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Fire in the UK Rural-Urban Interface: estimating avoided costs to residential property assets at risk

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Introduction

- Wildfire is a significant problem in parts of the UK's rural-urban interface (RUI) (Figure 1)
- With escalating demand for housing, urban areas will continue to expand into the countryside, bringing sources of ignition closer to the fuel
- More RUI buildings means greater potential financial loss from wildfire

Aims

- To map RUI types and their wildfire frequency;
- To calculate avoided costs of residential property losses within simulated fire perimeters for the May 2011 Swinley Forest fire (Figure 1), e.g. wind speed of +10 mph (Figure 2)

Figure 1: Extreme Fire in Swinley Forest, Berkshire, 2 May 2011; combined effect of fuel loading and high wind speeds

Study area

- Crowthorne-Swinley Forest, in Bracknell Forest district, Berkshire-Hampshire-Surrey borders (Figure 2)
- Wildfire was not regarded as a significant risk by Bracknell Forest Council prior to the Crowthorne Wood "Swinley Forest" fire
- Actual fire perimeter and simulated perimeters for different weather scenarios were used, e.g. +10 mph wind (Figure 2)

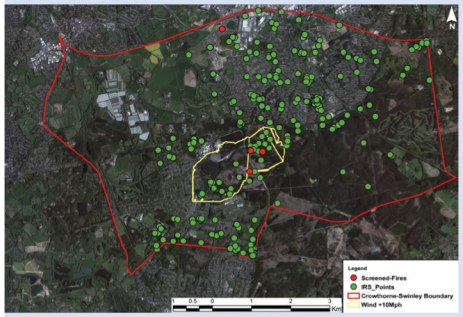


Figure 2: Study area, Crowthorne-Wood, Swinley Forest, with simulated fire perimeter for +10mph 2 May 2011 Swinley Forest fire and IRS vegetation fires, 2009-2013 (Background image; Google Maps)

RUI map: method and results

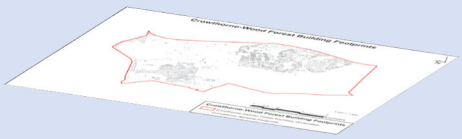
A GIS-based Wildland-Urban Interface (WUI) model (Lampin-Maillet et al. 2009) was adapted to map RUI types from building footprints and a land cover map (Figure 3). 48% was RUI.

Incident Recording System (IRS) vegetation fires for 2009-2013 (Figure 2) were overlaid to identify most ignition-prone RUI types

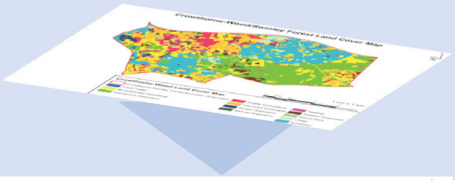
Type 12 (very densely clustered housing, high vegetation aggregation) dominated, covering 63% of the RUI and 30% of the study area.

It had highest incidence of wildfire; 85% of RUI fires. Dense housing provides more potential ignition sources, which are next to large expanses of fuel.

Building footprints; degree of clustering



Land cover; horizontal fuel continuity (aggregation)



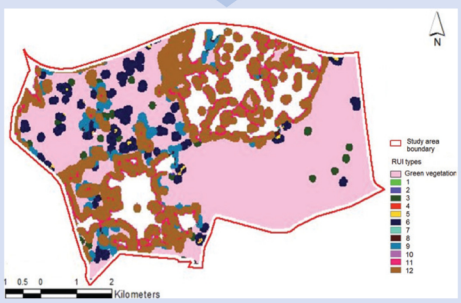


Figure 3: RUI Typology for Crowthorne – Swinley Forest study area. Legend in Table 1.

House prices: method and results

House prices from Land Registry pre-2011 fire used to assign monetary values to RUI types. e.g. Table for +10 mph scenario

Very dense clustered housing of no, low and high vegetation (types 10, 11, 12) accounted for the highest cost

Too few transactions to assign a price for other RUI types.

Buildings	Vegetation aggregation (horizontal continuity)	Key	RUI ID	Ha	Buildings	Avg. cost/ building	Avoided cost (£)	IRS points	IRS points screened
Isolated housing	No		1	0	0	0	0	0	0
	Low		2	0	0	0	0	0	0
	High		3	527	8	0	0	2	1
Scattered housing	No		4	434	8	0	0	0	0
	Low		5	434	8	0	0	2	1
	High		6	584	27	0	0	9	0
Dense clustered housing	No		7	0	0	0	0	1	0
	Low		8	0	0	0	0	0	0
	High		9	1,034	64	0	0	2	0
Very dense clustered housing	No		10	700	28	199519	5,586,532	1	0
	Low		11	964	38	229716	8729208	3	0
	High		12	926	73	262226	19142498	111	1
						Total	33,438,238	131	3

Table 1: RUI typology and avoided costs for scenario 1 (wind +10 mph)

Costing fire spread scenarios

- Weather scenarios using Prometheus fire spread modelling (e.g +10 mph wind) were overlaid on the costed RUI map.
- Dominated by RUI types 12 and 9 (dense or very densely clustered buildings, high vegetation aggregation) (Table 1)
- Most IRS fire ignition points occurred in RUI types 12 & 6 (very dense clustered and scattered housing, high vegetation aggregation) (Table 1)
- Fires screened to meet the wildfire manual definition (Scottish Government 2013) were in RUI types 12, 5 and 3 (Table 1). Only 10 occurred in the study area.

Conclusions

- Avoided costs (potential loss of buildings) were at least £33.4M (Table 1)
- Many assumptions required; e.g. mean price per house used for non-residential buildings; mean price = loss; accuracy of fire spread scenario
- However, monetary estimates of avoided costs help raise awareness of wildfire risk, target prevention and quantify the economic benefits of good wildfire risk management.

Further work is needed to refine the RUI model for the UK and obtain transactions for all building types over a longer period.

References

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