MoorLIFE 2020

Estimating Carbon Released from Wildfire:

A case study into the estimated amount of carbon released as a result of the wildfire that occurred on The Roaches in August 2018 in relation to the work undertaken by MoorLIFE 2020.

Funded by:

Prepared by

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Introduction

Moors for the Future Partnership (MFFP) is a conservation organisation that works with key stakeholders to conserve and restore Active Blanket Bog (ABB) habitats using innovative conservation techniques, with key sites being monitored to help inform future restoration work. Additionally, the organisation aims to educate and promote the responsible use of these habitats.

One way MFFP is delivering these aims is through the MoorLIFE 2020 (ML2020) project, which is an EU funded LIFE project, that aims to support environmental, nature conservation and climate action projects throughout Europe. This project focuses on the landscape of the South Pennine Moors (SPM) Special Area of Conservation (SAC), which forms one of the most southerly and significant areas of ABB which is protected by both UK and European legislation.

Aims and Objectives of the Case Study

This case study contributes to delivering actions within the project, by showing what impact wildfires can have on ABB and setting our work in a wider context by:

1. Identifying how much carbon is released through a wildfire event when compared to the activities required to restore an ABB site.

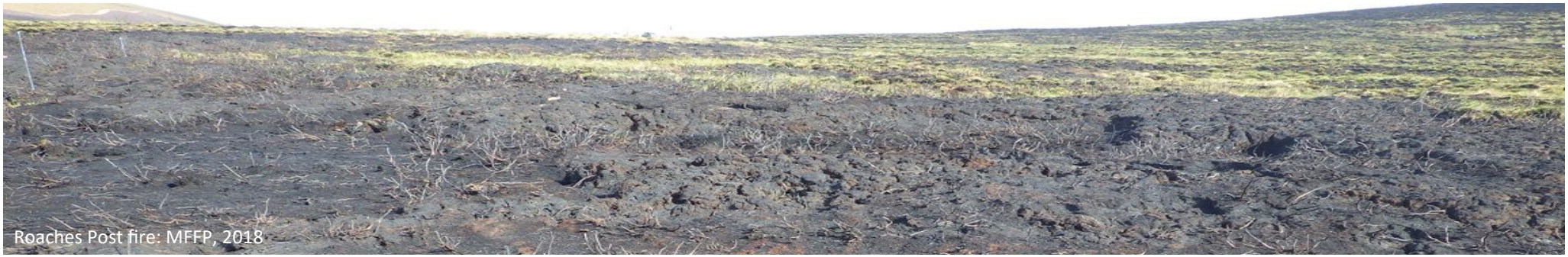
2. Emphasising the consequences of wildfire, helping to reduce the number of accidently started wildfires by increasing awareness of the impact which people's actions can have.

Background

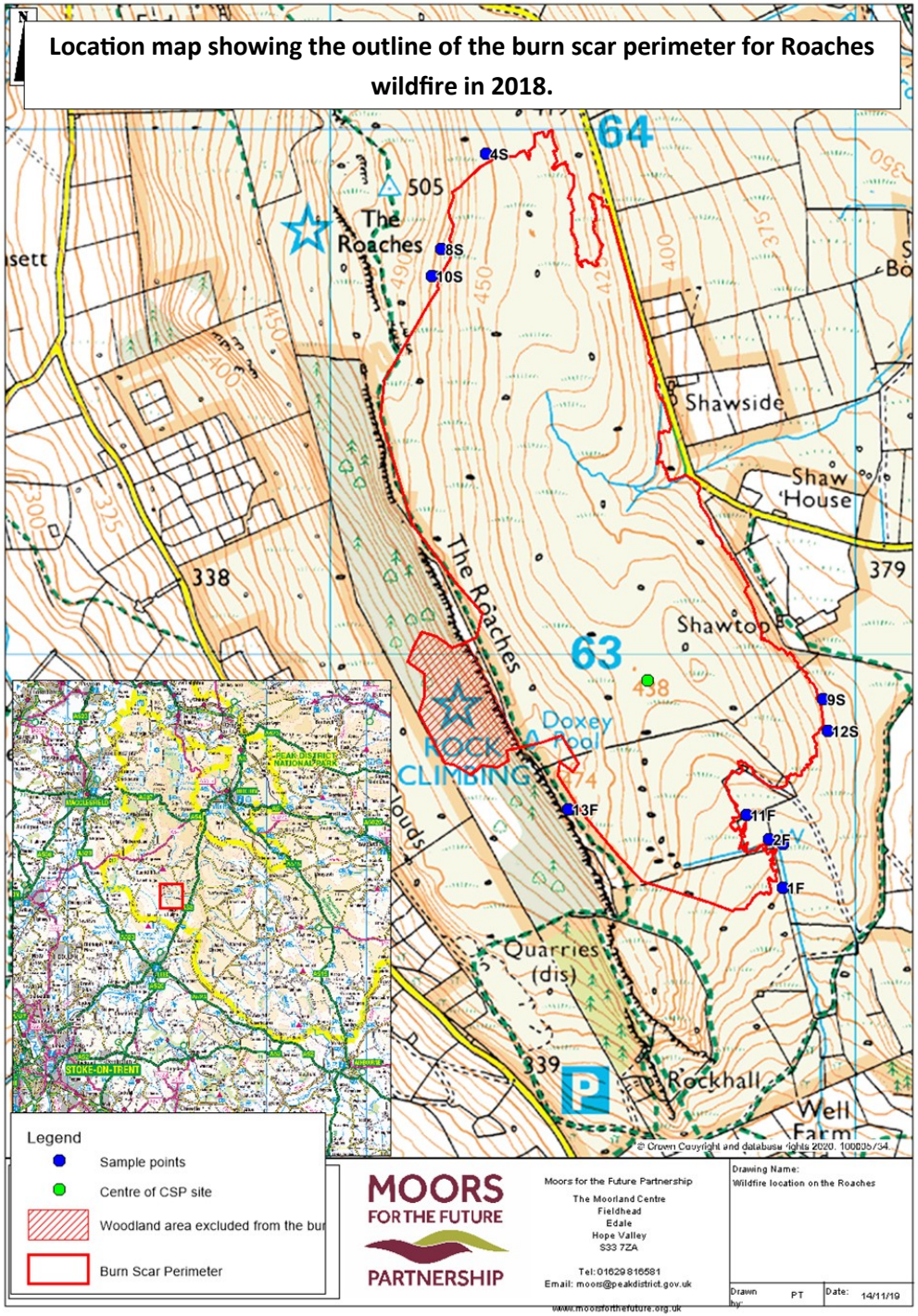
Peatlands represent a significant store of carbon *(Davies et al, 2013),* with close to an estimated 20 million tonnes locked up within the ABB habitats of the Peak District National Park alone *(PDNPA, 2009).*

A key threat to ABB is wildfire which leads to the release of carbon that is locked up within this habitat *(Davies et al, 2013*). In recent years a significant number of wildfires have occurred on ABB sites, increasing the amount of carbon released into the atmosphere. During the fire the majority of this carbon is released as carbon dioxide (CO_2) in smoke. Some carbon however will be converted into pyrogenic material, e.g. black carbon (which is charred carbon deposited from vegetation and grassland fires), which is not released to the atmosphere.

Due to the unpredictability of wildfire it is difficult to use empirical data to study carbon released, as before and after data is required to calculate carbon released. The wildfire on The Roaches therefore represents a unique opportunity, as before data is available from an monitoring site MFFP has on site.



Roaches Post fire: MFFP, 2018



Site Information

Site:	Roaches
Location:	4 miles North of Leek 8 miles North West of Macclesfield
Habitat:	Active Blanket Bog (ABB)
Wildfire occurred:	August 2018
Area of ABB burnt:	61 hectares
Notes:	An additional 4ha was burnt, but is not included in the study as it comprised woodland indicators.

Community Science Site Information

Established:	2016
Data available:	Peat anchors Vegetation cover Water table heights Air temperature Rainfall
No of peat anchors:	10

Survey Information

Sample size:	10 (5 on flat ground (F) 5 on Sloped ground (S)
Samples taken:	10 x 200g of soil for carbon analysis 10 x 150g for soil bulk density
Date surveyed:	June 2019

Methodology

The formula below was used to estimate the carbon released as a result of the wildfire:

> Carbon released = estimate of burned area*soil bulk density*carbon content*depth of peat burned
>
> *(C Evans, personal communications, 2019)*

Soil Bulk Density

1. Weigh 10 density rings individually prior to fieldwork
2. Sink the density ring 15cm into the peat vertically, this allows a consistent sample size to be obtained
3. Weigh the individual density ring and peat sample
4. Dry sample in an oven for 24 hours at 105 degrees
5. Subtract weight of density ring away from the oven dried weight to find out the dry weight of peat
6. Divide dry soil weight by the volume of the density ring to get the soil bulk density

(Rowel, 2014)

Carbon Content

Ten soil samples of approximately 200g of peat were collected at the same location as the soil cores and analysed using the OX/IR technique (SAL, 2019).

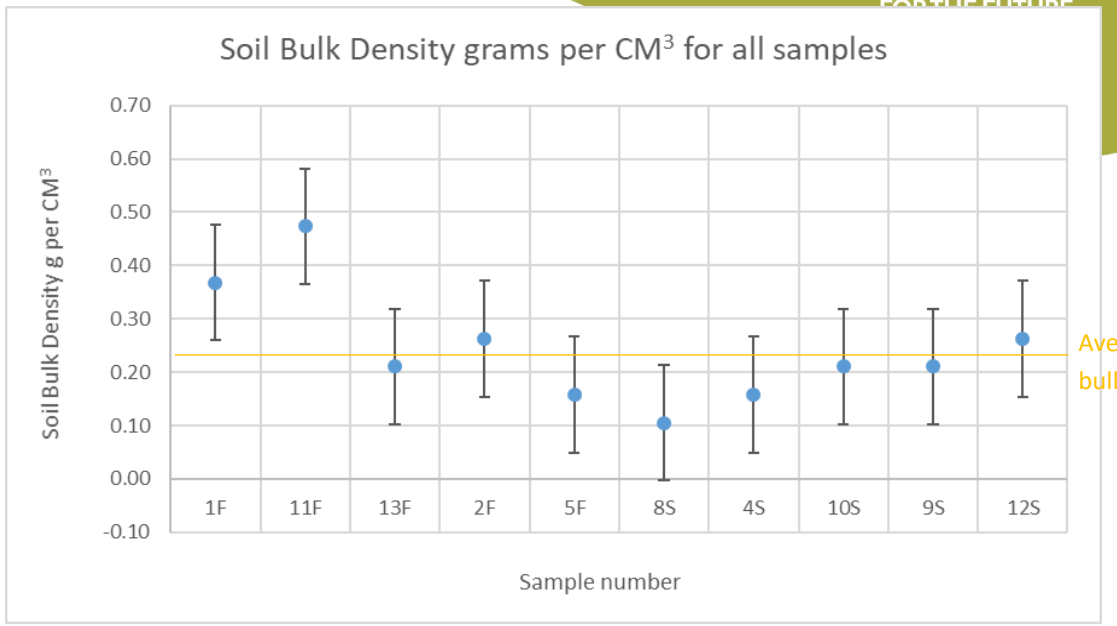
Peat Depth

Peat anchor measurements pre and post fire have been collected by MFFP staff and volunteers. This involved measuring the distance between the ground and the top of the peat anchor on the northern face.

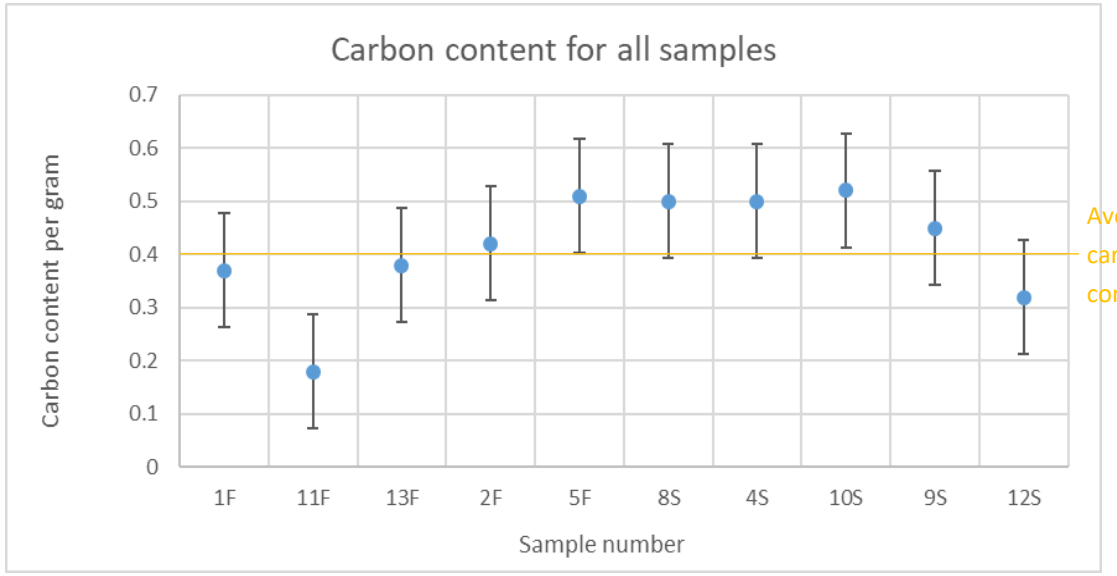
The higher the number the larger the difference between the ground and the top of the peat anchor. This data has been used to determine the change in peat levels.

Results

Soil bulk density



Carbon content



Results continued...

Peat Anchor Data

Data	Average (mm)
Pre wildfire data	328mm
Post wildfire data	381mm
Difference	53mm

Total Figures	Average (tonnes)
Average carbon released	3,244
Average carbon released into the atmosphere	3,115
Average carbon dioxide (CO_2) released to the atmosphere	11,193

Wildfire happening on The Roaches: MFFP trail camera, 2018

Discussion

This case study investigated the quantity of carbon released from an area of blanket bog following a wildfire, with approximately 11,431 tonnes of carbon dioxide released into the atmosphere.

The average figure for the amount of carbon released as a result of the wildfire is 3,244 tonnes which is the equivalent of 52 tonnes per hectare. This is approximately half way between the minimum (2 t C ha-1) and maximum values (110 t C ha-1) in Poulter et al (2006) study, which examines smoldering wildfires in temperate peatlands of America, but below the 96 tonnes per hectare calculated by a similar study undertaken by Davies et al (2006) focusing on Scottish peatlands.

Taking account of the carbon that is redeposited as pyrogenic material means that 3,115 tonnes of carbon was released to the atmosphere as smoke and fumes. This is based upon a study undertaken by Clay and Worrall (2011) in Edale, which identifies that 4% of carbon released is redeposited as black carbon.

Converting this to carbon dioxide identifies that 11,430 tonnes was released. Comparing this to the MoorLIFE 2020 project, it is possible to determine that approximately 68 times more carbon dioxide was released in this one event than the whole of ML2020 used in year 3 (166 tonnes of carbon), and is the equivalent of running 1,426 homes for 1 year.

Worrall et al (2011) identifies that by reducing the avenues of carbon release from bare peat (e.g. erosion) through restoration, 4.48 tonnes of carbon per ha per yr can be retained. The Roaches wildfire released the same amount of carbon that would have been lost from bare peat over 10 years.

This highlights the importance of the work that MFFP undertakes reducing the risk and severity of wildfires through concrete conservation actions (e.g. gully blocking etc.) and education (e.g. public engagement events). Even preventing one fire can prevent a significant amount of carbon being released.

References

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