MOORS FOR THE FUTURE PARTNERSHIP

FINAL WILDFIRE DATABASE REPORT

A GUIDE TO THE METHODOLOGY USED IN CREATION OF THE WILDFIRE DATABASE AND AN ANALYSIS OF TRENDS ASSOCIATED WITH KEY VARIABLES

MoorLIFE 2020

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Executive Summary

Wildfires pose a significant risk to active blanket bog habitats; there is however limited evidence investigating the numbers and severity of wildfires on this type of habitat. As part of the MoorLIFE 2020 Project, Moors for the Future Partnership is aiming to monitor the number and severity of wildfire incidents. One way this will be achieved is through the creation of a single wildfire database, for the whole of the South Pennine Moors Special Area of Conservation, covering as many years as possible.

The database was constructed by requesting all records held by the Fire and Rescue Services and other relevant organisations, e.g. National Trust, situated within the South Pennine Moors Special Area of Conservation. Each organisation provided data in a different format and in different levels of detail; this is because the data collected is down to the individuals attending the scene. The Fire and Rescue Services introduced a standard database in 2007/2008, but due to difficulties in collecting the data and not all fields being mandatory there are still a large number of incomplete records.

Another problem experienced during data collection is that most Fire and Rescue Services only have data going back to the inception of the standard database, meaning that there is a maximum of 14 years of data. Some organisations, e.g. the Peak District National Park Authority, have records going back further but this is rare; therefore, due to this issue the analysis only covers the period from 2007 to 2021.

Analysis of the data identified that the highest numbers of wildfires occur in the spring months (March to May); wildfires however did occur in 11 out of 12 months suggesting that wildfires occur throughout the year. The total number of wildfires varied considerably per year, with 2010 having the most wildfires (64 incidents) and 2007 and 2008 having the least (11 incidents each). Overall, there has been a slight upward trend in the number of wildfires since 2007.

Due to the limitations associated with the data set, e.g. not all variables are completed for all records, it is difficult to draw clear conclusions on the reason why wildfires occur. Of those known, the primary cause is candles and matches and exposure to naked flame, with most wildfires appearing to be started deliberately; however, this could be due to the way the fire services class accidental and deliberate fires rather than specific arson cases. It is also difficult to identify the damage caused by wildfires as most of the information is either missing or estimated.

From 2020 the wildfire log, also developed as part of MoorLIFE 2020, replaces the wildfire database. The new system is designed to tackle some of the limitations identified from the data, such as allowing multiple users to input data on a single fire. For more information relating to the wildfire log, please see the following presentation – https://my.demio.com/recording/c2pFs62J which explains how the wildfire log works and all the limitations associated with the data in more detail.

1. Introduction

As part of the MoorLIFE 2020 (ML2020) project, action D4, Moors for the Future Partnership (MFFP) will monitor the reduction in threats to active blanket bog (ABB) within the South Pennine Moors (SPM) Special Area of Conservation (SAC), see map in appendix 1. The focus of action D4 is to evidence a reduction in the number and severity of wildfire incidents within the SPM SAC. Wildfire is the focus of this action because it represents a significant risk to the habitat, especially in drier periods *(Davies et al, 2016).*

To achieve the aims of action D4, MFFP has compiled an up-to-date database of wildfire incidents across the SPM SAC. The database has been created to aid in the monitoring and evidencing of a reduction in the number and severity of wildfire incidents within the project area. It covers a 45-year period from 1 January 1976 to 31 December 2021. Data was compiled from a number of sources including the Peak District National Park Authority's (PDNPA) own fire-reporting register. This covers the whole time-period of the Fire and Rescue Service's (FRS) incident reporting system (IRS), which is utilised by all FRS from around 2008 onwards, except West Yorkshire FRS which started using the system in 2007 *(Walker et al, 2009)*. The aim of the IRS is to provide a standard "minimum" reporting form and protocol that can be extended by FRS *(Walker et al, 2009*). This difference in reporting practices has left a disparity in the spatial distribution of the available data, as prior to the introduction of the IRS only data from the PDNPA fire reporting register is available, as the SPM did not have their own method of reporting wildfires during this period. Since 2008 we have data covering the whole of the SPM SAC as collected by all FRS.

The database focuses only on wildfires, which are defined as "a fire that is burning strongly and out of control on an area of grass or bushes in the countryside" *(Cambridge University, 2017)* and excludes managed burns. Using this definition allows all fires on moorlands to be captured, allowing us to identify potential problem locations as well as potential management options. The FRS definition, see below, was not used because it means that small fires can be missed and therefore management could be targeted in the wrong locations.

One of the following criteria must be met for the FRS to class an incident as a wildfire:

- Involves a geographical area of >1 hectare.
- Has a sustained flame length of >1.5 metres.
- Requires a committed resource of ≥ 4 FRS appliances.
- Requires resources to be committed for ≥ 6 hours.
- Presents a serious threat to life, environment, property and infrastructure.

(Scottish government, 2013)

This report provides an overview of the methodology used to create the database and the trends identified from analysing the dataset, which can be found in the wildfire log. The wildfire log will be used to record wildfires after ML2020 is completed. This tool was developed as part of action E7 associated with the ML2020 project.

2. Methodology

When collecting data the relevant organisations (see Table 1) were contacted by email during January and February of the following year, e.g. in January 2018 all organisations were contacted and asked to provide data from 1 January 2017 to 31 December 2020. Organisations were asked to provide all information relating to all records on wildfire incidents within the SPM SAC for the past year. A map was provided to all organisations; see appendix 1, defining the boundary of the SPM SAC to ensure that data was provided for the correct area and to avoid missing any small wildfires due to the definition used by the FRS. Table 1 summarises the outcome of this data gathering exercise. From 2020 onwards the information was obtained from the wildfire Log and the Home Office. Which supplied data for all fire and rescue services in the study area.

Table 1 – Outcome of organisations asked to provide wildfire incident data

Organisation	Data Provided						Notes
	2016	2017	2018	2019	2020	2021	
Peak District National Park Authority (PDNPA)	✔	✔	✔	✔	✔	✔	
South Pennine Moors Fire Operation Group	X	X	X	X	X	X	The organisation does not hold wildfire data
Cheshire FRS	X	X	X	X	X	X	The organisation does not cover the SPM SAC
Derbyshire FRS	✔	✔	✔	✔	✔	✔	
Greater Manchester FRS	✔	✔	✔	✔	✔	✔	
Lancashire FRS	✔	X	X	X	X	X	The organisation does not cover the SPM SAC
North Yorkshire FRS	X	X	X	X	X	X	No data provided
Land owners	X	X	X	X	X	✔	Individual land owners were asked to provide data through the FOG groups, but no data was forthcoming. In 2021 some landowners had access to the wildfire log which they could add data too
South Yorkshire FRS	✔	✔	✔	✔	✔	✔	No fires occurred within the SPM SAC boundary in 2017
Staffordshire FRS	X	X	X	X	X	X	The organisation does not cover the SPM SAC
West Yorkshire FRS	✔	✔	✔	✔	✔	✔	
Natural England	✔	✔	X	X	X	X	NE stopped holding records of wildfires in 2017
National Trust	✔	X	✔	✔	✔	✔	Both the High Peak Team and Marsden Teams were contacted
United Utilities (UU)	✔	✔	✔	✔	✔	✔	UU send their data to PDNPA, therefore included within the PDNPA data set

3. Key Trends

In total the wildfire database contains 3,530 individual wildfire records, the earliest dating from 28/06/1976. The database covers 113 different variables; complete data sets however are not available for all variables. Table 2 identifies the numbers of missing data for some of the key variables.

Table 2 - Incidents of missing data

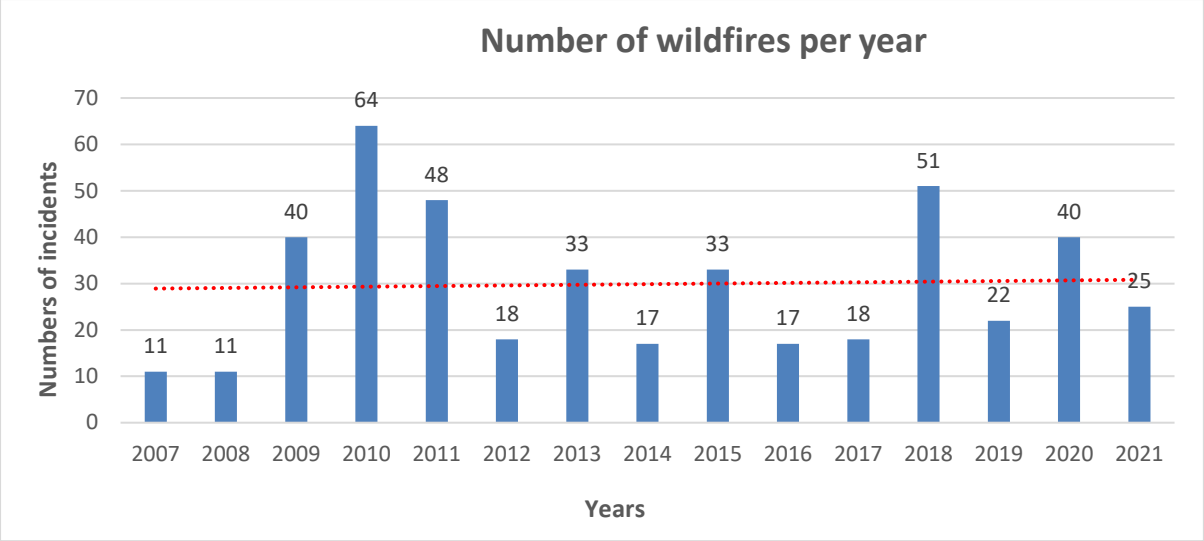
Data	Variable not recorded between 1976 - 2006	Variable not recorded between 2007 - 2021	Total number of variables not recorded
Coordinates of where wildfire occurred	0	16	16
Date	0	34	34
Area m^2 (Actual)	124	309	433
Est. Area m^2	262	280	542
Cause of ignition (e.g. Deliberate/ Accidental)	261	178	439
Caused by (e.g. BBQ)	32	339	371
Source of ignition (e.g. Primary, secondary)	262	191	453
Age group responsible	231	418	649
Victims involved	262	331	593
Total Records	**1434**	**2096**	**3530**

Although the IRS aims to standardise the information recorded, the amount of data differs for each record and by organisation, this is because it is still dependant on what information was recorded by the individuals attending the incident.

Data from 2007 – present represented a more complete data set with all areas of the SPM SAC and data sets from multiple organisations included; it was concluded that further analysis within this report would be restricted to these timescales.

3.1 Time period when wildfires occur

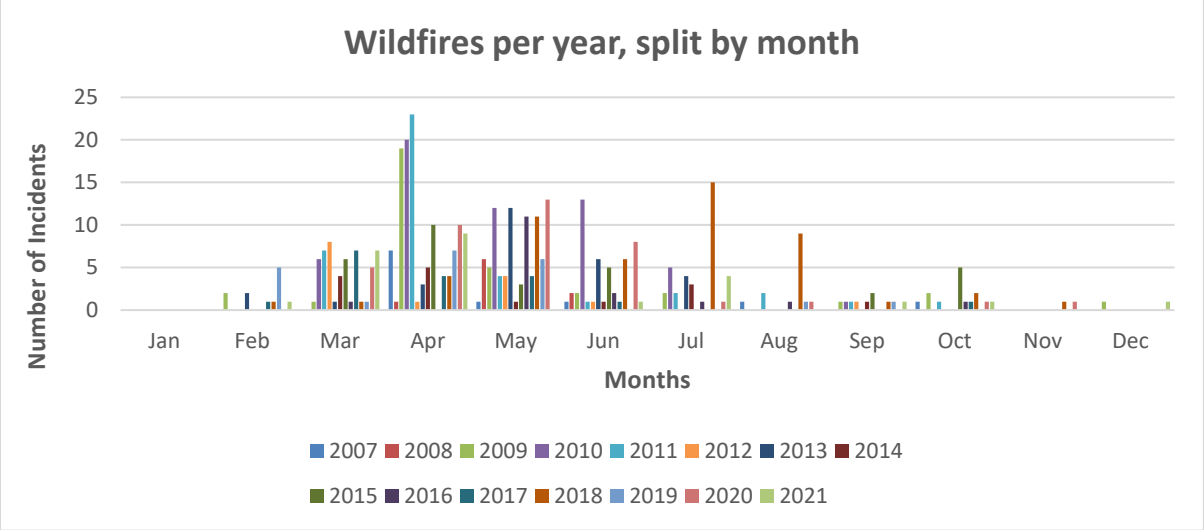
Graph 1 below identifies that most wildfire incidents occurred in 2010 with 64 separate incidents. The least amount of wildfire incidents occurred in 2007 and 2008 with just 11 occurrences each, closely followed by 2014 and 2016 each with 17 incidents. The overall trend shows a very slight increase in the number of wildfires. The number of occurrences however varies widely per annum making it difficult to identify any clear conclusions, and therefore what impact our conservation work is having on wildfire occurrences. This variability per annum is due to the number of variables associated with wildfire ignition, e.g. weather (*McMorrow and Lindley, 2006*).



Graph 1 – Total wildfire incidents per year since 2007

Breaking this data down by month, see Graph 2, identified that April is consistently the peak month when wildfires occur, with May and March having the second and third consistently highest occurrence of wildfires respectively, suggesting that spring is regularly when most wildfires occur throughout the year.

Wildfires are however reported in 11 out of the 12 months suggesting that wildfires can occur at any time of the year.

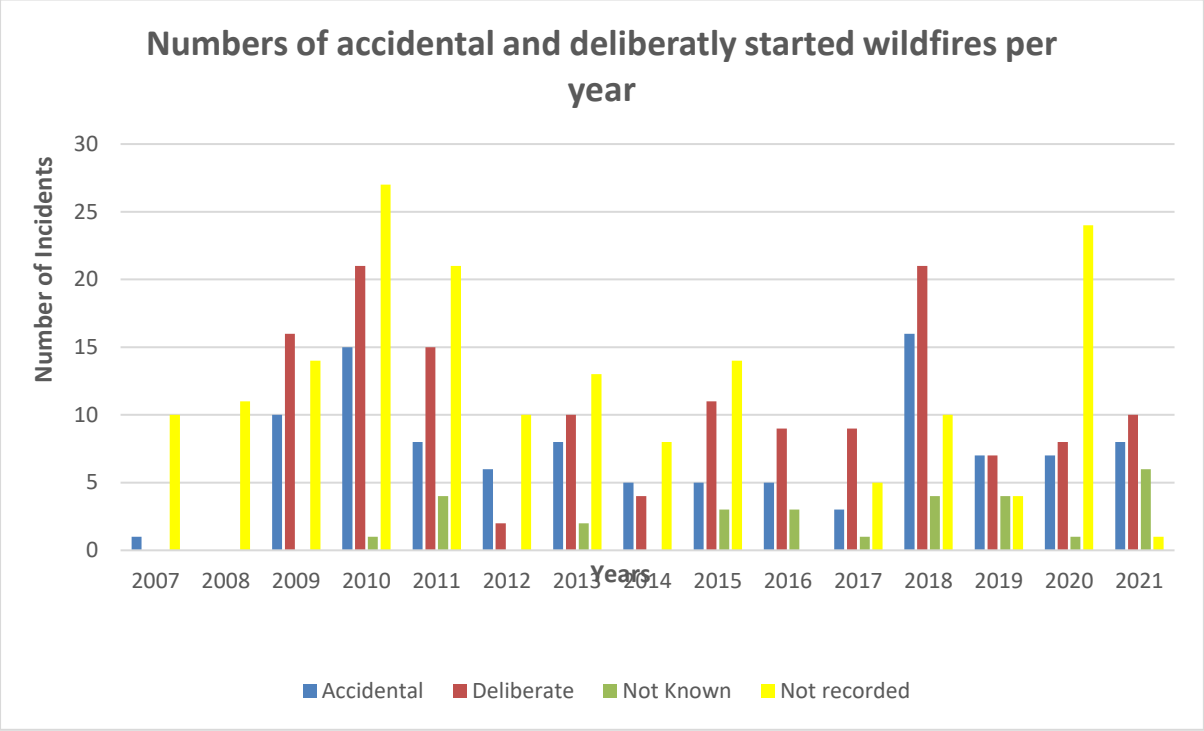


Graph 2 – Wildfire incidents by month since 2007

3.2. The reasons behind wildfire ignition

Of the 448 wildfire incidents that occurred between 2007 and 2021, the cause (accidental or deliberate) was recorded for 276 of these incidents. Of these 276 wildfire incidents, 104 were recorded as being started accidentally, and 143 as being started deliberately, and 29 as unknown, see Graph 3 below. This overall picture is represented per annum with deliberately started wildfires being consistently higher than accidently started wildfires. Due to the high

number of missing records for this variable, it is difficult to say with any certainty if this represents an accurate picture of wildfire ignition. For example, there may be a bias towards completing this field for deliberate wildfires because the cause may be more obvious or it may be thought to be more important to record.



Graph 3 – Motives behind wildfire incidents

In-depth analysis of this data identifies that in at least one incident, Derbyshire FRS classed a wildfire beginning by smoking/ smoking-related materials as a deliberate wildfire, which does not comply with the description of a deliberate wildfire defined by the FRS:

> *"Deliberate fires on the moors would be someone deliberately setting fire to the moors with matches etc." (A Taylor personal communication, 15 May 2017)*

Table 3 below identifies that there are a variety of reasons why wildfires start; the most common occurrence is exposure to naked flame with 14 incidents. This is closely followed by matches and candles (13 instances). For most wildfires the ignition cause is not recorded.

Table 3 – Causes of wildfires

Cause	Total all years
Naked Flame	14
Smoking material	9
Campfire	13
Matches and candles – Matches	5
Arson	4
Cooking	5
MOD Flares	3
Contractor fire out of control	1
Natural occurrence – Natural occurrence	1
Vehicles only – Engine, fuel line or pump	1
Not Known	54
Unrecorded	338
Grand Total	448

It is also impossible to determine which age group causes the most wildfires, because in 94% of incidents no data was recorded. Of the remaining incidents, 5% (11 incidents) are from Adults (18–64) with 1% (2 incidents) classified as other (see Table 4).

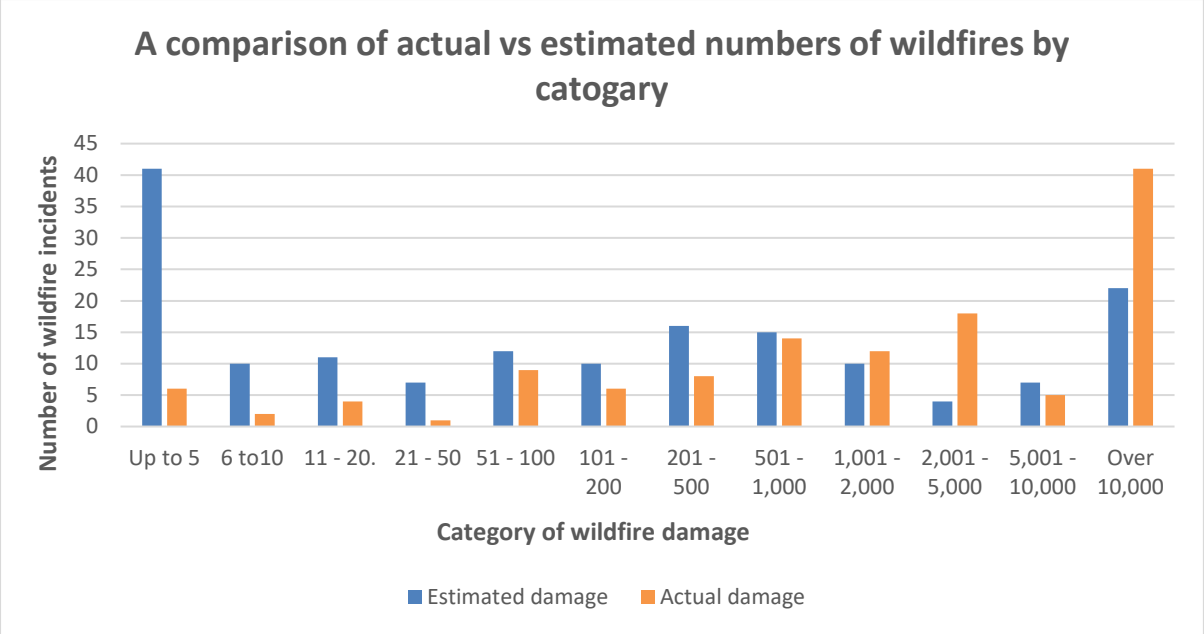
Table 4 – Age group responsible for causing wildfire incidents

Variability	Total all years
Adult (18–64)	11
Other	2
Not known	17
Not recorded	418
Grand Total	448

3.3. Damage caused by wildfires

The damage caused by wildfire is equally difficult to determine, as only 139 incidents of all wildfires since 2007 have accurate burn scar perimeters. A further 168 incidents have an estimated burn scar perimeter, with 11 incidents having both an actual and estimated burn scar perimeter. For those incidents where data was recorded it is possible to determine that 951,355m^2 was burnt since 2007, of which 594,280m^2 is actual burned area recorded and 357,075m^2 is estimated damage.

Examination of those fires with an estimated burn scar area indicates that larger wildfires occur less frequently, with 41 wildfire incidents being 5m^2 or less, and only 22 incidents over 10,000m^2. However the reverse is true for actual burn scar areas with 6 incidents under 5m^2 and 41 incidents over 10,000m^2 (see Graph 4 below). This maybe because it is seen to be more important to map large burn scars.



Graph 4 – Estimated and actual wildfire damage (m^2)

There have been two recorded instances of deaths caused from wildfire, one in 2009 and a further one in 2015. The extent of the burn scar at which these deaths occurred varied, with the death in 2009 occurring in a wildfire of 501 – 1000m^2, whereas the death in 2015 occurred in a large fire of 10,000m^2.

5. Conclusion

Wildfires pose a significant threat to ABB within the SPM SAC. MFFP as part of the MoorLIFE 2020 project has collated all the data held on wildfires by a variety of organisations, including the fire and rescue services and large landowners including the National Trust. This has allowed records from as early as 1976 to be included within the database for some areas, whereas in some areas the record does not begin until 2007 as the resources were not available to collect the data prior to this.

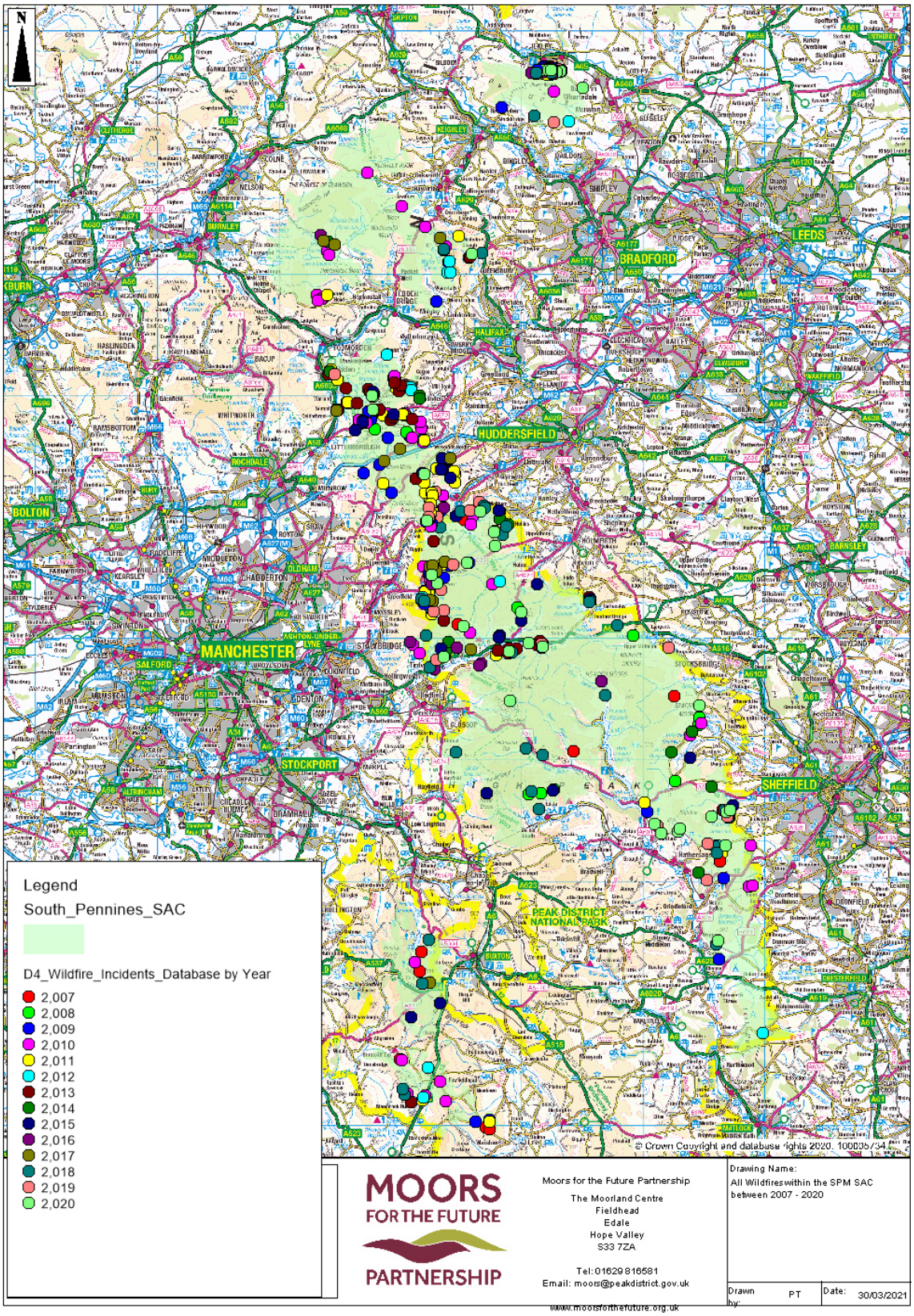
There are a number of limitations associated with this data set, including not all variables are completed for each record, limiting the ability to draw an accurate conclusion from the data. This is in part due to the individuals who collect the data at the incident. As part of this project these limitations have been raised at both the South Pennine and Peak District National Park FOG groups in order to reduce their impact going forward.

Using the available data it is possible to see that the number of wildfires varies per year, making it difficult to determine what impact our conservation works has on reducing numbers and severity of wildfires, especially with the overall trend from 2007 showing a slight increase in wildfire numbers.

Moving forward MFFP have developed an online recording tool to continue recording wildfires beyond the project. The wildfire log is designed to assist in reducing some of the limitations associated with the above data set, including combining data from multiple sources for a single wildfire to reduce the amount of missing data.

4. Appendices

Appendix 1 – Map of wildfires within the SAC by year from 2007 to present



Appendix 2 – Variables removed from the master database and the reasons why

Organisation	Data removed	Notes
PDNPA	Only Sin SMD MM	Removed because there was no data in the table and nobody knew what this related too.
Derbyshire FRS	Incident type (fire)	Not relevant as the database only includes incidents relating to fire
Greater Manchester FRS (2015–2016)	Incident type (fire)	Not relevant as the database only includes incidents relating to fire
	Revised address	Not included as there is no difference between this and the address which is already included
	Ward	Not included as we have categories including address, borough etc
Greater Manchester FRS (2008–2014)	Calendarid	Not relevant as the database only includes incidents relating to wildfire
	Incident category (fire)	Not relevant as the database only includes incidents relating to fire
	Property category	Not relevant as the database only includes outdoor incidents
	Property type	Not relevant as the database only includes outdoor incidents
	Property class	Not included as the same information is included within the sub property field, and in greater detail.
	Incident over the border	
West Yorkshire FRS	Over the boarder incident	
	Time of stop message	Time incident closed used instead of time the call finished
	Incident Category (fire)	Not relevant as the database only includes incidents of fire
	All party involved derelict	
	Chimney fire	Not relevant to moorland fires
	Type of attack	No data included in WY FRS report
	Serious injury to fire personnel	No data included in WY FRS report
	Slight injuries to fire personnel	No data included in WY FRS report
	How discovered (other)	No data included in WY FRS report
	Covered by RRO 2005	Not relevant to moorland fires
	Means of escape	No data included in WY FRS report
	Means of escape (Other)	No data included in WY FRS report
	Compartmentation	No data included in WY FRS report
	Alarm system present	Not relevant to moorland fires
	Occupied at time of fire	Not relevant to moorland fires
	Normally occupied	Not relevant to moorland fires
	Main action non FRS (Other)	Covered by main action non RFS which is included in database
	Main action FRS (Other)	Covered by main action non-RFS, which is included in database
	Manual systems used	

	Building facilities	Not relevant to moorland fires
	Active safety system	Not relevant to moorland fires
	Cause of fire (Other)	Covered by cause of fire, which is included in database
	Make and model	Not relevant to moorland fires
	Caused by (Other)	Covered by cause of fire, which is included in database
	Source of ignition (Other)	Covered by source of ignition, which is included in database
	Ignition powered by (Other)	Covered by ignition powered by, which is included in database
	First item ignited (Other)	Covered by first item ignited, which is included in database
	Item responsible (Other)	Covered by item responsible, which is included in database
	Rapid fire growth (Other)	Covered by rapid fire growth, which is included in database
	Explosion	Not relevant to moorland fires
	Explosion dangerous substance	Not relevant to moorland fires
	Explosion occurred when	Not relevant to moorland fires
	Containers involved	No data included in WY FRS report
	Containers involved (Other)	No data included in WY FRS report
	Fire start location (Other)	Covered by fire start location, which is included in database
	Household occupancy	Not relevant to moorland fires
	Household occupancy (Other)	Not relevant to moorland fires
	Human factors (Other)	Covered by human factors, which is included in database
	Spec construction	No data included in WY FRS report
	Spec construction (Other)	No data included in WY FRS report
	Heat and smoke damage	No data included in WY FRS report
	Fire size on arrival	No data included in WY FRS report
	Adjacent property dist	Not relevant to moorland fires
	Fire and heat at stop	No data included in WY FRS report
	Adjacent property at stop	No data included in WY FRS report
	Fire damage at stop	Covered by estimated and actual damaged, which is included in database
	Total damage at stop	No data included in WY FRS report
	Size of room of origin	Not relevant to moorland fires
	Size of floor of origin	Not relevant to moorland fires
	Floors/decks above	Not relevant to moorland fires
	Floors/decks below	Not relevant to moorland fires
	Floor (deck) of origin	Not relevant to moorland fires
	Vehicle registration	Not relevant to moorland fires
	Vehicle identification	Not relevant to moorland fires
	Vehicle missing	Not relevant to moorland fires
	Vehicle abandoned	Not relevant to moorland fires
	Evacuated without assist	No data included in WY FRS report
	Evacuated with assist	No data included in WY FRS report

	FRS assisted in evacuation	Not relevant to moorland fires
	Reason for delay in evacuation	No data included in WY FRS report
	Estimated evacuation completion time	No data included in WY FRS report
	Last_User	Meta data associated with the database therefore not relevant
	inc_schema_version	Meta data associated with the database therefore not relevant
	inc_validation_status	Meta data associated with the database therefore not relevant
	inc_frs_id	Meta data associated with the database therefore not relevant
	inc_incident_status	Meta data associated with the database therefore not relevant
	inc_date_created	Meta data associated with the database therefore not relevant
	inc_created_by	Meta data associated with the database therefore not relevant
	inc_date_updated	Meta data associated with the database therefore not relevant
	inc_mobilise_type_priority	Meta data associated with the database therefore not relevant
	inc_location_additional_desc	Meta data associated with the database therefore not relevant
	ins_description	Meta data associated with the database therefore not relevant
	inc_version	Meta data associated with the database therefore not relevant
	inc_validation_error_count	Meta data associated with the database therefore not relevant
	inc_generic_incident_type	Meta data associated with the database therefore not relevant
	inc_sent_status	Meta data associated with the database therefore not relevant
	inc_can_data_audit	Meta data associated with the database therefore not relevant
	inc_can_audit	Meta data associated with the database therefore not relevant
	inc_station_ground	Meta data associated with the database therefore not relevant
	inc_property_category	Meta data associated with the database therefore not relevant
	inc_is_primary_fire	Meta data associated with the database therefore not relevant
South Yorkshire FRS	None	
Natural England	None	

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Life

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NATURA 2000