**Wildfires are recognised as an increasing risk to natural ecosystems, property, and human lives.** The objective of this project was to develop an online mapping tool to assist West Yorkshire Fire and Rescue Service (WYFRS)

**Project overview**

The tool was developed using a case study covering Marsden Moor in the Peak District by employing various topographic, meteorological, and geological factors that influence wildfire spread.

**Data and methods**

We defined the wildfire risk as the risk of spread if a fire starts. Wildfire spread is influenced by several topographic, meteorological and landcover factors. For example, wildfires tend to travel faster under stronger wind, uphill or when the vegetation is dry. Our objective was to build a tool that can aggregate those factors and visualise the overall wildfire risk.

We started by obtaining the data layers from multiple sources and aggregated them on unified 25-meter grid for cell-based computation and analysis. See Table 1 for details on the data layers used.

*Table 1: Data layers included in the tool and their sources*

|  |  |
| --- | --- |
| **Data Layer** | **Source and Date** |
| Rainfall volume | Environment Agency Rainfall API (EA, 2024) |
| Wind speed and direction temperature and humidity | MetOffice Datapoint API (MO, 2024) |
| Landcover | UK Land Cover Map (CEH, 2021) |
| Peaty soil | Peaty Soils Location (Natural England 2023) |
| Lidar Composite DTM | EDINA LIDAR (Digimap, 2023) |
| Public roads | OS Open Roads (Digimap, 2023) |

We used R. Shiny for tool development and Leaflet.JS for interactive map visualisation. The tool includes two components:

1. Propagation risk map to visualise the risk of fire propagation across the landscape. This was generated from a classic weighted linear combination of user-defined weights for each factor and landcover class.
2. Wildfire spread map**:** to visualise the potential extent of fire when a user clicks on an ignition location, after having set wind direction and speed, and relative humidity. Cost Distance Analysis method was used to create an accumulated cost surface where costs represent the time required for the fire to cross the cell.

A diagram of a map

Description automatically generated

*Figure 1: Overview of the tool development process.*

**Key findings**

The tool has shown to be promising in terms of wildfire propagation risk mapping (See Figure 2). WYFRS reported that risk scores during dry seasons and with all weights set to equal values successfully highlighted the locations where large wildfires took place in the past five years.

A screenshot of a computer

Description automatically generated

*Figure 2: Snapshot of the wildfire risk mapping component.*

The fire spread map showed promising results (See Figure 3). However, it requires rigorous testing against actual wildfires for calibration and improvement.

A screenshot of a map

Description automatically generated

*Figure 3: Snapshot of the wildfire spread mapping component.*

**Value of the research**

This project contributes to the understanding of wildfire risk in the UK based on a novel approach that focuses on risk of spread rather than risk of ignition. This can contribute to improved resilience and preparedness against growing wildfire risk.

This tool can be useful in fire mitigation and management by helping WYFRS identify geospatial patterns of wildfire risk and allocate resources accordingly. The tool can also be used by other organisations who work in the fields of wildlife conservation and physical infrastructures that is affected by wildfires.

**Quote from project partner**

*“Wildfires can be devastating to the environment and wildlife and could ultimately put people’s lives at risk. We have witnessed an increase in wildfires in Marsden Moore in the past few years, which is likely to continue due to longer dry seasons. The wildfire mapping tool can help us anticipate wildfire spread, improve preparedness, and identify where and when to put our resources for fire mitigation and management”.*

Richard Hawley - T/Group Manager, West Yorkshire Fire and Rescue Service

**Insights**

* Wildfire risk management is a pressing challenge that needs all relevant organisations to work collaboratively. Digital mapping tools can help us identify necessary measures.
* Geo-temporal mapping tools can be utilised to provide essential insights of seasonality and spatial patterns of wildfire risk.
* Risk of ignition is important. However, it is crucial to focus on risk of fire propagation and spread as wildfires are expected to continue to increase.

**People**

Abdelrahma Ibrahim (Hegazy) – Data Scientist, Leeds Institute for Data Analytics, University of Leeds

Alexis Comber – Professor of Spatial Data Analytics, School of Geography, University of Leeds

Steve Carver - Professor of Rewilding and Wilderness Science, School of Geography, University of Leeds

Stuart Hodkinson - Lecturer in Critical Urban Geography, School of Geography, University of Leeds

Richard Hawley - T/Group Manager, West Yorkshire Fire and Rescue Service

**Partners**

West Yorkshire Fire and Rescue Service

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