

# On Wires, Mires, and Fires: Towards a Wildfire Threat Map for the National Grid

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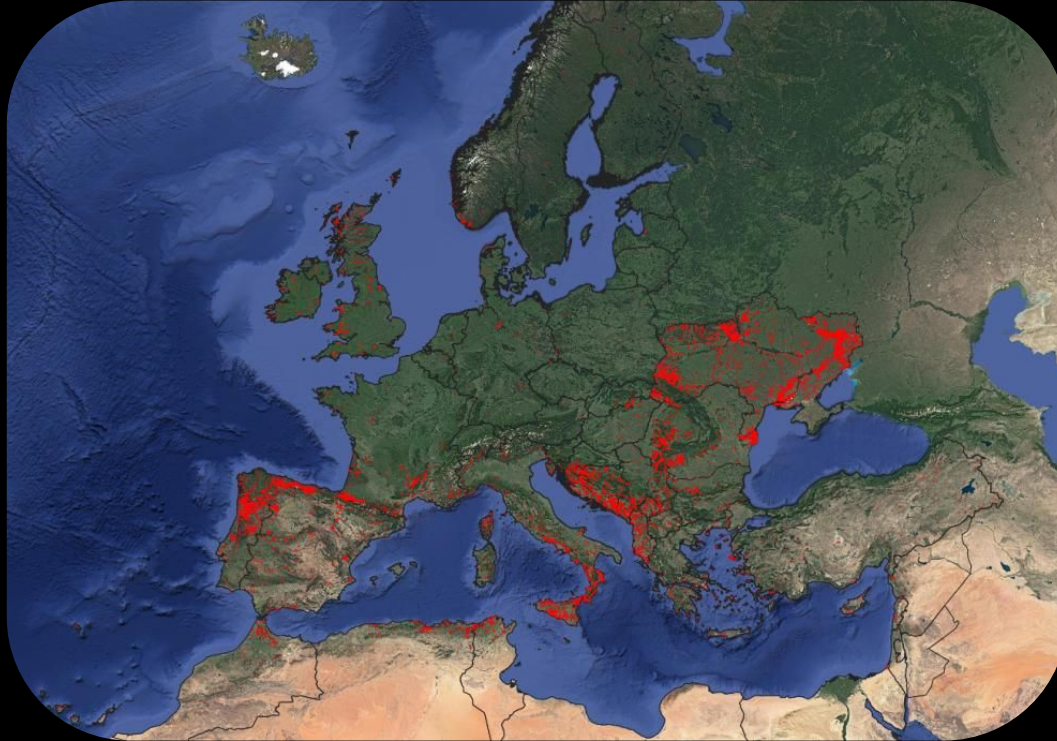
UNIVERSITY OF  
BIRMINGHAM

# When We Think of Wildfires, California Springs to Mind



Source: [US Department of Agriculture](#)

# But Wildfires in Europe - and the UK - Are On the Rise

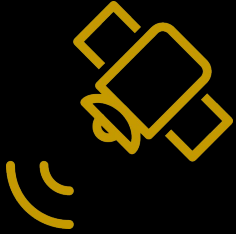


Source: European Union Science Hub

**387 239**

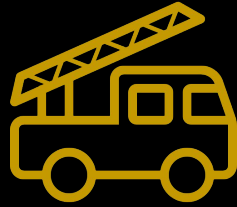
Recorded Fires Since 2010

# The Majority of These Are 'Small' Fires



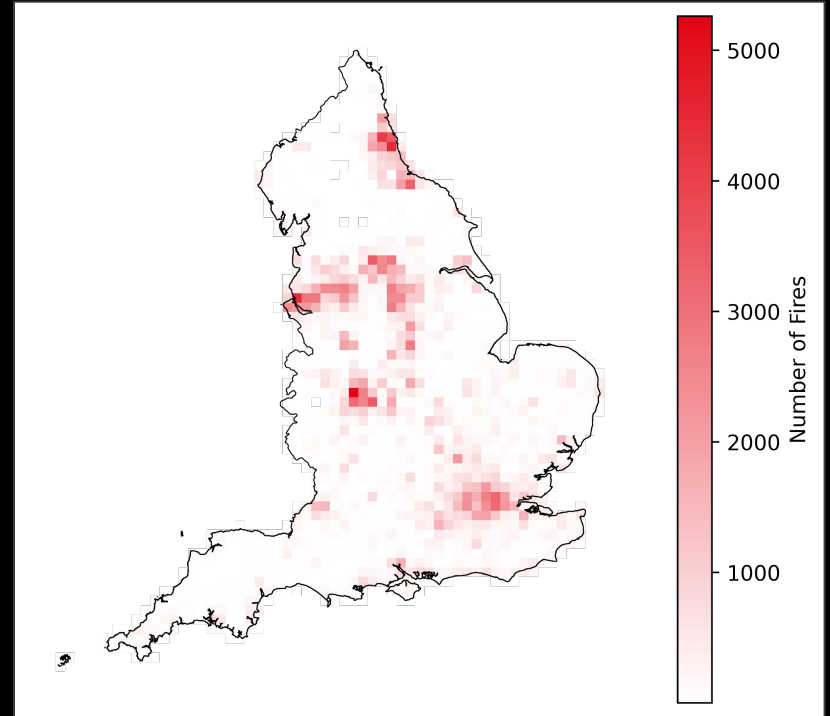
MODIS/  
EFFIS

<500



Forestry  
Commission

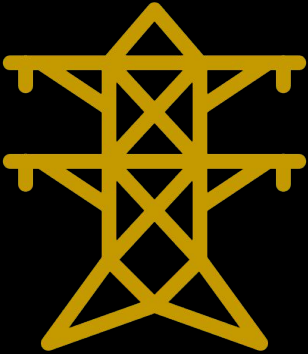
>385 000



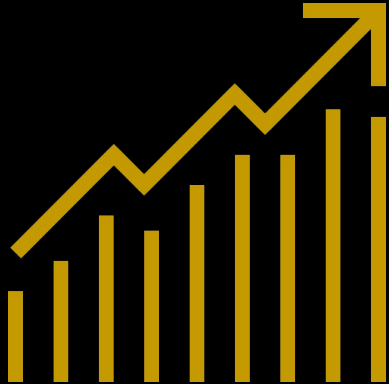
Is the impact of wildfires  
on the National Grid a  
cause for concern?

# The Current Approach

# Proactive Planning for Critical Infrastructure is Needed



5x past 30 years  
by 2030



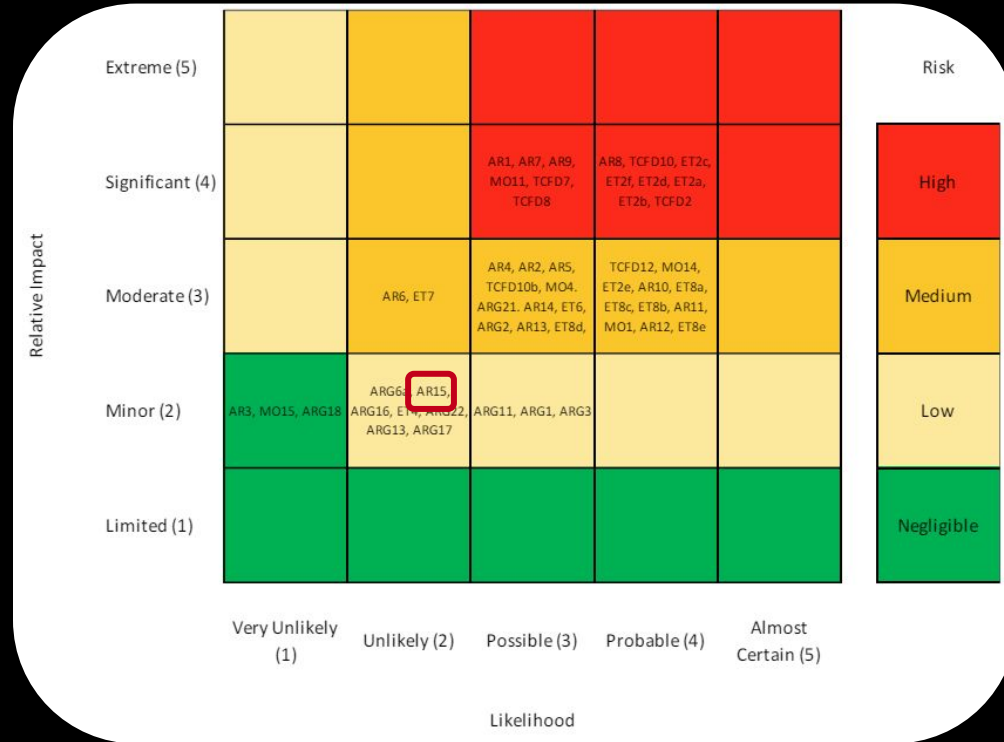
Risks increasing due to  
changing climate



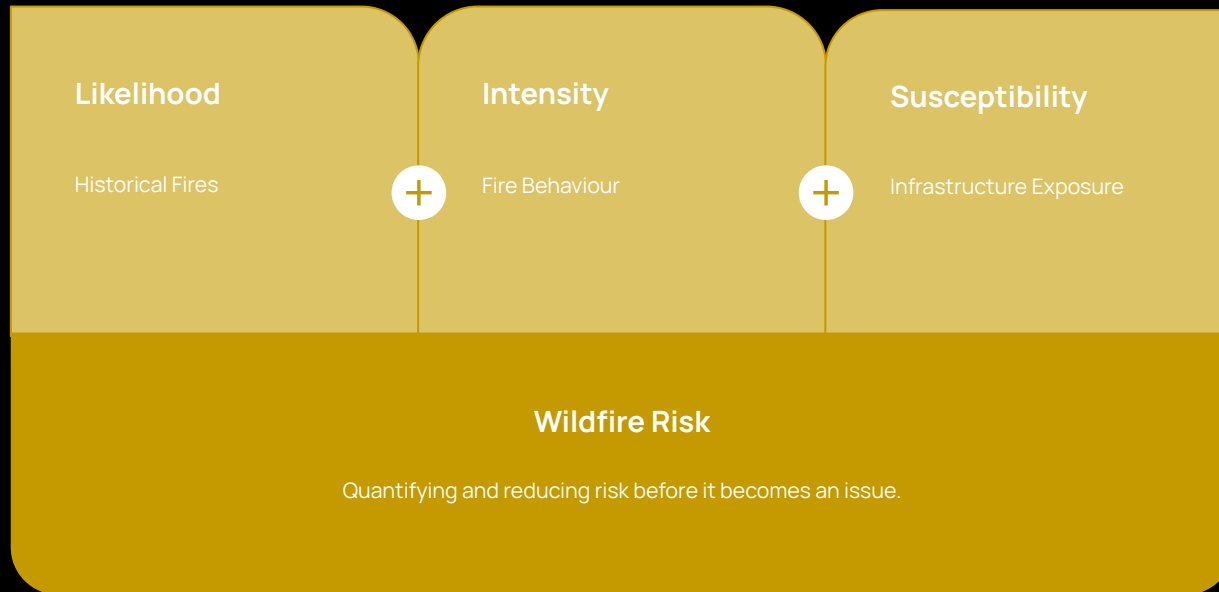
Reactionary investment  
is expensive



# Wildfires Are Presented and Projected as Low Risk



# A Quantitative Approach is Required

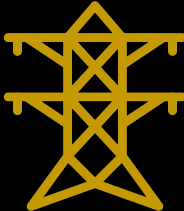


How many fires have  
burned in the National  
Grid's vicinity?

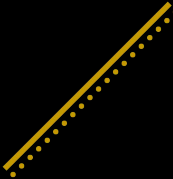
# The Transmission Network is the Backbone of the UK



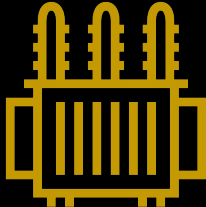
21 958



7222 km



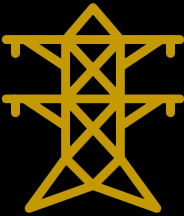
546



# Over 2000 Fires in Proximity Since 2010

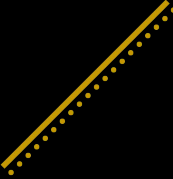


21 958



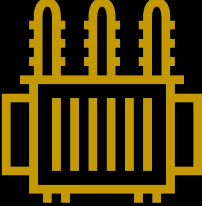
339

7222 km



1720

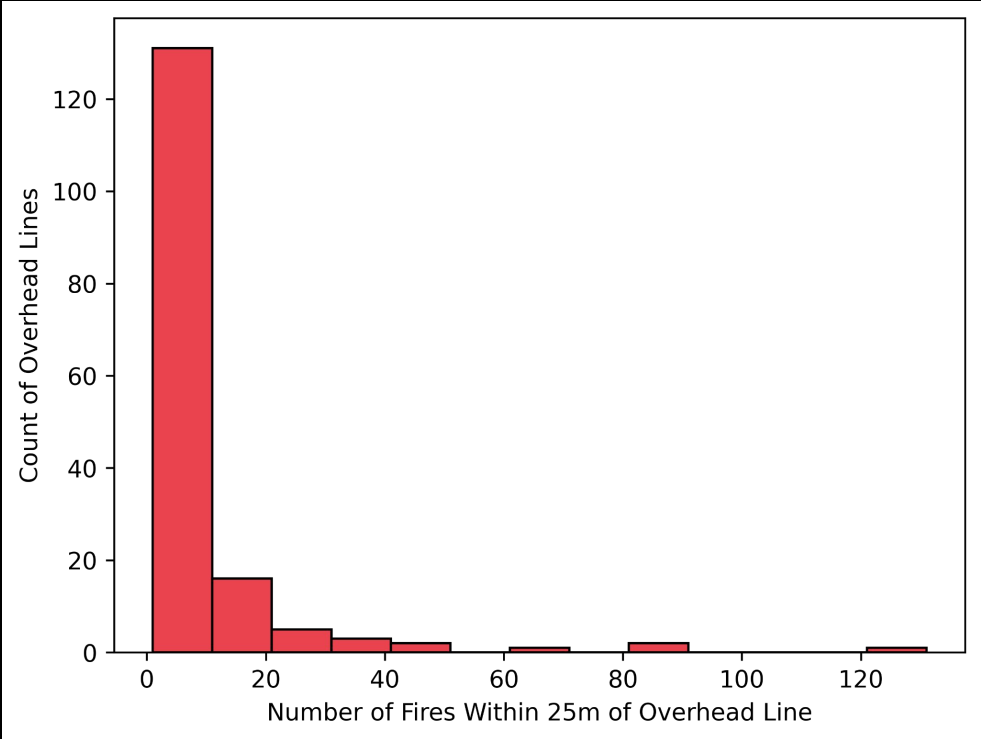
546



66

One fire for every 4.19 km!

# Most Lines Have Seen Between 1 and 11 Fires Within 25m



For the fires that do  
intersect infrastructure,  
will it cause any **damage**?

# One Such Metric is to Compare Flame Height Against Clearance

SCHEDULE 2  
MINIMUM HEIGHT ABOVE GROUND OF OVERHEAD LINES

Regulation 17(2)

<i>Column 1</i>	<i>Column 2</i>	<i>Column 3</i>
<i>Nominal Voltages</i>	<i>Over Roads</i>	<i>Other Locations</i>
Not exceeding 33,000 volts	5.8 metres	5.2 metres
Exceeding 33,000 volts but not exceeding 66,000 volts	6 metres	6 metres
Exceeding 66,000 volts but not exceeding 132,000 volts	6.7 metres	6.7 metres
Exceeding 132,000 volts but not exceeding 275,000 volts	7 metres	7 metres
Exceeding 275,000 volts but not exceeding 400,000 volts	7.3 metres	7.3 metres

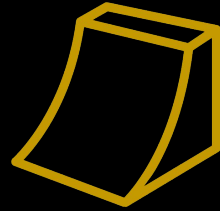


# Behave Modelling

# A Behave Simulation Takes Some Inputs...



Vegetation



Slope Angle



Weather

...And Gets Some Outputs



Flame Height

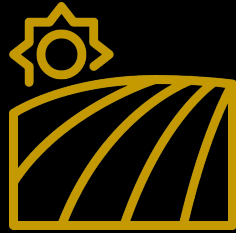


Intensity

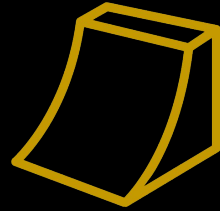


Spread Rate

# How Can We Obtain Relevant Input Values?



Vegetation



Slope Angle



Weather

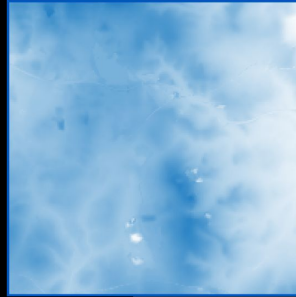
# We Use Three Open Datasets to Provide Localised Inputs

*Land Cover*



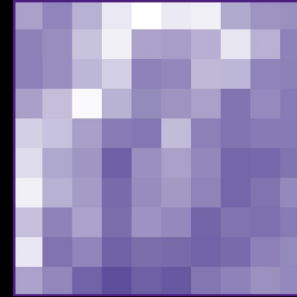
**Vegetation**

*Topography*



**Slope Angle**

*Wind Speed*



**Weather**



Land of Slope and Glory

# Our Land Is a Tapestry of Land Cover Classes

Aggregate Class		Land Cover Class	
ID	Class Name	ID	Class Name
1	Broadleaf Woodland	1	Deciduous Woodland
2	Coniferous Woodland	2	Coniferous Woodland
3	Arable	3	Arable
4	Improved Grassland	4	Improved Grassland
5	Semi-Natural Grassland	5	Neutral Grassland
		6	Calcareous Grassland
		7	Acid Grassland
		8	Fen
6	Mountain, Heath, and Bog	9	Heather
		10	Heather Grassland
		11	Bog
		12	Inland Rock
7	Saltwater	13	Saltwater
8	Freshwater	14	Freshwater
9	Coastal	15	Supralittoral Rock
		16	Supralittoral Sediment
		17	Littoral Rock
		18	Littoral Sediment
		19	Saltmarsh
		20	Urban
10	Built-Up Areas and Gardens	20	Urban
		21	Suburban

# We Are Interested in Six Aggregate Classes



Broadleaf Woodland



Coniferous Woodland



Arable



Semi-Natural Grassland



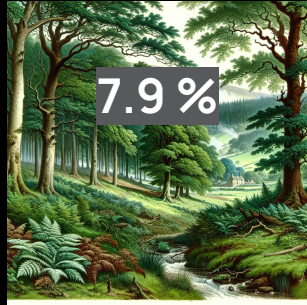
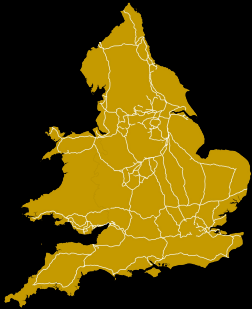
Improved Grassland



Mountain, Heath, and Bog



# Arable and Grasslands Constitute The Majority (~80%)



Broadleaf Woodland



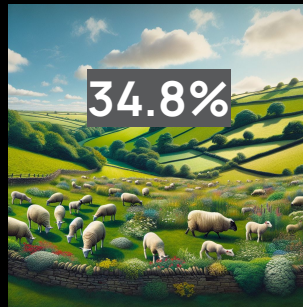
Coniferous Woodland



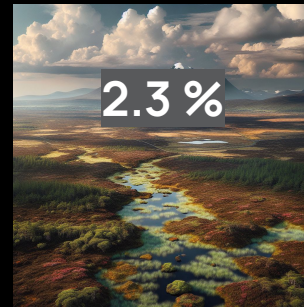
Arable



Semi-Natural Grassland

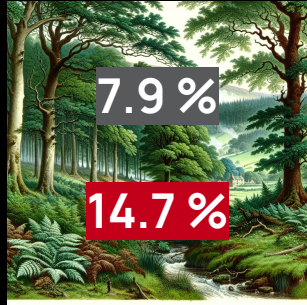


Improved Grassland



Mountain, Heath, and Bog

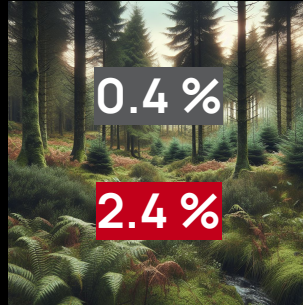
# These Six Land Classes Account for 54% of All Fires



7.9 %

14.7 %

Broadleaf Woodland



0.4 %

2.4 %

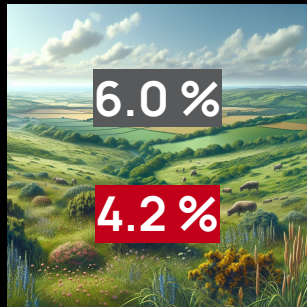
Coniferous Woodland



40.5 %

12.6 %

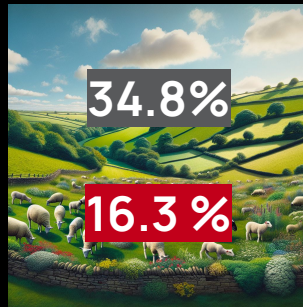
Arable



6.0 %

4.2 %

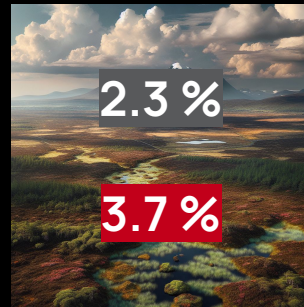
Semi-Natural Grassland



34.8 %

16.3 %

Improved Grassland

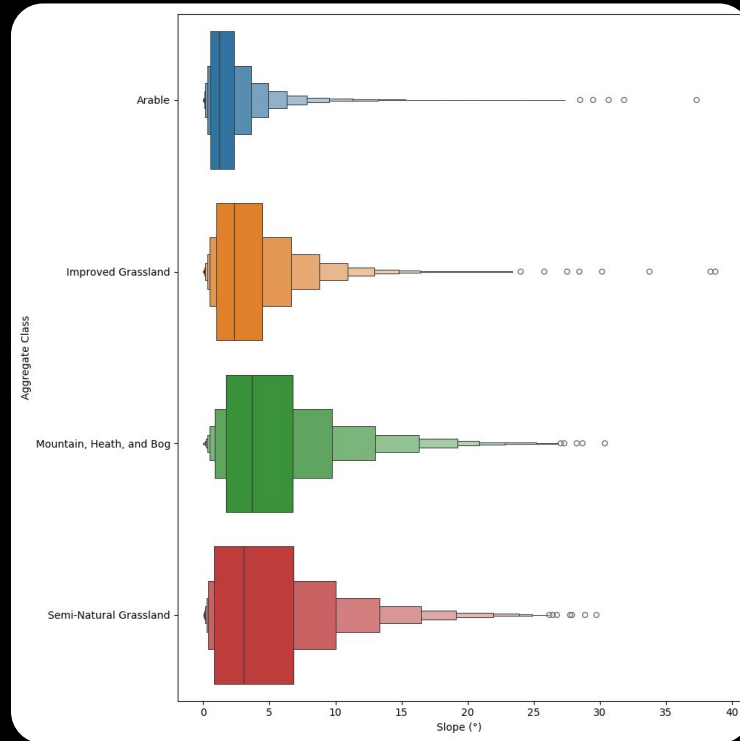


2.3 %

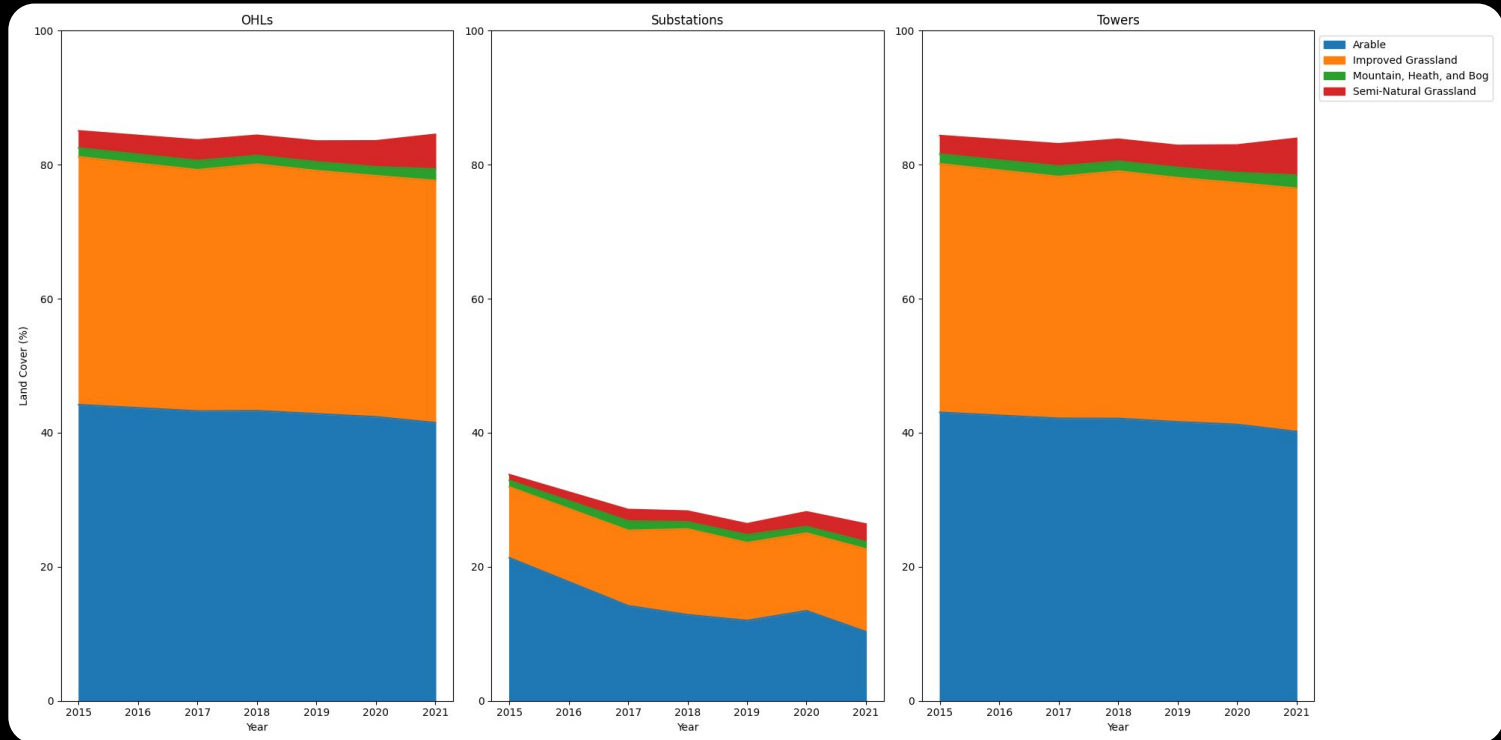
3.7 %

Mountain, Heath, and Bog

# Various Aggregate Classes Present Differing Slope Profiles



# Areas of Semi-Natural Grassland are Rising

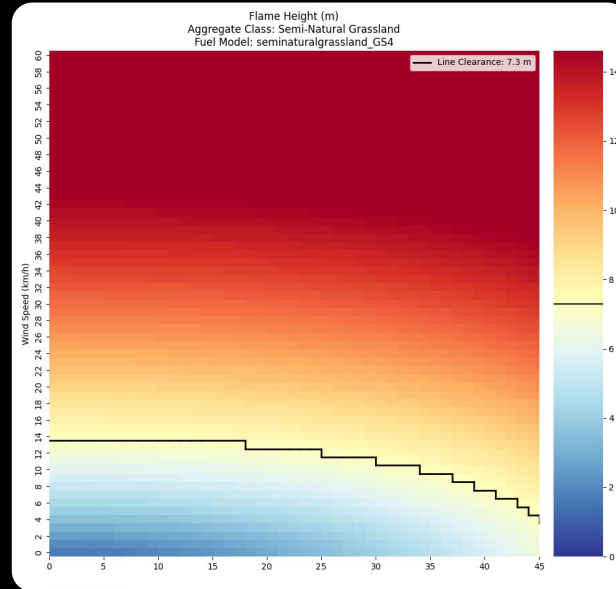


The average wind speed  
in the United Kingdom is  
15.37 km/h (8.3 knots).

# Towards a Threat Map

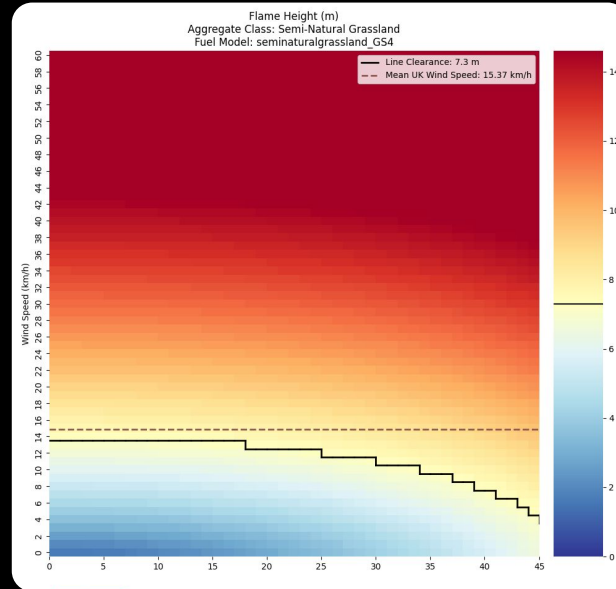


# Add the Clearance Value

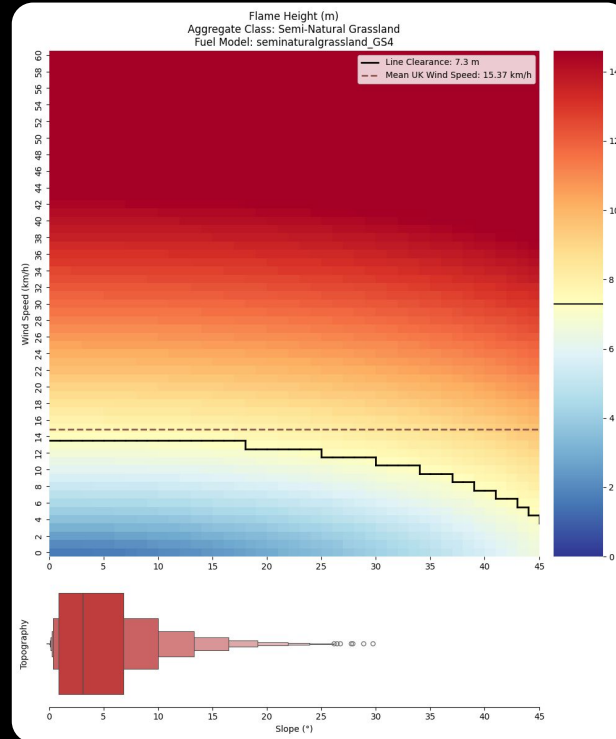




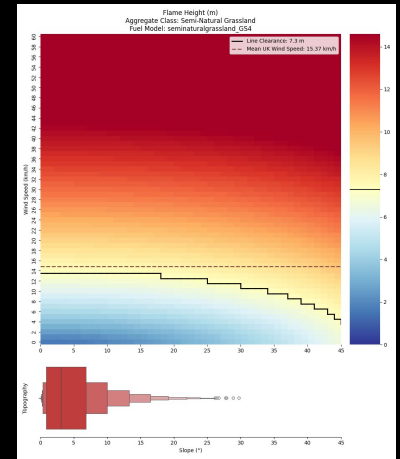
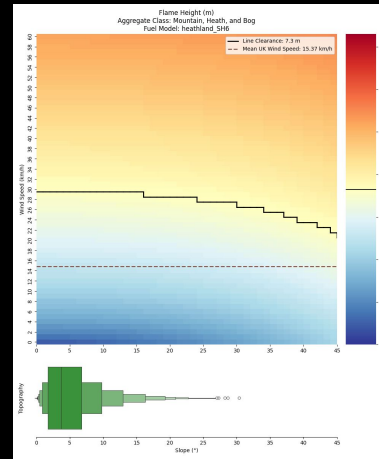
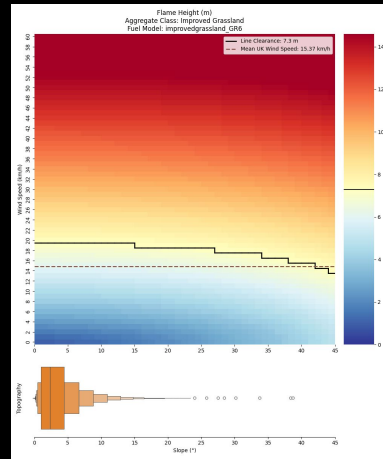
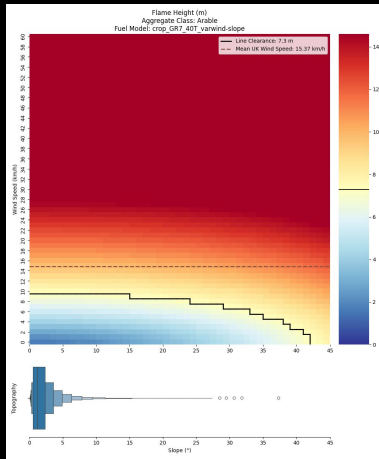
# Add the Average UK Wind Speed



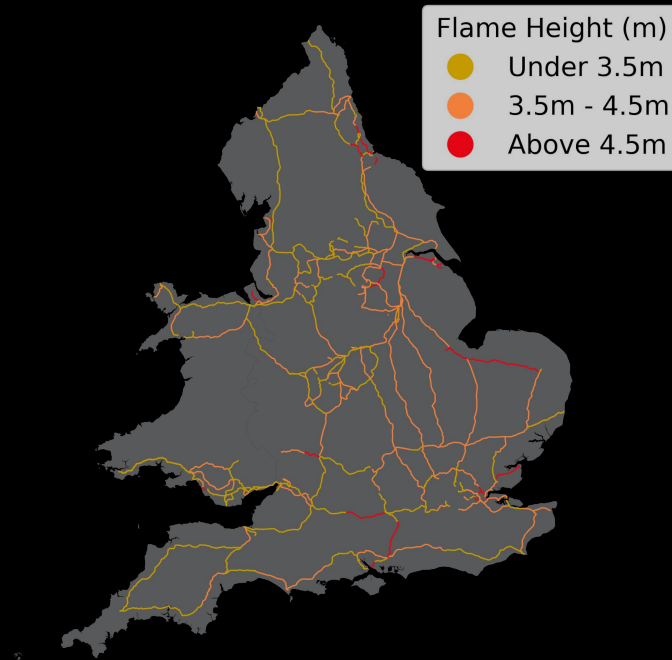
# Add Our Slope Profiles



# Each Land Cover Class Has a Unique Fire Model



# With Local Predictions, We Can Start to Build a National Map

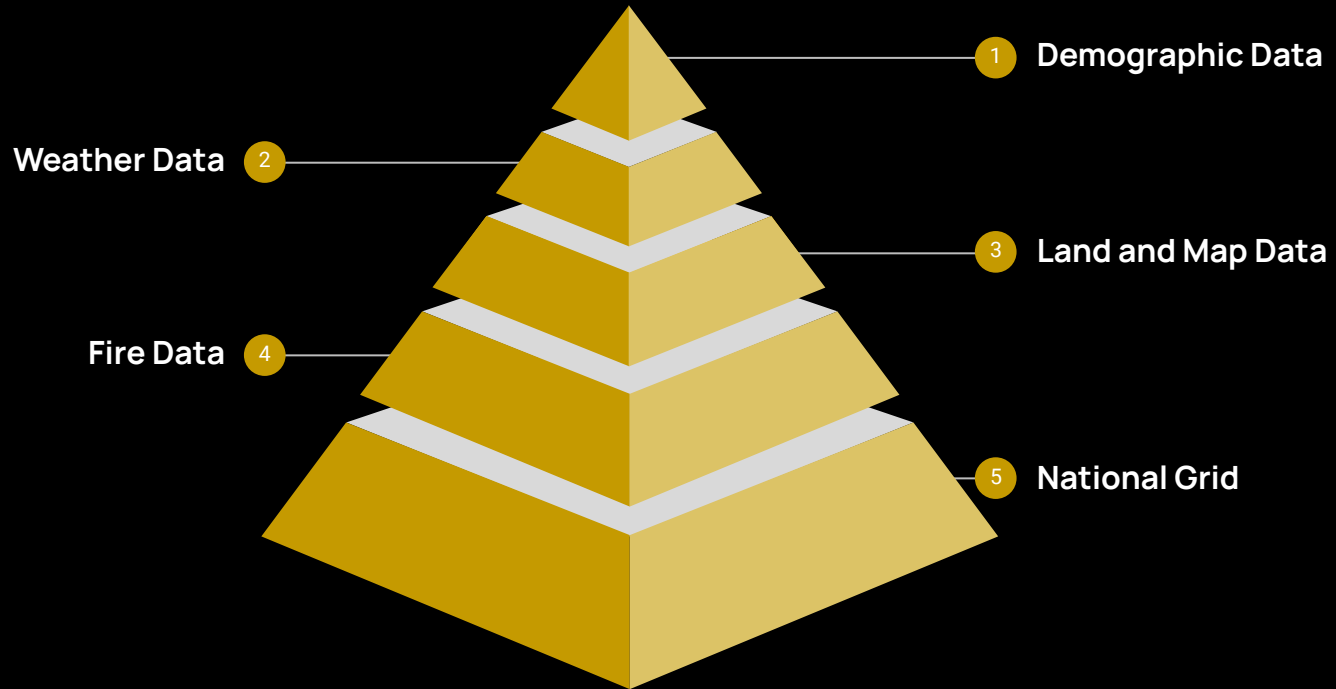


Looking Ahead

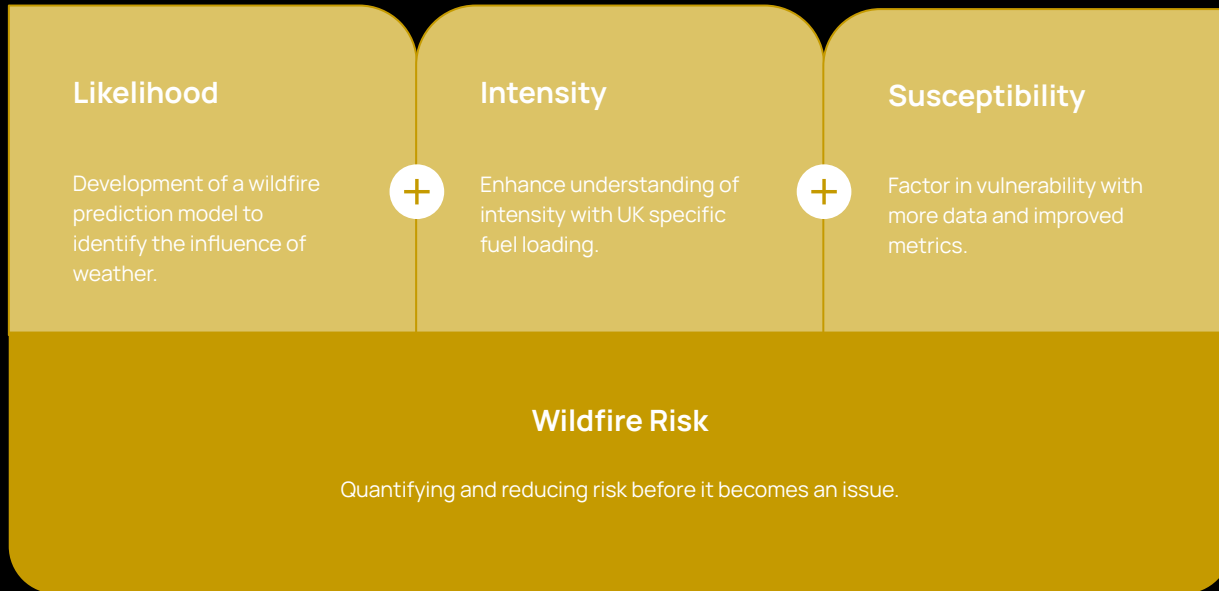
# Recommendations

1. Actual **recorded wildfire data** should be used to inform historical exposure.
2. Start **tracking planned outages** during fire events.
3. Focus attention on understanding **arable or grassland** land covers.
4. Replicate the approach for **other infrastructure**.

# Additional Data Layers Will Provide Greater Insights



# Deeper Dives





Our methodology will  
soon be available as an  
open-source Python  
package.

# Thank You For Listening!

- Project Team
  - University of Birmingham
    - Joe Preece
    - Nick Kettridge
    - Daniel Donaldson
  - National Grid
    - Douglas Dodds
  - Infrastructure Operators' Adaptation Forum (IOAF)
    - John Dora
- Further Collaborators
  - University of Birmingham
    - Kerryn Little
  - University of Exeter
    - Claire Belcher