Wildfire and muirburn monitoring in Scotland

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NatureScot

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Scotland's Nature Agency
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NatureScot – Scotland's nature agency

NatureScot's purpose

We connect people with nature, through inspiring action to address the emergency in our natural world, because our future, and that of following generations, depends on it.

Our strategic priorities

- Enriching biodiversity
- Leading nature-based solutions to climate change

Why are we interested in wildfires and burning?

- Record damage to protected sites
- Build a national picture of burn
- Investigate habitat recovery
- Inform debate on fuel loads and fire risk
- Inform policy on land management
- Understand impacts on carbon budgets

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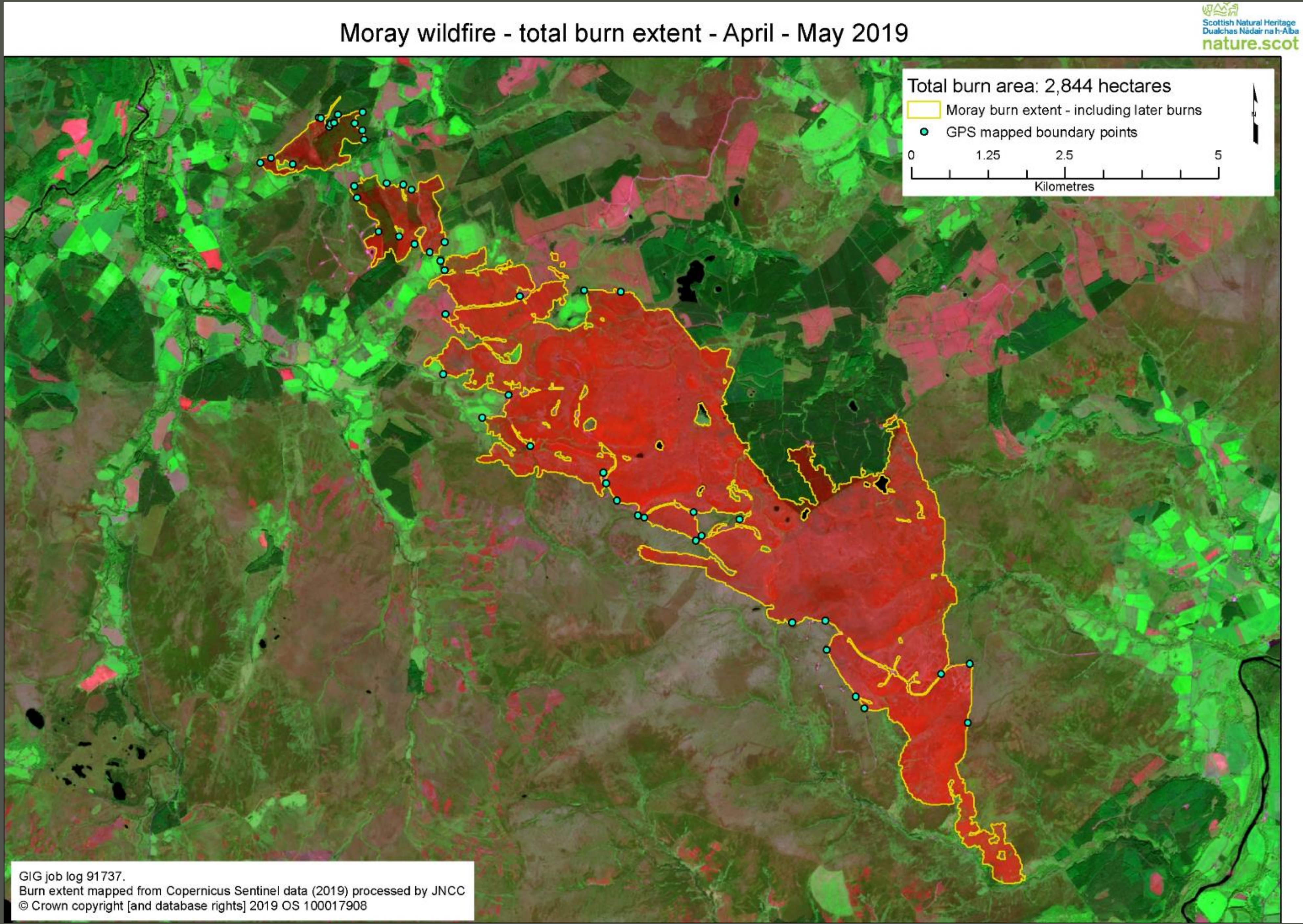
Mapping of wildfire extents

False Colour:

- R – SWIR2
- G – NIR
- B - Green



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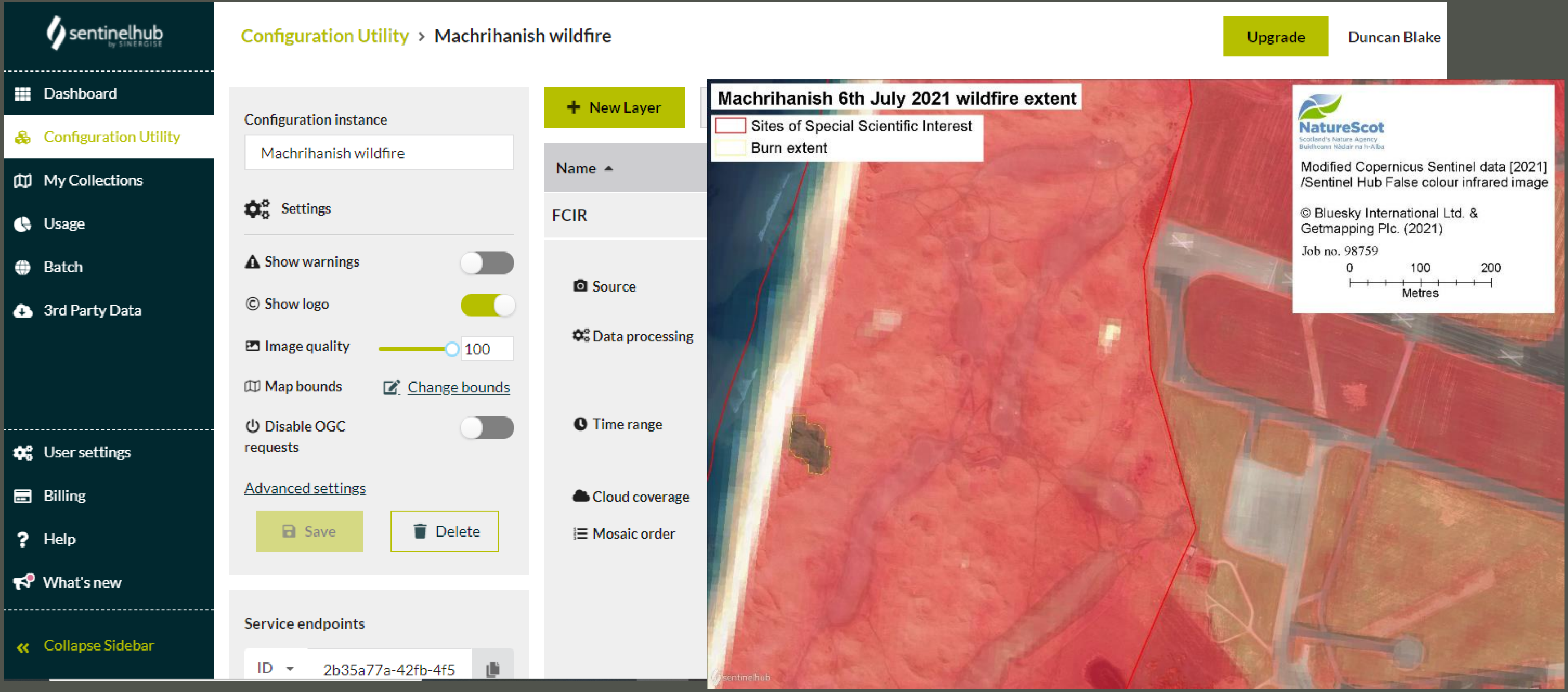
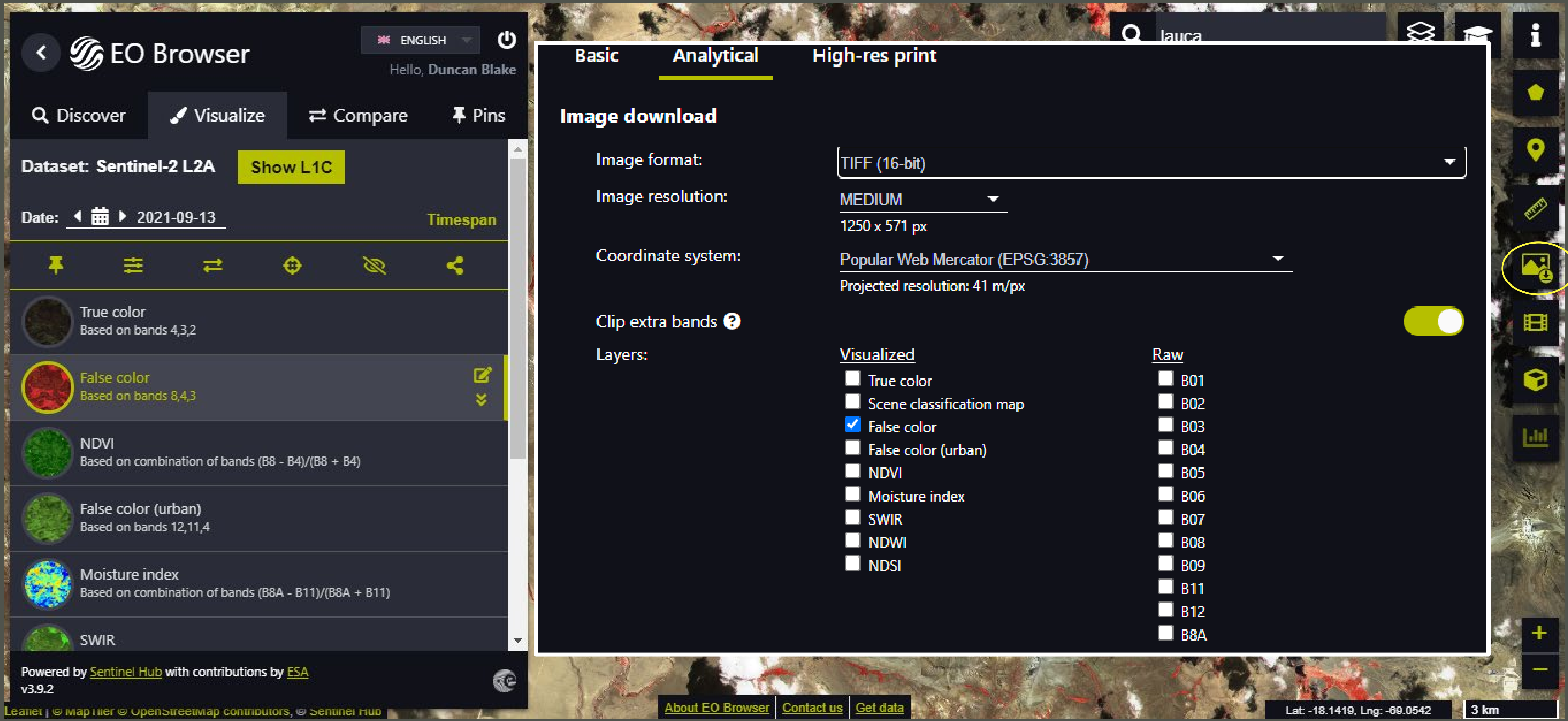
Mapping wildfire extents - simple

Manual digitisation from FCIR Web Map Service (WMS) from [Sentinel Hub]



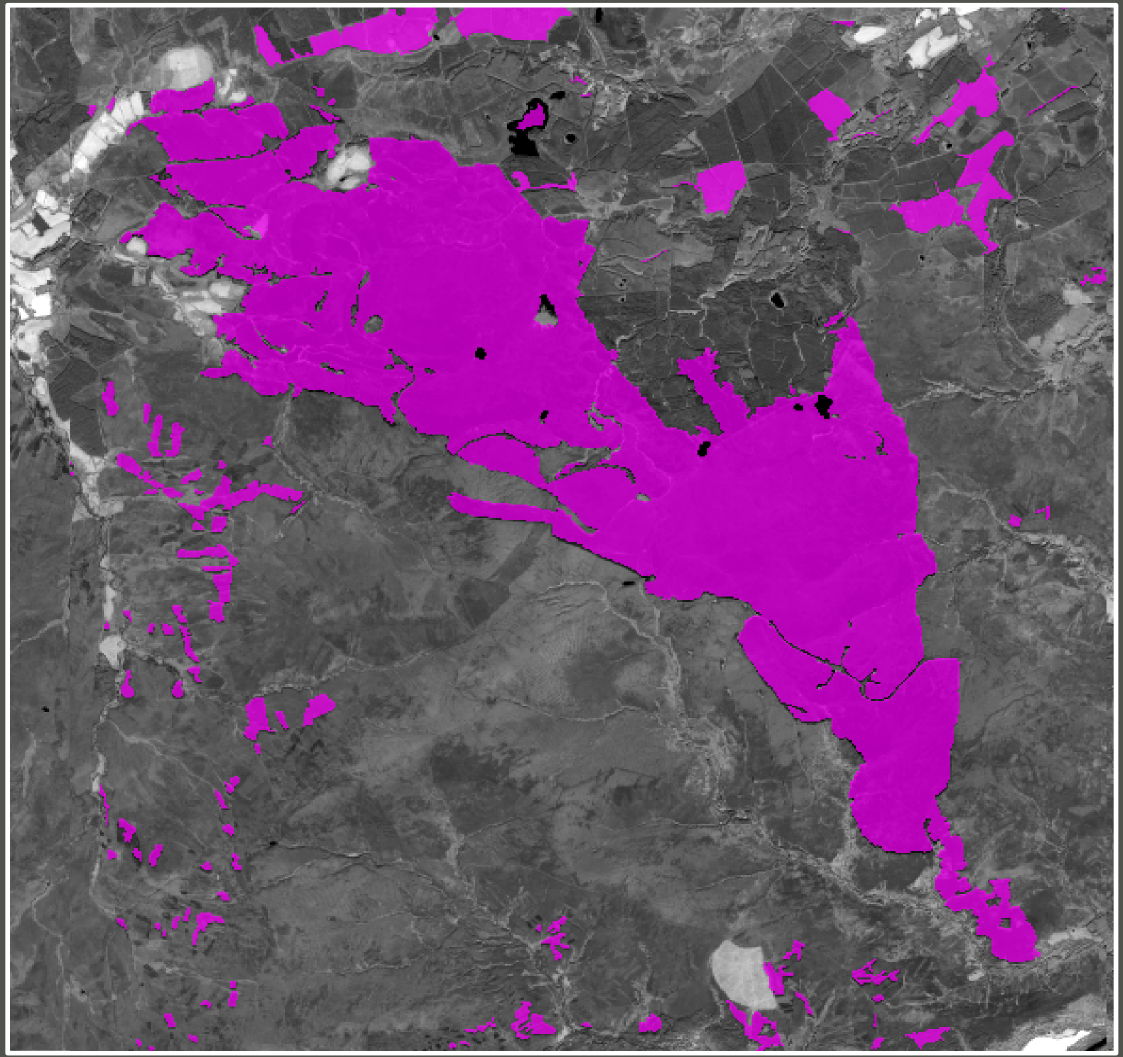
Mapping wildfire extents - simple

Or download image portion from Sentinel Hub EO Browser



Mapping wildfire extents - complex

- Sentinel-2 Analysis Ready Data (JNCC)
- NDVI, NBR and dNBR indices created
- Multiresolution segmentation on post fire image plus indices (eCognition)
- Threshold polygons on mean dNBR
- Manual amendments
- Ground truthing – 50% locations within 1 pixel



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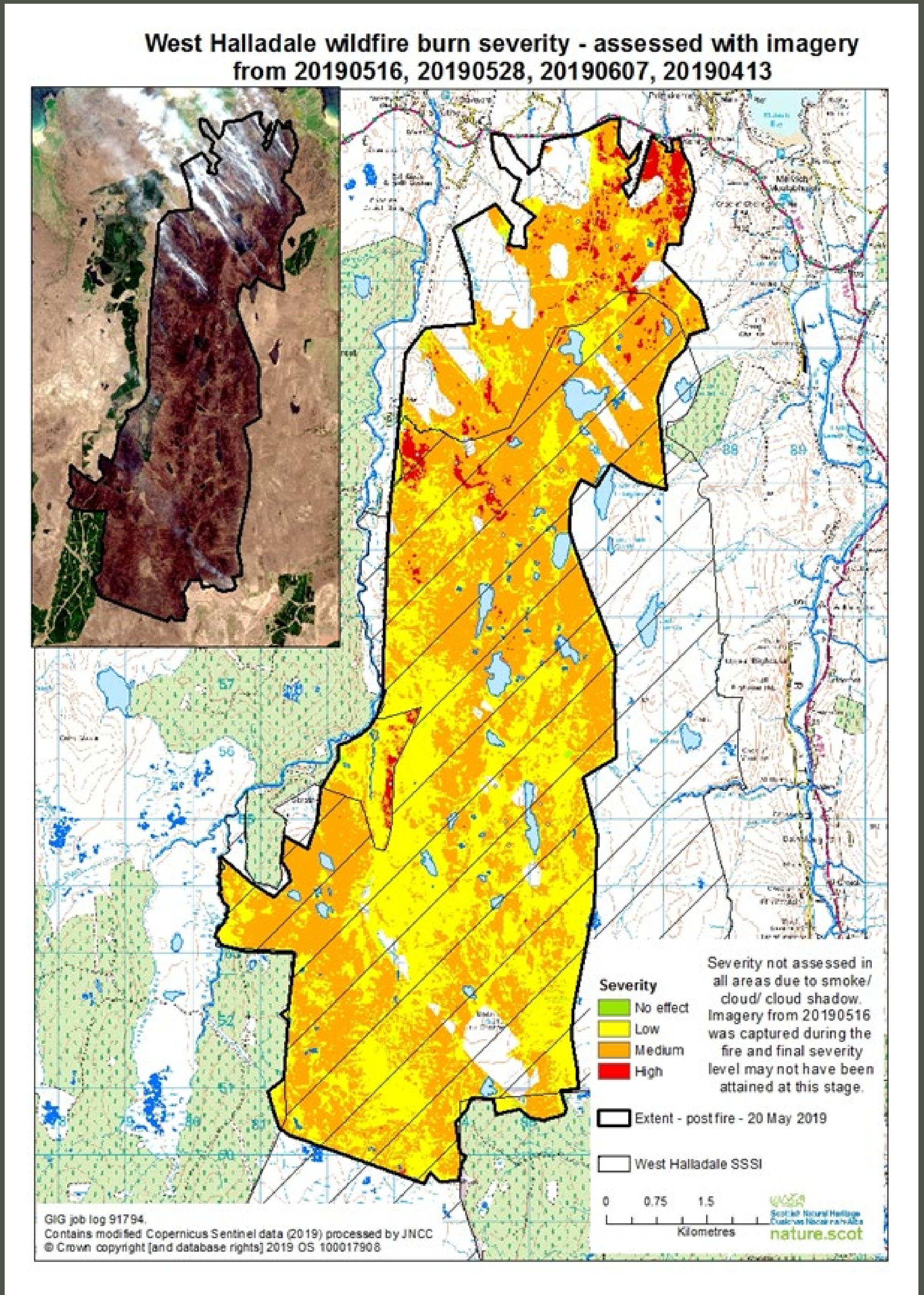
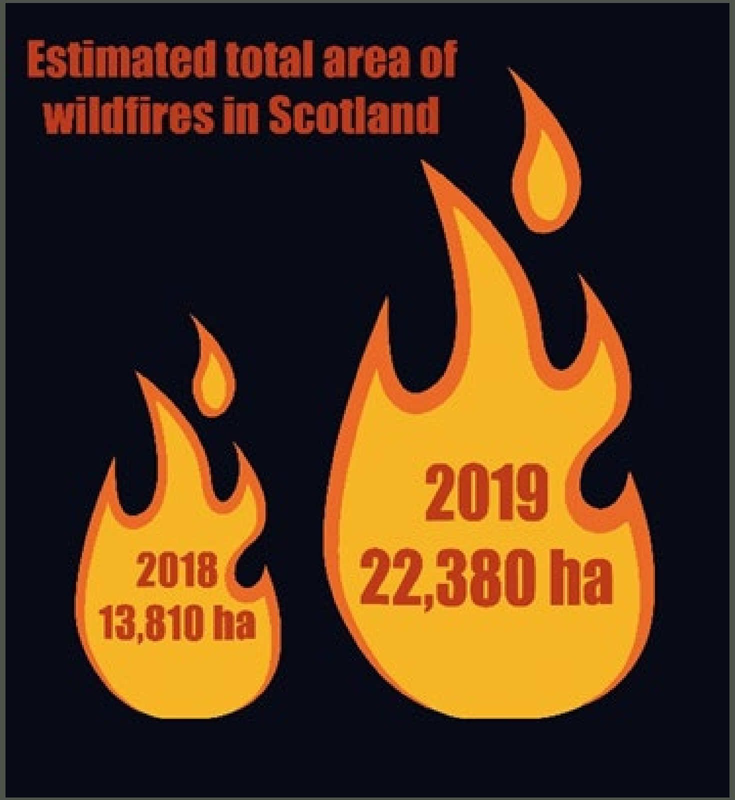
Mapping of wildfire severity

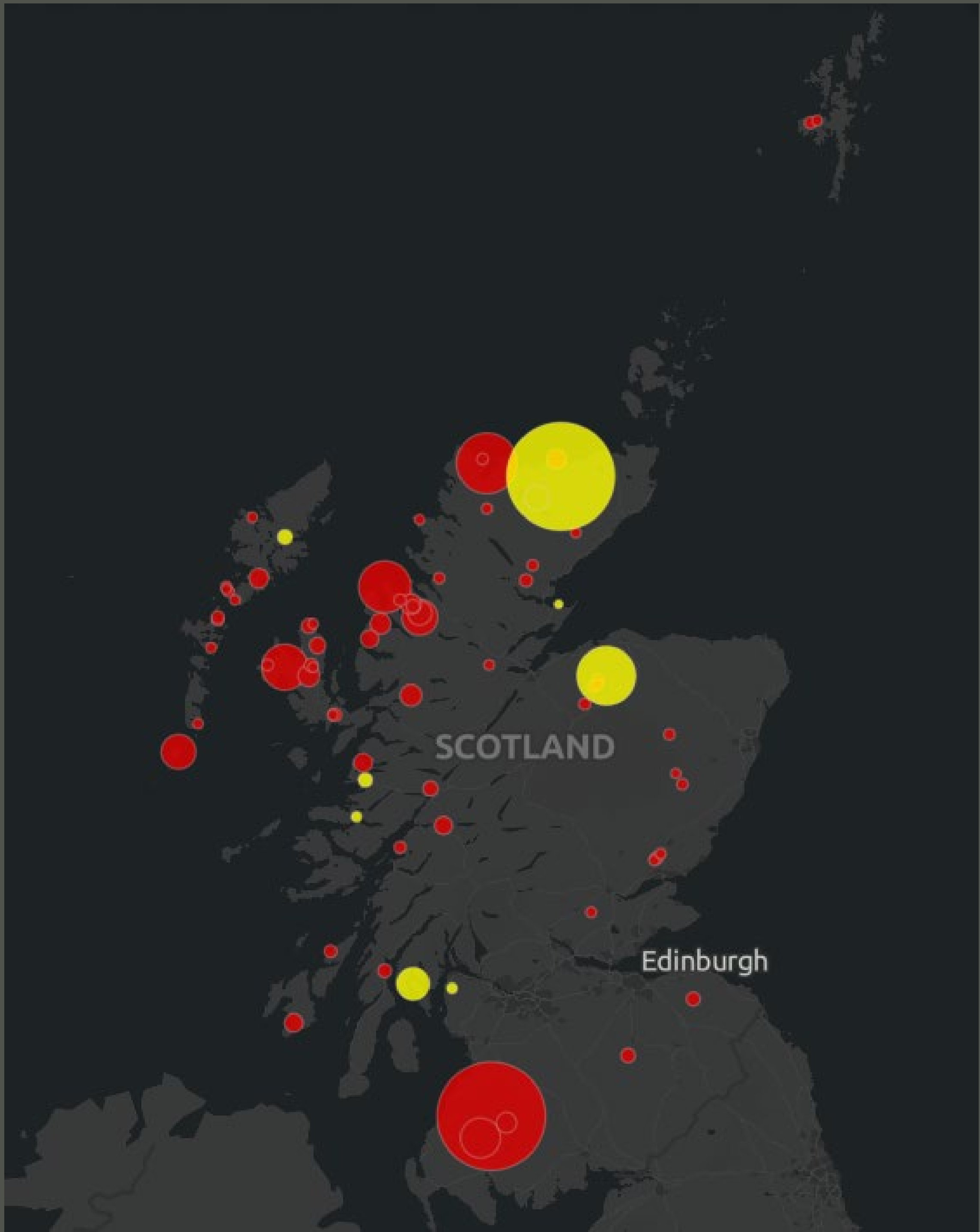
- Relative low/medium/high severity from dNBR
- Sample points selected from these categories
- 30m diameter plot surveyed in field
- Regression analysis between field data and dNBR
- New low/medium/high severity thresholds



Building up a picture of burning across Scotland

- MODIS burnt area mapping (EFFIS)
- See StoryMap: https://arcg.is/1fTnnH
- But still large gaps, especially smaller fires





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Towards automated detection of burning

Is it possible to detect wildfires and muirburn on an ongoing basis across the whole country?

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Detection system overview

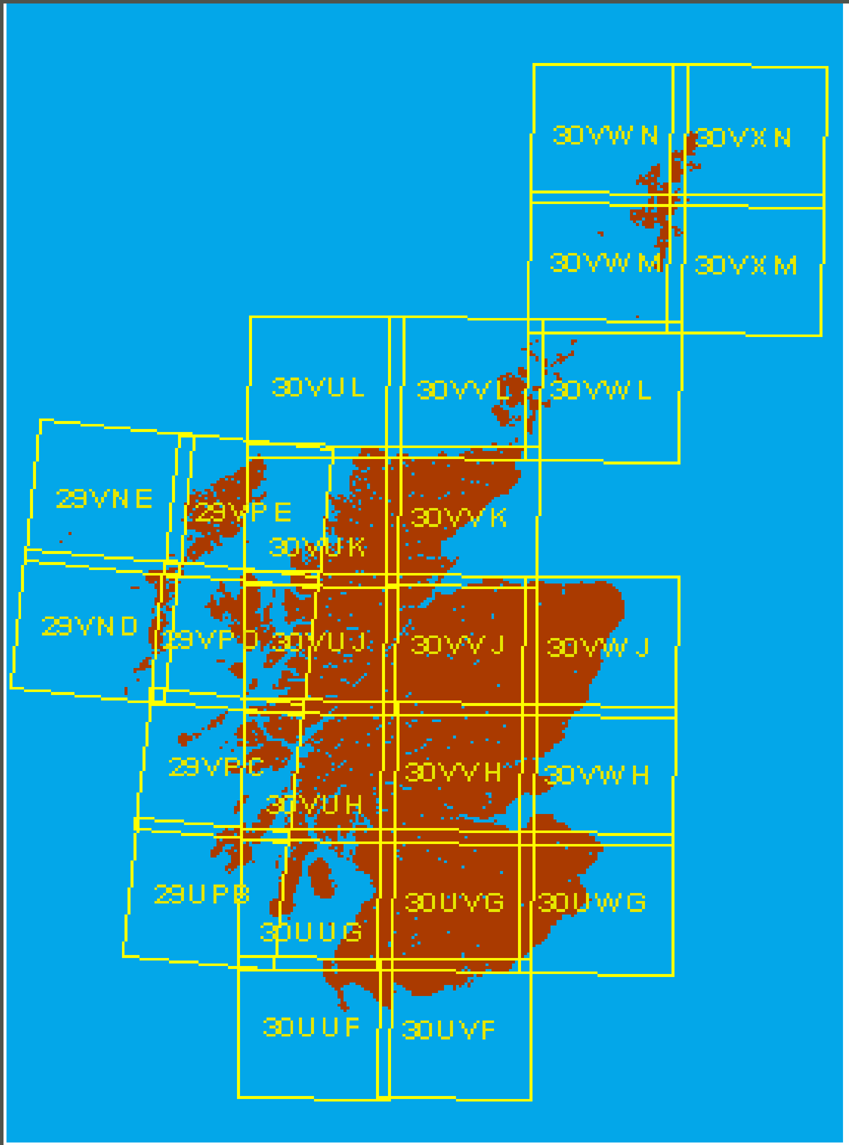
CEDA archive
S2 ARD | Cloud mask | Topographic shadow mask

Mask
Inland water | Sea | agricultural layer

JASMIN
Python code
Cloud cover | Granules | Months

Compare granule pairs
dSAVI | NBR thresholds

Shapefile of burn polygons



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Towards automated detection of burning

- Calculates cloud % per granule based on landcover mask
- If cloud cover is less than threshold then granule is used

- Compares pairs of granules by…
  - Calculating dSAVI and NBR on unmasked image areas
  - Extracting core burn pixels based on index thresholds
  - ‘Grows’ burn areas using lower thresholds around core burn pixels
  - Converts to vector and exports to shapefile

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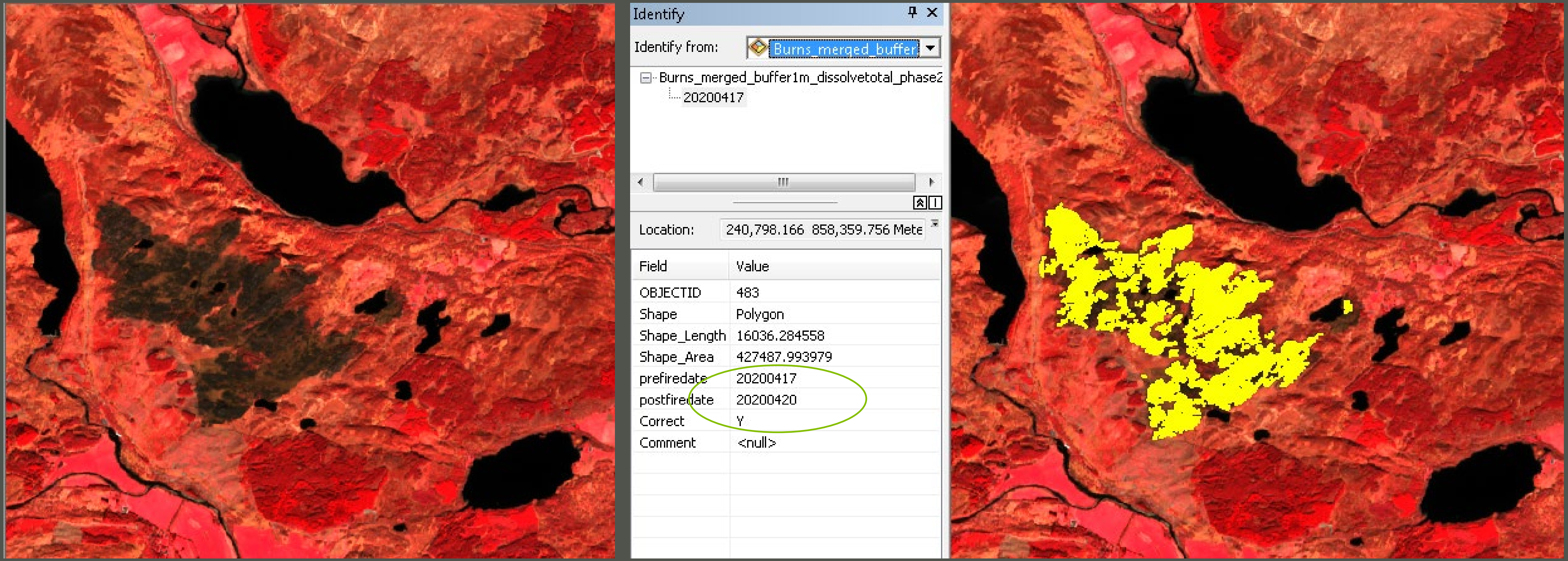
Results

- Product is a polygon dataset with a date range for each burn



Summary

- Sentinel 2 invaluable for mapping burn events
- Nationwide monitoring now feasible
- Challenge now is:
  - Is product accurate enough – how many burns missed?
  - How much effort required to remove false positives?

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Thank you
Muchas gracias

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