Mapping the Spring 2011 fires

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Wildfire 2011, Buxton, Derbyshire, 14 -15 Sep 2011
Aims and Data

Aims
• To produce a map of ‘wildfires’ for the England and Wales Wildfire Forum (EWWF)
• To scope data-handling issues for future GIS analysis using Incident Recording System (IRS) data, to answer simple ‘where & when’ questions [and eventually ‘why, what if’]

Data
• **Satellite databases**: MODIS (Moderate Resolution Imaging Spectrometer) on Terra and Aqua satellites. See poster
• **Raw IRS data** from Department of Communities and Local Government (DCLG); 18 April – 6 May, all 14 classes of outdoor fires
Fire Information for Resource Management System

http://firefly.geog.umd.edu/firemap
Rapid Damage Assessment, Burnt Area, >40 ha

2703 ha, 2 - 4 May Wester Ross

• 17,211 ha for UK so far this fire season
• 6,809 ha for GB. Available for only 17 (12%) of the 147 vegetation fire hotspots
• 1,050 ha for England, for 2 so far.

Hotspots

MODIS-detected vegetation fires, FIRMS database. 18 Apr – 8 May 2011

• CORINE land cover to screen out urban, construction, water → ‘vegetation fire’ hotspots

• 21 veg fire hotspots for ~14 fires in England (>1 for some)

• But IRS has 23 - 250 ‘large’ fires, so MODIS detecting only the very largest, hottest fires, when sky clear and satellite overhead. So IRS is the prime datasource

See Ogbechie et al. poster for GB
IRS: All outdoor fires, 18 April – 6 May

>7100 geolocated fire ground points

Density surface for GIS modelling

Density Value
High: 5276.82
Low: 0
Search radius: 2 km sq

Data provided by FRS via the National Incident Reporting System, supplied by Department for Communities and Local Government.

All outdoor Spring 2011 fires: Rate per resident population, Local Authority areas

Outdoor fires per 10,000 population
18 April - 6 May 2011

Same data, two ways of defining classes:
- Natural breaks to show extremes
- Quantiles

Classified using natural breaks.

Classified using quantiles.
How many were ‘major fires’?  
...what is a ‘major fire’/’wildfire’ in IRS??

Decisions (in consultation with EWWF)

1. Data fields
   - Size (damage area), Duration (call-out to close), Resources (vehicles, crew), [Primary fire, others? ]

2. Thresholds
   - >1 ha, >= 6 hours call-out to close, >= 5 vehicles

3. Combinations of criteria
   - E.g. All 3 criteria (AND), any of the criteria (OR), etc

4. Or devise a single new combined criterion?
   - weighted combination of unthresholded IRS data?

- Each produces a different set of fires to map
- So further consultation and consensus is needed
- .... and what to call them
Size: >1 hectare (10,000 m², 100 x 100 m)
Duration: >= 6 hours
Resources: >= 5 vehicles

251 'Major' outdoor fires, 18 April - 6 May 2011 with all combinations of these 3 criteria
Fire size, damage area

All outdoor Spring 2011 fires by damage area

>1 hectare, 10,000 m² (39)

Lancs, W Yorks, Devon & Somerset, Cumbria, ‘Swinley’ Forest

Reliability of area estimates?
Size AND Duration AND Resources (23)

'Major' outdoor fires
18 April - 6 May 2011

Major fires criterion:
Size > 1ha
Duration >= 6hrs to close
Resources >= 5 vehicles
No. of fires = 23

Size OR Duration OR Resources (251)

'Major' outdoor fires
18 April - 6 May 2011

Major fires criterion:
Size > 1ha OR
Duration >= 6hrs to close OR
Resources >= 5 vehicles
No. of fires = 251
251 major fires; rate per 10,000 resident population, Local Authority areas

Natural breaks

Quantiles

Data provided by FRS via the National Incident Reporting System, supplied by Department for Communities and Local Government.
Mid-2010 population estimates for LA from ONS © Crown Copyright 2011.
Major fires by property type

- Over half logged as Heathland/moorland or Tree scrub
- These classes had largest damage area

MODIS CORINE classes and IRS classes not directly comparable
MODIS overestimates Heathland/moorland fires (including peatbogs) 52% (IRS 31%) and agriculture fires 25% (IRS 16%). Underestimates woodland & scrub
Anglezarke Moor, Lancs

4 MODIS hotspots, 29 April, 1pm

Shaded area rough outline of burned area from Rapid Damage Assessment


IRS record at Belmont Reserv, 3 May
IRS issues & recommendations

• **How to define major fires** → Further consultation required. Regional criteria to allow for size-time–resources tradeoffs?

• **Damage area**: accuracy → Further QA, training

• **Location**: ignition/centre? MODIS records fire front →
  – Include in operational procedure e.g. 1st arrival on fire ground record co-ords.
  – Include degree of confidence field.
  – Fire perimeter would give area & centre pt, recurrence analysis, costing etc.

• **Property classes** → Review
  – Should include veg fires which damage structural property
  – Accuracy → QA against land cover in GIS. Could auto-fill from GIS database.

• **Multiple records**: re-ignitions on FC land (Swinley), peat, record overflows (Simonswood, Lancs)
Conclusion

• Despite these issues, IRS has good potential for GIS analysis of wildfire regime, relative risk, and resource resilience.
• In return, GIS and satellite data can help QA of IRS data
• Further partnership research is justified.

Acknowledgements

• Department of Communities and Local Government, Fire Statistics for IRS data
• EWWF and FRS officers for data and advice
• Olisa Ogbechie for analysis of FIRMS data
• School of Environment and Development, University of Manchester for funding.