristics of wildfires, esp. summer fires.
- Behaviour of summer heather fires (determined largely by the moisture content of dead heather, mosses and litter) differs from that of spring fires (determined largely by the moisture content of the live heather canopy).
- Require experimental field burns to adapt/develop fire behaviour models for UK, especially peat fires
- Value for understanding wildfire risk & safer, more efficient fire fighting.

WF as a semi-natural hazard: the role of people

WF would not occur in UK without people to provide ignition sources, accidentally or by arson.

∴ Risk of WF occurrence is a function of biophysical hazard of **fuel**, primed by **weather** + human-induced hazard of **ignition**.

Expanding settlements and more visitors → ↑ density of ignition sources , ↑ frequency of WF ∴ Access land closures.

Research needed on **public attitudes to fire** (to improve WF awareness campaigns and arson reduction), and **socially acceptable strategies** to manage WF risk



'WF natural hazard regulation' as an ES

Impact pathway / adaptive management exercise

Stage 1

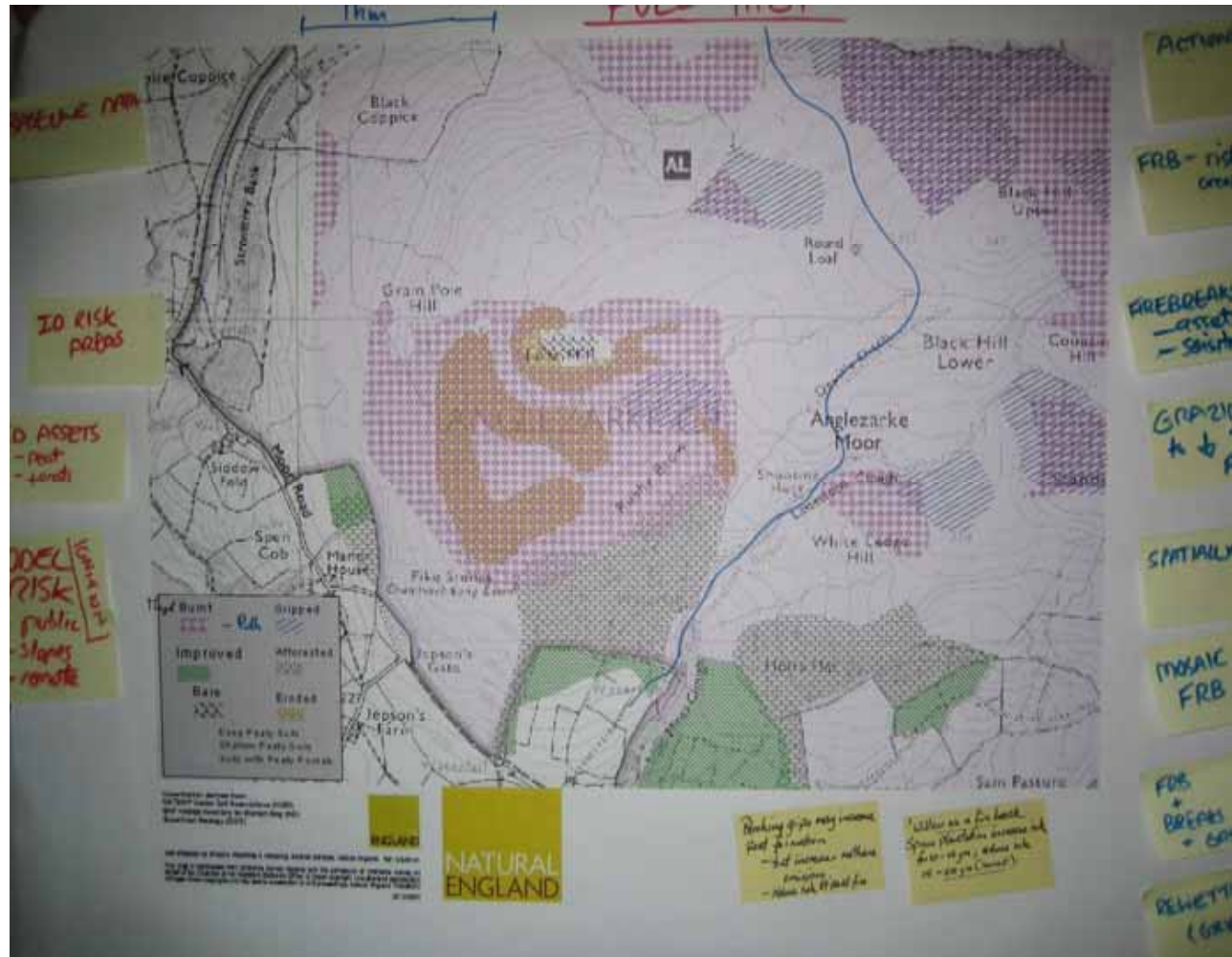
Policy change =
mitigate WF risk
by fuel
management

e.g.

Prescribed burns,
grazing, cutting

Stage 2

Impacts on
biodiversity,
timber
production,
recreation and
other ES



Stage 3

- Include 'WF hazard regulation' as an ES on Defra grid:
 - WF frequency
 - WF intensity ('severity')
- Business as usual
- Changes to other ES (+/-/=/?)
if policy of managing fuel load:
 - +ve for ↓ risk of severe WF
 - +ve for grazing,
 - ve/? for carbon sequestration,
 - ve for biodiversity (if PB)
 - +ve for access
- Need a mix of strategies

VITAL Q →

Prob of severe fire?

SEVERE FIRE PROB

BUSINESS AS USUAL

Checklist of ecosystem services for consideration under different wildfire management scenarios

Category	Fuel Management	Risk reduction	Increase resilience	Signalling
Provisioning services				
Food (livestock)	+			0 --
Fibre (woodland)	+			0 --
Renewable energy provision				0 -
Fresh water	+			0 -
Regulating services				
Air-quality regulation	+			1 -
Climate regulation- Carbon storage	-/0	?		1 -
Climate regulation- GHG sequestration	-/0	?		1 -
Erosion regulation	+			1 0 0
Water purification	+			1 0 0
Pest/ disease regulation	+			1 0 1
Pollination	+			0 1 -
Natural hazard regulation				
- wild fires risk	++			++
- wild fires intensity	++			++
- food mitigation/ water-runoff	+			+ --
Cultural services				
Cultural heritage	+			1 - (-)
Recreation & tourism	++			1 1 (-)
Field sports	++			1 1 0
Aesthetic value	+			2 0 1
Biodiversity conservation	++			2 1 1
Supporting Services				
Nutrient / water cycling, soil formation	+/0			0 -
Economics				
Local economy	++			1 0 0
National economy	+0			1 0 0
Wildfire mgmt costs	+			0 0 0
Public Health/ Wellbeing	+			0 0 0
NET FIRE COSTS	-			0 0 0

Score and assessment of effect

++ Potential significant positive effect
 - Potential negative effect

+ Potential positive effect
 - Potential significant negative effect

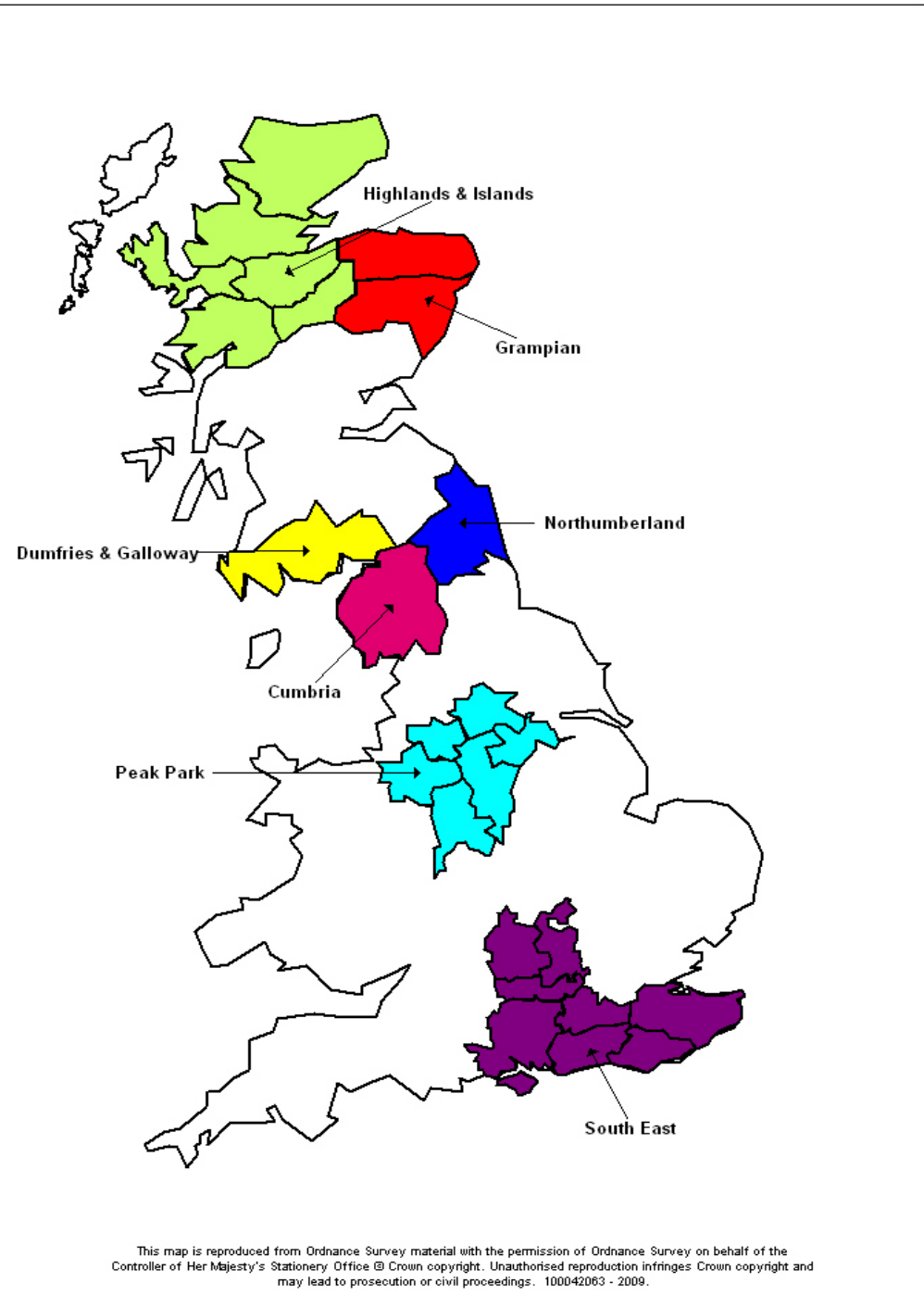
0 Negligible effect
 ? Gaps in evidence

Source: adapted after Defra (2007) An introductory guide to valuing ecosystem services, Table 3.1, p24

Adapted from Defra (2007) An introductory guide to valuing ecosystem services

Partnership working

UK Local Wildfire Groups



Slide credit: Trevor Johnson,
Scottish Wildfire Forum

Key policy messages 1

- UK has a growing & costly WF problem: episodic, spatially variable fire regime and causes.
- Not recognised as a (semi-)natural hazard in UK because so far life and ‘property’ rarely damaged and poor recording
- Need good **UK-wide evidence base**
- Need **costing** of moorland and heath ES as property assets so suppression costs can be balanced against avoided costs to ES
- WF affects all ES so requires managing, ∴ include WF reduction as an ES on Defra grid and do **full impact path analysis**.
- Impacts of PB & WF on ES depend on baseline, timescale and fire regime. Need research optimum PB and WF **fire regime** for each ES under changing climate and rural economy.

Key policy messages 2

- Fuel loads thought to be dangerously high. Monitoring required. Changes in rural economy are as important as climate change. The 2 interact.
- People cause WF; need better understanding of attitudes to fire
- Balanced prevention strategy addressing the 3 conditions for fire -- *fuel* (reduce fuel load and continuity); *weather* (↑ ecosystem resilience to droughts; fire weather index); *ignition source* (restrict access, weather-dependent PB).
- Improve fire-fighting efficiency but avoid over-suppression which increases fire severity.
- Better training and technical tools; improved MOFSI, risk mapping.
- Promote partnership working – Local Fire Groups, EWF & SWF
- Continued KE, especially on fire behaviour and fire regime.

What next?

- Response on Muirburn to Scottish Government's consultation on WANE Bill
- Research and KE grant applications
- Journal articles
- Articles for stakeholder magazines
- Policy brief



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www.fires-seminars.org.uk