

Supplementary Material

Vegetation phenology as a key driver for fire occurrence in the UK and comparable humid temperate regions

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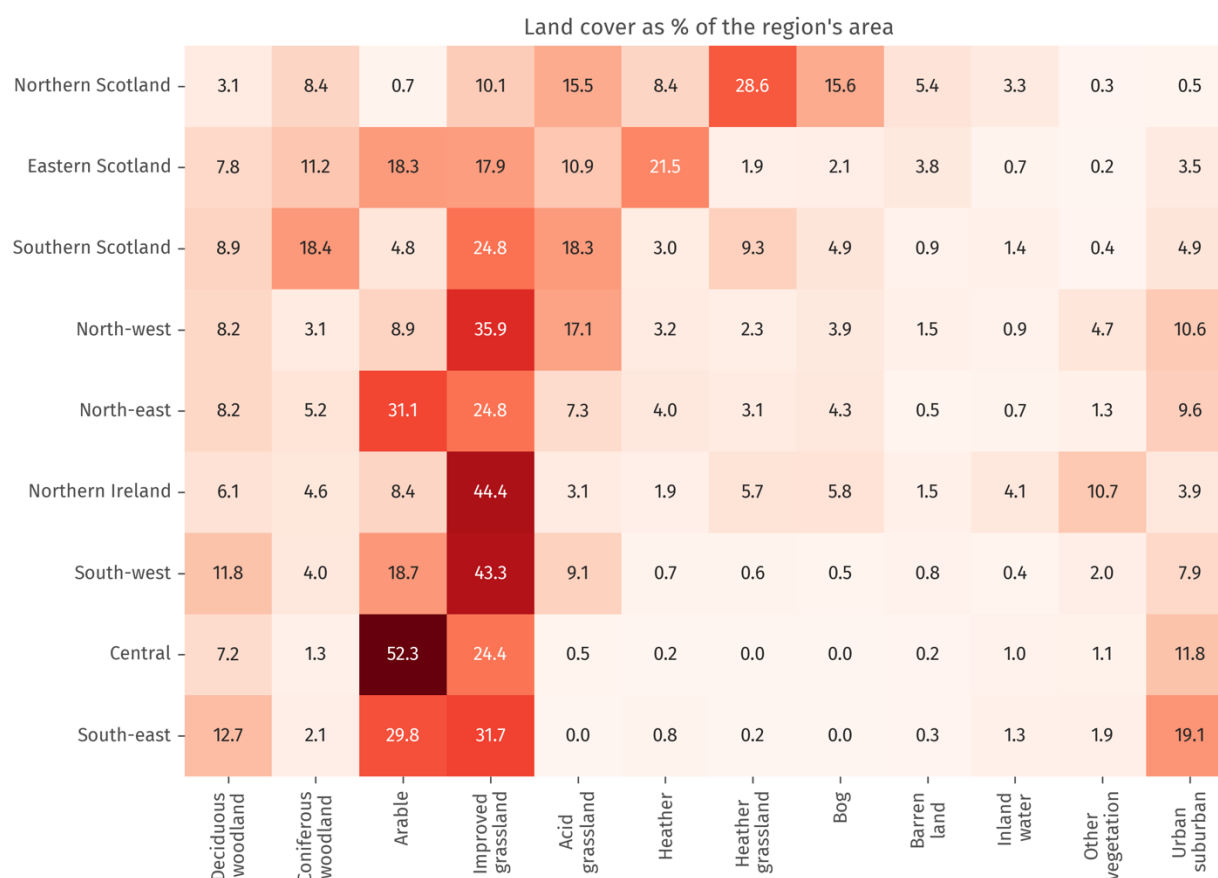
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Supplementary figures and tables

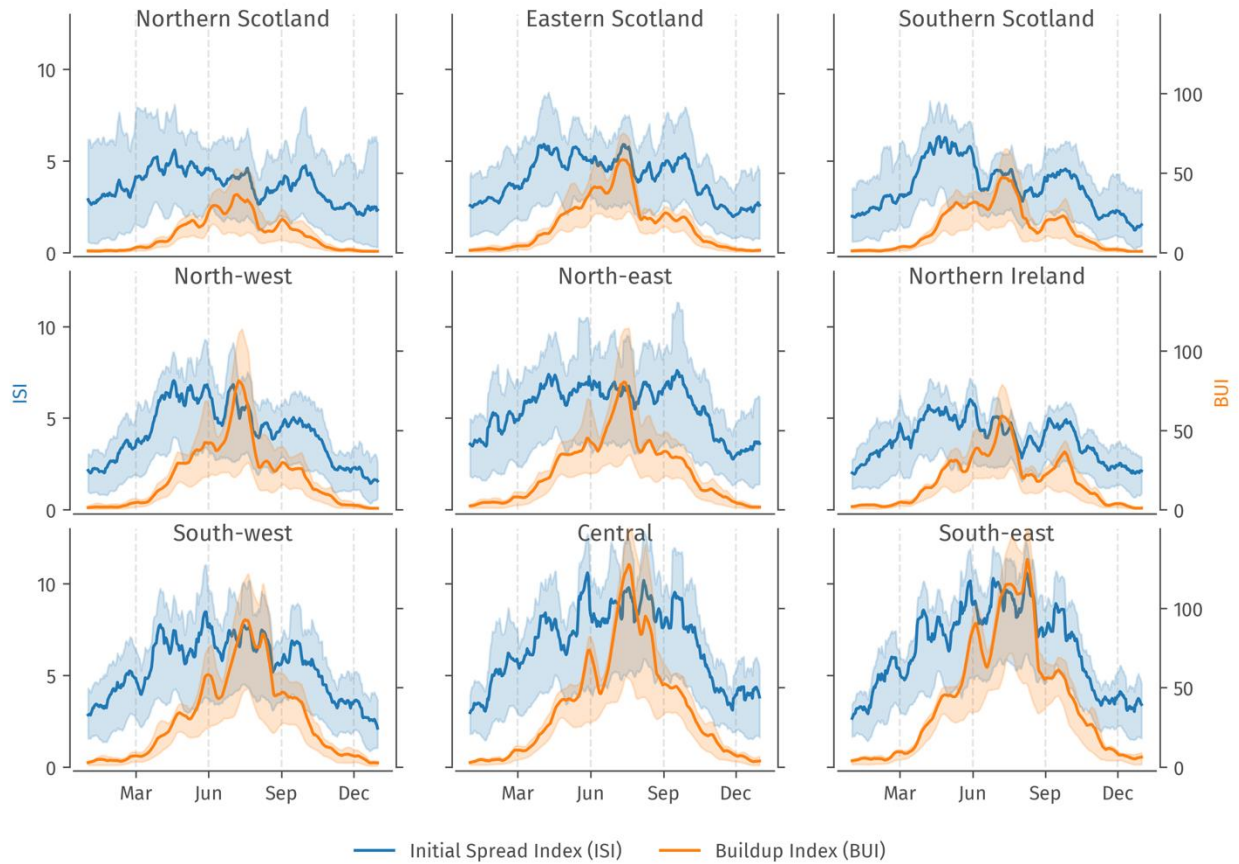


Supplementary Fig. S1: UKCEH land covers as a percentage of the region's area according to the 2018 product. The estimates are shown for eight fire prone vegetation land covers of this study, plus four categories that agglomerate areas of multiple UKCEH land covers for brevity. Barren land class combines UKCEH land covers of inland rock, supralittoral rock, supralittoral sediment, littoral rock and littoral sediment, inland water class represents saltwater and freshwater, other vegetation category combines estimates for UKCEH vegetation covers not included in this study due to low fire detection counts (neutral grassland, calcareous grassland, fen and saltmarsh) and urban-suburban category combines areas covered by UKCEH urban and suburban land covers.

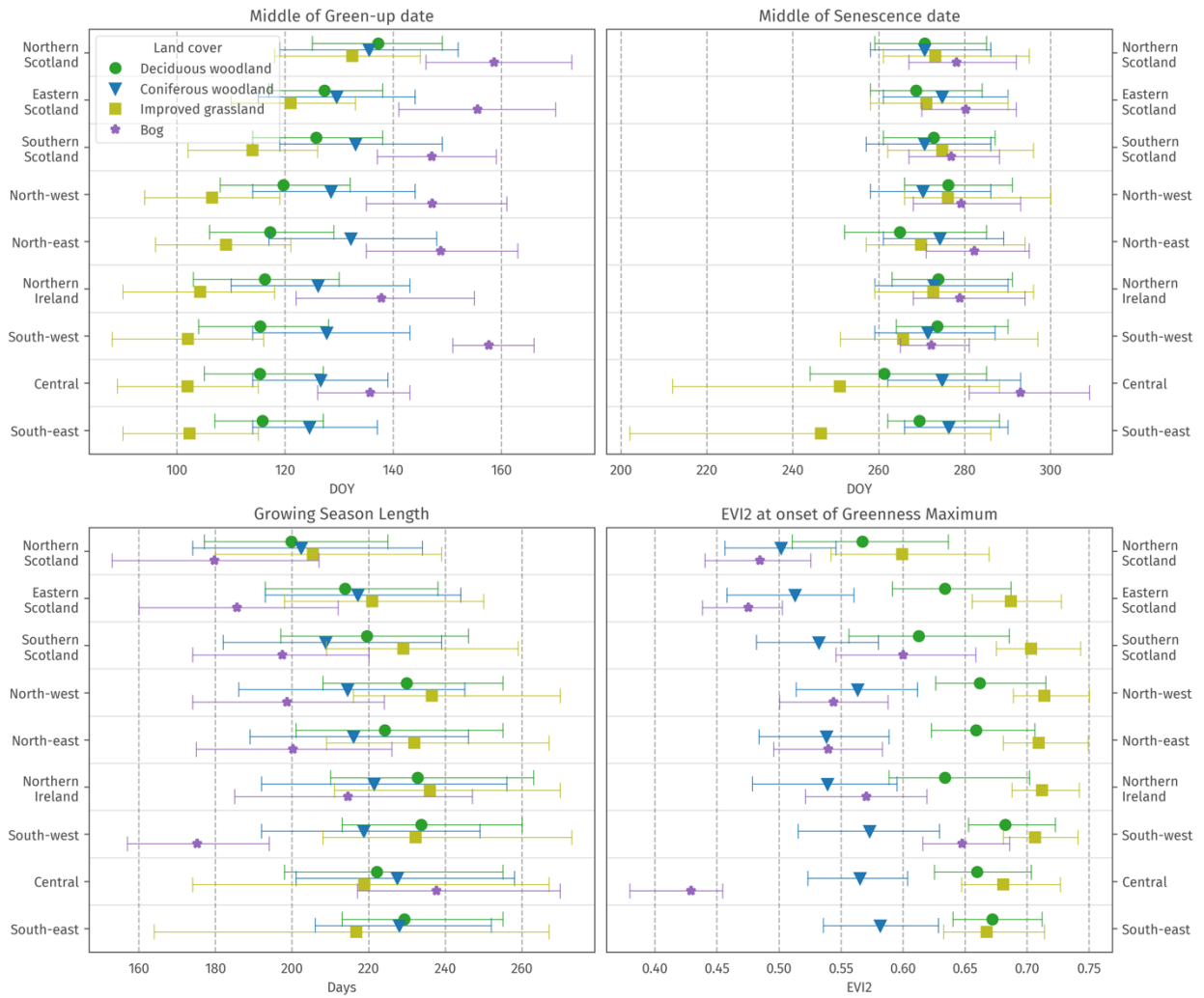
Fire detections per km²

Northern Scotland	0.08	0.04	0.02	0.05	0.07	0.12	0.15	0.11
Eastern Scotland	0.04	0.04	0.04	0.03	0.15	0.33	0.31	0.08
Southern Scotland	0.02	0.02	0.04	0.02	0.09	0.14	0.08	0.19
North-west	0.07	0.04	0.09	0.04	0.08	0.55	0.19	0.59
North-east	0.07	0.06	0.05	0.04	0.15	1.41	0.53	0.49
Northern Ireland	0.05	0.08	0.05	0.03	0.12	0.51	0.19	0.31
South-west	0.06	0.17	0.08	0.03	0.28	0.43	0.66	0.19
Central	0.06	0.05	0.09	0.07	0.05	0.20		
South-east	0.10	0.14	0.14	0.11		0.87	0.37	
Combined	0.06	0.06	0.09	0.05	0.13	0.40	0.17	0.22
	Deciduous woodland	Coniferous woodland	Arable	Improved grassland	Acid grassland	Heather	Heather grassland	Bog

Supplementary Fig. S2: VIIRS NPP vegetation fire detection counts per square kilometre for the study’s regions and land covers during 2012 – 2023 period. Row “Combined” shows estimates pooled over all regions.



Supplementary Fig. S3: Seasonal variability of Initial Spread Index (ISI) and Buildup Index (BUI) in the study regions. Solid lines show upper quartile values (75th percentile), shaded regions envelope 50th and 99th percentiles of ISI and BUI values for the 2012 – 2022 period.



Supplementary Fig. S4: Middle date of green-up phase, middle date of senescence phase, growing season length and maximum EVI2 value for different regions and land covers. Points indicate median values; error bars represent interquartile value ranges.

Supplementary Table S1: Relationship between UKCEH Land Cover classes and UK BAP Broad Habitats (Jackson 2000) and descriptions (Morton et al. 2020a, 2020b).

UKCEH Land Cover Class	UK BAP Broad Habitat	Description
Deciduous woodland	Broadleaved mixed and yew woodland	The broadleaved tree stands >5 m high with canopy cover >20%. Stands with near-closed canopies are generally classified with high accuracy. Open-canopy woodland (stands with trees <50%) is a particular problem, albeit occurring relatively rarely. These are likely to be confused with other classes due to the dominance of the non-woodland understory. Broadleaved evergreen trees rarely occur in stands >0.5 hectares; an area large enough to create suitable training areas appropriate for classification. As a consequence, the classifier would struggle with this land cover. It is likely they will be classified as Coniferous woodland because of the full-year chlorophyll signal.
Coniferous woodland	Coniferous woodland	Coniferous trees including semi-natural stands and plantations, with cover >20%. Classification of coniferous woodland is generally straightforward, but rare examples of open canopy semi-natural pinewoods are likely to be classified according to the dominant understorey class. Deciduous larch has potential for confusion with broadleaved deciduous woodland but is generally correctly identified.
Arable	Arable and horticulture	This is a very broad class that includes diverse range of annual crops such as wheat and barley, perennial species such as berries and orchards. It therefore has large potential for spectral confusion with non-arable surfaces. The main confusion occurs between arable land and improved grassland.
Improved grassland	Improved grassland	Characterised by a fast-growing grass such as <i>Lolium spp.</i> , and also white clover (<i>Trifolium repens</i>) on fertile soils. Typically managed as pasture or mown regularly. Improved grassland is distinguished from semi-natural grasslands based on its higher productivity, lack of winter senescence, location and/or context. Grasslands lie on a continuum, so some confusion with other grassland types and crops is inevitable. Indeed, seasonal reflectance pattern of intensively managed grasslands is similar to wheat and barley.
Acid grassland	Acid grassland	Vegetation on lime-deficient soils, dominated by mixture of grasses rushes, mosses, herbs and sedges. A common representative species is deciduous Molina grass (<i>Molinia caerulea</i>). This UKCED land cover also includes bracken.
Heather	Dwarf shrub and heath	This land cover represents dwarf shrub and heath habitats characterised by a mixture of heath family (i.e. <i>Calluna vulgaris</i> , <i>Erica cinerea</i> , <i>Erica tetralix</i>), gorse (<i>Ulex europaeus</i>) and dwarf gorse (<i>Ulex minor</i>) on well-drained, nutrient-poor acid soils. This class indicates areas with more than 25% heath family shrub presence.
Heather grassland		Same as above but areas with less than 25% heath family shrub presence and higher proportion of grasses (i.e. <i>Molinia caerulea</i>).
Bog	Bog	Vegetation on deep peat soils; a continuum involving acid grassland, dwarf shrub heath and some types of fen, marsh and swamp. The separation of continuously varying land cover into discrete types can be difficult, especially when they exist in a complex small patch mosaic and their definitions are vague. Bog and the range of upland vegetation classes expected to occur on peaty soils (Acid grassland, Fen marsh and swamp, Heather, and Heather grassland) cannot be clearly separated and there is considerable confusion between bog, Heather and Heather grassland classes.