THE HEATHER TRUST
Promoting Integrated Moorland Management

The Heather Trust contributes modest funding each year to a range of research which is relevant to moorland management. This helps to answer important questions about good practice and it's important that farmers, gamekeepers and other moorland managers can make use of it.

One way we can do this is through our *So What?* Guides. They explain the scientific conclusions so that practitioners can make good decisions based on the latest research.

Background

Wildfire is to some extent a natural phenomenon. It has occurred for millennia and some vegetation such as heather are adapted to it as a result. However Britain experiences many more wildfires each year than would be the case through natural processes. These fires are the result of either human error or through the deliberate act of arson.

Most scientists believe that wildfires will become more common in Britain in the future as a result of climate change. It is expected that the British climate will become more like that experienced by Portugal and areas of the western Mediterranean. While wildfire may not be completely avoidable, it is possible to take action to keep the incidence down and better manage those that do occur. Wildfire mitigation and management are likely to become an increasingly important factor when planning land use and management in future. Key things to take account of are:

- How resilient the land is to fire and whether resilience can be improved;
- The strategic use of firebreaks; and
- Better education of the public to reduce risky activities.

Experts agree that it would also be helpful to establish a wildfire danger rating system so that people on the ground can be more aware of climatic conditions which might lead to a wildfire. There are systems like this available in the USA and Canada which provide a useful blueprint, but it is not easy to roll these ideas out in Britain where wildfires are more likely to occur on open moorland. Before we can develop a danger rating system, we need customised research to understand the details of wildfire in Britain and its interaction with the different fuel bed strata.

The Studies

To improve our understanding of wildfire and to lay the groundwork for an improved wildfire rating system, the Heather Trust contributed funds to two studies which measured the likelihood of wildfire ignition in grasses and heathers in different conditions so that this information could be used to produce models for predicting the likelihood of wildfire.

In one study, the scientists focussed on litter layers and the build-up of old, dead material which forms beneath living vegetation. Particular focus was placed on gorse, heather, bilberry and crowberry. Peat was also included.

Another study looked at the varying flammability of different grass and grass-like species according to their structure variation depending on the season. This was also undertaken in the laboratory on tussocks of grasses including common cotton grass, hare's tail cottongrass and molinia grass ("blow grass" or "purple moor grass").

How

British moorlands are usually characterized by a range of different species that create litter layers lying on peat. As the moisture content is key to the flammability of the plant material, the scientists prepared litter layers and peat cores with a range of moisture contents in the laboratory. They also simulated the vegetation structure of Calluna vulgaris.

Burning trials were then conducted within a standardized burn chamber. Ignition was either via a barbecue lighter pill or using an electrical heating element designed to mimic a cigarette butt.

The scientists measured: Ignitability (time to ignition), Sustainability (flame time), Consumability (how much weight was lost) and Combustability (flame height).

Results in a Nutshell

Fuel moisture content played a major role in every assessment. In brief, wetter vegetation takes longer to catch fire, burns for less time, loses a smaller percentage of its mass and burns with less heat. Importantly, we measured what “dryness” had to be achieved for the fire to take hold.

Litter which burns hot and fast (i.e. Gorse and Sphagnum), produced flames which quickly may catch the main canopy and escalate into a major fire. In contrast, litter which burns for a longer time (i.e. heather and crowberry) are more likely to ignite surrounding vegetation because flames persist for longer. In this sense, further studies assessing which flammability properties (ignitability and combustibility vs. sustainability) are more important in propagating fire to the vegetation are needed.

At the same time, low-density litter beds composed of big particles are less likely to pack down and these generally allow better air circulation for fire development. This adds more variables to create a complex overall picture.

Peat is normally covered by litter and vegetation. Cigarette ends or barbeque cinders are unlikely to ignite peat directly, and it is more likely that peat ignition occurs when the litter layer is smouldering. Litters of species with higher sustainability (heather and crowberry) are more likely to ignite peat.

The probability of ignition in the upper-Calluna vegetation was influenced by both the proportion of dead fuels and their fuel moisture content.

The ignition source was very important in determining the probability of ignition in both peat/litter fuel-beds and vegetation. Smouldering sources were more effective in igniting peat and litter fuel-beds, whereas direct ignition was more likely to move through the undergrowth canopy without burning the litter layer.

The study which focused on grass found that the fuel load is generally drier in the spring. This is because the higher load of dead fuel produced during the previous winter. At this time (April and May) wildfire risk is at a peak and it is consistent with the fact that “grassland fires” mainly occur around this time in Britain.

So What?

This data helps us to refine and improve our fire danger rating system. Wales and England currently use a fire danger rating system which consists of a series of basic codes which are used to predict wildfire occurrence. This system often fails in its predictions, and only one of its basic codes, Fine Fuel Moisture Code (FFMC), is able to forecast fire occurrence with acceptable accuracy. FFMC is a rating of the moisture content of litter and other fine fuels, and it is worked out from data on rainfall, relative humidity, wind speed, and temperature collected over the previous twenty-four hours.

These studies can assist in improving the predictions of heather and moorland fire danger. We can prepare for periods of high risk, and link this to public awareness campaigns to prevent accidental wildfires.

The results from the study on litter and heather suggest that the risk of a serious fire is linked to fuel loads. Management strategies which keep heather/moorland plants in a "young state" with less than 20% dead-fuel may be an effective measure for reducing wildfire risk. The presence of grass amongst older heather can greatly increase the severity of a fire.

Understanding the timings of grass growth and ecology and the impact of seasonality of fires in grassland can also help us to prepare for wildfires. This work, therefore, helps in improving the techniques we use to forecast fires.

More Detail...

for the full studies, read:

Models for predicting fire ignition probability in graminoids from boreo–temperate moorland ecosystems

by Victor M. Santana and Rob H. Marrs, publiushed in the International Journal of WIldland Fire, Journal compilation IAWF 2019

Flammability properties of British heathland and moorland vegetation: Models for predicting fire ignition

by Victor M. Santana and Rob H. Marrs, published in Journal of Environmental Management 139 (2014) 88e96

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