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**ADVICE AND RECOMMENDATION TO:**

**NATURAL ENGLAND WILDFIRE EVIDENCE REVIEW**

**NOVEMBER 2016**

***Information that will improve understanding of wildfires and our ability to prevent them.***

**SUMMARY.**

The Moorland Association (MA) has answered the eight questions posed by Natural England for this evidence review and provided five case studies to illustrate what worked and what did not in mitigating wildfire damage. The MA has drawn 12 observations and conclusions to help the future protection of our precious dry heath and blanket bog from the projected increased threat from wildlife. This threat is now recognised as an urgent climate change risk to natural capital by the Committee for Climate Change Adaption sub-Committee [https://www.theccc.org.uk/wp-content/uploads/2016/07/UK-CCRA-2017-Synthesis-Report-Committee-on-Climate-Change.pdf page 5](https://www.theccc.org.uk/wp-content/uploads/2016/07/UK-CCRA-2017-Synthesis-Report-Committee-on-Climate-Change.pdf%20page%205)**.**

**12 MOORLAND ASSOCATION CONCLUSIONS AND RECOMMENDATIONS FROM EVIDENCE**

* **We seek acceptance by the relevant Authorities that wildfire in this country is always caused by human intervention and that high fuel loads on areas of heath and peatland with no vegetation management exacerbate its spread.**  The hugely negative financial and ecological impacts of severe wildfire mean that a range of preventative measures and changes to some current systems and policies has to be actively considered as set out below.

* **Acknowledge that vegetation management through strategic burning and/or cutting with brash removal creates important firebreaks and reduces the overall fuel load on moorland areas.**  Some of the ‘no burn’ regimes in places where resulting high fuel loads alongside reduced grazing stocking levels, are the very areas where the worst and most severe wildfires have occurred.
* **All interested parties to work together to identify where additional wildfire mitigation burning could be beneficial for all parties and the local ecology.** The addition of burning for wildfire mitigation to Countryside Stewardship and upland management plans is to be welcomed. No-burn areas should be re-assessed with wildfire mitigation running alongside other outcomes agreed for the moors; water, biodiversity, carbon, grazing and grouse. (One example is the current conservation perspective that burning in gullies could be damaging and potentially increase erosion leading to water quality, carbon storage and biodiversity issues. However, high fuel loads in narrow channels creates potential pathways for fires to spread over a large area. These areas are often the ones used by campers and picnickers so are at an even more risk of fire starting.)
* **Accept that even a large area of blanket bog will not necessarily act as a firebreak.** Clearly damper areas of upland created by re-wetting schemes will be helpful in future fire prevention in some areas. But in some hot dry conditions where there are high levels of fuel load this makes little difference. When conditions are very dry, the mosses on top of blanket bog are readily combustible.
* **All parties to work together to identify shortfalls in local water source provision and take remedial action suitable for local conditions.** This could be to improve or increase natural pools, ponds and other water features or provide strategic tanks, for example and build these into relevant agri-environment schemes going forward.
* **The Moorland Association recommends that the MORECS threshold for ‘Exceptional’ is reduced to a level lower than the current DSR limit of 6.39 and that new evaluation is put in place to review changes to the DSR limits for both ‘High’ and ‘Exceptional’ categories.**

* **The system should allow for flexibility so that decision making about closures and public information can be carried out by LOCAL Fire Operations Groups, Park Authorities and public and private landowners and farmers.** This is because so many wildfires occur in periods and conditions, currently classified as ‘low risk’ and there are huge variations in climactic conditions that can occur even at a very local level.
* **High fire risk should favour prompt local access land closures, strong warning signage and progressive information campaigns.** Resources for this should be tied into the Treasury as preventative action on wildfire represents excellent value for public money and protects public goods – especially compared to the costs of fire-fighting and post fire regeneration.
* **Progressive information campaigns should raise awareness of fire risk among members of the public as it rises and have a media plan that uses all communication channels for quick dissemination.**  A template key messages document has already been successfully implemented through the England and Wales Wildfire Forum for local Fire Operations Group media leads. It is explicit about visitor behaviour do’s and don’ts drawing from the Countryside Code. There could be a powerful logo and use of yellow colour for ‘high’ fire risk and bright orange for exceptional which then could be used with local discretion. New Zealand and the USA use a coloured ‘dial’ signage system to denote local fire risk. Talks with the Met Office about adding these symbols to weather maps/reports should be revisited.
* **6 wheel 4x4’s such as Polaris and Argos fitted with water tanks and pressure sprayers (foggers) are the most useful tools for locals to assist the FRS in fighting upland fires.** These cost in the region of £20,000 each and have a high running cost. Under Environmental Stewardship Agreements, it was possible for some funding to be put towards these expenses, but this is no longer the case. Any equipment recommended as locally necessary or very useful by the FRS should be considered eligible for funding.
* **A greater use of CCTV in public car parks and access points (perhaps installed alongside more information/warning boards where needed) could be advisable.**  Local fire groups could work with the police to identify these ‘hot spots’ which could also be useful to them in monitoring drug dealing in remote places, which is becoming a very real problem in rural areas.
* **Access issues for vehicles and firefighting equipment should be reviewed by local Fire Operations Groups on an annual basis and necessary actions taken.** The Oaken Bank case study clearly illustrates what can happen if key paths go unmaintained and allowed to fall into disrepair.

**Natural England Questions**

1. **What factors contribute to the severity of wildfire?**

Fire severity is measured by its impact on the upland environment but, as well as the acreage of flora and fauna adversely affected, it is also important to take into account the intensity of the fire and its subsequent impact on underlying heathland and peatland soil health. Long term damage will be exponentially greater the deeper and hotter the fire has burnt into the dormant seed layer and below the surface. Prolonged periods of dry weather and high winds, resulting in reduction of the water content of the soil and vegetation are factors in a fire starting, but these atmospheric conditions have more damaging impacts on its severity and intensity. In the 70’s, uncontrolled wildfires that burned for days and weeks effectively turned many valuable and vibrant upland habitats into ‘moonscapes’.

The quantity of the ‘fuel’ or biomass available on the surface for the fire to feed on is the main key factor. Doubling one quantity of biomass on the ground quadruples the intensity of the fire and therefore its severity, and burning an entire acre of fuel at once increases the intensity and flame length as it takes hold. The moisture content of both the soil and the biomass has an impact, so the largest number of, and most severe, fires generally take place in hot, dry and windy conditions.

As a recent example, the vast majority of last spring’s (2016) spate of upland wildfires started on land not managed for grouse shooting. On grouse moors, a historic combination of careful rotational burning and mowing in strategic areas had the effect of reducing the overall fuel load and creating effective firebreaks. A firebreak is any feature that reduces the fuel load for a fire to feed off – be it a track, stream, wall, mown strip or multiple burnt patches across a landscape. There have been widespread wildfire outbreaks in the past 15 years, the worst taking place in 2003, 2011, 2013 and 2016 and the Defra-led Best Practice Burning Group produced a Guidance Note on ‘How to mitigate and adapt to wildfire risk by managing fuel loads and making habitats more resilient to wildfires’. This is with England and Wales Wildfire Forum for approval and adoption.

Intense fires that burn in unbroken and/or fast growing unmanaged vegetation are extremely difficult to contain or extinguish. The principal tool used by the Fire and Rescue Service (FRS) to extinguish fire is water, but on heath and peat landscapes water supplies can be scarce. This is a real issue in times of drought when there is a greater risk of fire and less water to combat it. It can take too long and is logistically difficult and expensive to bring enough water needed to the scene of a fire - whether by tender or to create pumping relays in topographically challenging areas.

Helicopter water drops have their own issues of helicopter availability and cost and, in some cases, intense water dumps can have the effect of creating localised wind increases that actually spread the edge of the fire to other areas whether from rotor downdraft or the result of large quantities of water hitting the land at top speed. Without an ample supply of local water, fire-fighting tactics can be limited to attacking the less intense part of the fire and back burning to run the fire into a fire break. The topography, nature of and access to upland areas often prevents conventional fire fighting vehicles from reaching the fire front even when water is available.

1. **What are the main factors that contribute to the risk of wildfire?**

Weather conditions, available ‘fuel’ (as Q1) added to human activity (see Q3).

1. **What are the causes of ignition of wildfires?**

In 99.9% of cases, ignition sources are the direct result of human activity rather than any natural phenomena. These are typically:

* Thoughtless discarding of cigarette ends or use of portable barbeques
* Deliberate arson. Regrettably, these instances seem to be on the increase
* Sparks flying out of steam engines or poorly serviced vehicles
* Carelessly discarded glass/bottles, which then magnify the heat of the sun and start a fire. This is exacerbated if other flammable discarded rubbish is in the vicinity
* Prescribed moor burning by moorland managers getting out of control. This is increasingly rare (see Q.8) as many new and improved techniques, fire fogging equipment, training, technology, controls and communication methods are now in place.

It is the case that wildfire ignition most commonly takes place in, or adjacent to, areas where human usage is high, such as tarmac roads, car parks and public access points. ‘Knowledge for Wildfire’ by Julia McMorrow of Manchester University, for instance, studying fires of all sizes recorded by Lancashire FRS in spring 2011 found that most occurred within 200m of a minor road. <http://www.ruraldevelopment.org.uk/wp-content/uploads/2013/11/McMorrow-J.-Knowledge-for-Wildfire-Project.pdf>.

1. **What are the most efficient prevention methods for wildfires?**

As the principal cause of wildfire is human, the logical action for prevention is to remove human influence at times of high fire risk. Closing access to moorland and other vulnerable heath and peatland areas in prolonged hot and dry conditions when the moisture content has fallen is the most complete approach. This, however, currently requires an agreed severity risk level to trigger closure and a coordinated and effective communications system to alert would-be and actual visitors. An alternative approach is to ensure that every single visitor is wildfire aware and does not behave in a way that is a fire-starting risk.

The second is probably unrealistic due to resources and human nature, and the first perceived to be problematic and going against the spirit of open access. Every moor is different, and each will have its own microclimatic conditions in times of fire risk, so it is suggested (see later) that a much greater degree of local and sensible flexibility is introduced into the current system.

Land management action is the most reliable wildfire mitigation currently available. Currently, reducing the overall biomass with controlled burning to break patches into smaller areas will check the spread of wildfire once started, as can increasing the moisture content of both vegetation and soils. The latter is gradually being achieved on large tracts of moorland, where many managers are mapping and then blocking historic drains or ‘grips’ to re-wet key areas both for ecological improvements (recreation of blanket bog vegetation, hydrology and increasing biodiversity) and long term wildfire prevention through naturally reduced fuel load as dwarf shrub vegetation growth slows.

These mitigation outcomes will not be seen overnight, are not suitable for all areas and, as can be seen from the case studies below upland wildfires, especially in strong dry (often easterly) wind conditions, will easily jump boggy areas and just keep on going.

Countries such as Spain, France, Portugal, Germany, USA, Australia and Canada have all recognised that fuel reduction programmes, including strategic burning, are a key tool in managing wildfire risk and protecting the landscape from the severe damage caused by uncontrolled vegetation fires. This is especially the case where economic agriculture has been lost and, with it, vegetation management through controlled burning and grazing.

The Spanish Government spends £3 billion a year on strategic burning in rural areas for this reason and Barcelona will be the venue for a major international conference on the subject in January 2017. The Fire and Rescue Service in the UK will be sending representatives to this event to find out more. It is suggested by FRS that a small delegation from interested organisations in this country – particularly the Environment Agency and Natural England - also attend to compare experiences and hear about best practice on an international level.

FRS are also aware of the impact of climate change going forward and advocate the use of prescribed fire as a suppression technique, successfully used in the past to prevent the spread of high intensity fires across the landscape.

The current legal heather burning dates are 1st October – 15th April in the uplands, generally outside the summer period when wildfires are most common and this action helps with the creation of firebreaks and reducing overall fuel load. Consent to burn and cut out of season can be issued by Natural England and as wildfire risk increases, as identified by the Committee on Climate Change Adaptation Committee, more flexible and swift use of these powers may become essential.

Another prevention method is managing ignition sources where possible. This includes removing litter and flammable vegetation in or near areas known to be particularly vulnerable such as car parks, access routes - particularly tarmac roads - and public access points. The prompt removal of fly-tipping – especially large dumps of flammable material such as car tyres or mattresses - is increasingly being carried out by farmers, landowners and estate staff at their own expense due to increasing pressure on local authority resources. Thousands of bags of litter are picked by moorland gamekeepers each year.

Well thought out public awareness campaigns that can be triggered quickly and effectively, particularly at times of high fire risk, are key, but they must start earlier and continue to have an impact should the risk continue to rise. All traditional communication methods have a role to play, but much more could be done to integrate the many social media tools now available for awareness campaigns.

While it will not prevent major fires, effective inter-agency communications/action plans and vigilance by all concerned parties can be instrumental in stopping a small burn turning into a wildfire (see Q 8). Similarly, practical on-the-ground initiatives by stakeholders such as providing or improving access tracks for fire engines or specialised 4x4 vehicles and estates gearing up with ‘ fire-foggers’ (water tanks + specialist pressure sprayers mounted on ATVs), widening gateways to improve access for emergency vehicles, creating better turning or passing places and creating fords or bridges over streams where necessary are all sensible initiatives where applied strategically, and in consultation with FRS through Fire Action Plans.

Each Moorland Association member estate is very actively encouraged to put in place a wildfire plan with their local FRS and there are well established and effective Fire Operations Groups in each moorland region where there are driven grouse shooting interests. Gamekeepers and estates provide specialist (and often expensive) firefighting equipment, controlled burning skill, local knowledge and the ability to quickly implement changes to address access issues for firefighting.

1. **What are the characteristics of effective firebreaks?**

In any upland area, there will always be effective potential firebreaks in existence – typically roads, paths (particularly bridleways and 4 x 4 designated routes that tend to be wider), rivers, lakes and reservoirs and any open grazed areas with no dry vegetation. The width or area of these will determine their effectiveness. This can be enhanced by strategic burning to create adjacent areas with a low fuel load to further minimise the effect of flame length and a fire jumping to a new area.

Cutting or mowing heather is another important tool for creating fire breaks, but only if the resulting brash is removed. If this is left it simply dies, dries out and the same (or more flammable) biomass is left to fuel the flames, arguably assisting the fire. The Moorland Association recommends that areas cut for fire management purposes should be at least 10 metres wide in normal circumstances. If it is next to a high fire risk area (such as adjacent to a popular tarmac road), next to a habitat that has a lot of biomass and of greater biodiversity value to protect such as woodland or there is a threat to human habitation and life it should be up to 30 metres in width. However, cutting is not always possible to achieve safely in a steep remote area, and in some instances causes unacceptably damaging impacts on soil, vegetation or archaeology, so most moorland managers use a combination of burning and mowing techniques to create effective firebreaks.

The width of firebreaks should be 2.5 times the expected flame length which is a product of how much biomass there is. For instance, mature gorse beds can generate very long flames and there are often areas which have a high density of molinia leaves which turn into windblown burning embers in wildfire situations and in these cases, again, firebreak width will need to be increased.

The creation of ‘green corridors’ is being explored by a number of Moorland Association members who have had experience of wildfires. This involves changing the vegetation where compatible with habitat designations on a c. 30 metre-wide fire management area next to critical parts of the landscape or places of particular vulnerability. These are created by burning or cutting areas and then adding lime to the acidic soil, encouraging less woody biomass as sweeter short grass can grow which is attractive for more intensive grazing. The short grass is also good for foraging waders and the increased pH gives rise to more invertebrates.

There are some barriers and disincentives associated with this. The change in vegetation type may not be seen as ecologically or visually desirable in designated sites and will need consent from authorities, and the lime needs to be re-applied every few years as it depletes quite quickly in peat soils. If close to access points or areas of high public usage, these grazed green corridors may be attractive to picnickers and therefore have the potential to actually raise the fire starting risk. An open mind to this approach, even on designated habitats, may be needed in the future as a trade-off for greater over all designated site protection.

1. **What are the mechanisms for reducing the negative impacts of wildfires?**

As previously posited, these can be summarised as vegetation (fuel load) and soil management, litter management, general public education and specific wildfire risk awareness raising campaigns that are all locally relevant and sensitive to weather conditions, ecology, topography and human pressures.

There are also a number of remedial actions that can reduce the residual negative impact on areas ravaged by wildfire – or put another way, post fire techniques to speed up restoration. These include re-seeding with heather, re-wetting and planting key bog-loving species whilst excluding grazing. However, any of these initiatives are very expensive, whoever funds them, and it will take many years (if ever) before a severely affected area can be returned to a favourable biodiversity and hydrological situation.

Following severe moorland burns at Arnfield and Stalybridge in the last century, a Moorland Association member developed a bare peat revegetation formula using lime and grasses to first stabilise the peat before heather re-seeding could effectively start. This is now widely accepted as a good ecological regeneration model but it has to be accepted that some peat soils we have seen may never recover their hydrological properties after a very intense wildfire, as they become friable and incapable of holding water (hydrophilic). This cannot be to the long term good of the ecology and water retention properties of our upland areas and their contribution in mitigating against severe downstream flooding and water quality.

Moors for the Future estimates a restoration cost to a representative level of biodiversity in peat and heathland following a severe wildfire at £4,800 per acre - so nearly £500,000 investment per 100 acres damaged by wildfire. Prevention in the first place has to be a better course of action.

In addition to actively pursuing a variety of remedial management techniques, it is recommended that stakeholders are actively encouraged to create networks of small open water features across their heath and peatland which will not dry up in drought conditions. These should be positioned close to access routes where fire engines can also refill their tanks and require careful design and maintenance. Combining slow-the-flow style water traps from access tracks could create synergy between the need for carefully designed drainage to protect tracks from being washed away, the need to keep water in the hills in a storm event and provide water resources for fire-fighting.

1. **What is the effectiveness of the Met Office Fire Severity Index (MOFSI) in reducing the incidents of uncontrolled fires?**

MOFSI (level 5) is designed to provide a trigger point at which open access land can be closed to the public as set out in the requirements of the CRoW Act. The level of wildfire risk at the top end (5) aims to predict the conditions in which the most ‘severe’ wildfires would occur if they did start, not all wildfires. Various pieces of research have shown that its use has had little impact on the incidence of uncontrolled fires, as most wildfires over the past seven years have occurred at MOFSI levels 4, 3, 2 and even 1 – often well below the level 5 required to trigger closure of open access land. This closure does not extend to public rights of way so footpaths, bridleways, roads and car parks remain open even when the access land over which they pass has been closed due to exceptional fire risk. This conundrum presents a very real practical problem for land managers and the FRS and, as can be seen from the real-life recent case studies included in this evidence, MOFSI has extremely little meaning or impact at the local level on preventing fires from starting.

When MOFSI was introduced, the Met Office acknowledged that further analysis of summer and autumn critical values was needed to judge the basis for ‘Exceptional’ fire risk and it would be refined to reflect increasing understanding and findings, including an evaluation of the model’s performance when compared to actual events. This does not seem to have happened and there is nothing in statute to prevent the threshold based on the Canadian Daily Severity Rating (DSR) for closure being reduced to the MOFSI equivalent of level 4 – ‘High’ rather than 5 ‘Exceptional’ risk. We believe this should be reviewed by all interested parties, as should the possibility of devolution of decision making to local Fire Operations Groups, depending on individual conditions.

Closure of access land is regarded as an essential tool in preventing wildfires but there are practical difficulties in enforcement and conveying to the public where land closures apply. Information campaigns (see Q. 4) are crucial and there is a need to publicise increasing fire risk prior to level 5 being reached. For example, the North York Moors National Park Authority has a progressive information campaign in place where signs are erected on all access routes when the Met Office’s Rainfall and Evaporation Calculation System (MORECS) records a reading of 0.8 and at a reading of 0.6, the use of steam engines by the North York Moors Railway is stopped. Other authorities have different, but proactive, plans for information campaigns triggered prior to level 5 being reached and these play an important part in managing the incidence of wildfire. Yet they still occur – often in areas of high public usage and often in places where the official ‘threat’ has been classified below level 3.

1. **What is the evidence of the effectiveness of ‘fire watcher’ networks in preventing uncontrolled fires?**

There are many different models of ‘networks’ around the country. These range from an informal local grouping of interested stakeholders, landowners and individuals and more formal Fire Operations Groups, through to a sophisticated and well-funded model such as that operated by the Peak District National Park Authority. There have even been attempts to use camera technology to provide an early warning system.

None of the groupings can prevent wildfires as they are the result of human intervention. However, the relationships and communications systems forged through these networks and Fire Operations Groups will hopefully speed up a better integrated rapid response and reduce the impact and spread of wildfire - or prevent a small fire turning into a major conflagration. During periods of high fire risk, moorland and woodland managers and keepers re-position and make ready the relevant equipment for use. This has been recognised by FRS and partner organisations as an essential on-the-ground resource.

As an example, in times of high fire risk (not related to official ratings, but relying on local knowledge and understanding) all terrain and fogging vehicles are checked to ensure they are working, fit for purpose and put to the fore of storage areas for quick access. Gamekeepering staff manage or alter their working practices to ensure that they can, as far as possible, keep a close eye on the ground that they look after. Many National Park rangers, utilities employees and concerned moorland users such as walkers, cyclists, horseriders and birdwatchers will also be looking out for smoke at these times and are aware of the need to report a potential uncontrolled fire to the FRS and local gamekeeper quickly.

Most vulnerable heath and peatland grouse shooting estates have, with other stakeholders, a Fire Plan which sets out protocols and actions for everyone potentially involved at a practical level, with allocated responsibilities for different preventative and firefighting tasks.

A number of factors appear to have contributed to the unfortunate stalling of Northumberland National Park’s attempt to create the UK’s first automated wildfire detection system (AWFDS). These include the high cost of putting in the equipment, identifying suitable sites for it and a lack of buy-in from stakeholders. This is not to say that there is not a place for this or other developing technology in combatting wildfires, such as the use of drones by the fire service, but more work needs to be done in these areas and the cost/benefit assessed. Funding will always be an issue.

**CASE STUDIES**

**Case Study 1: Wildfire on a National Trust owned moorland leased by a shooting tenant on Oaken Bank above Slippery Stones to the east side of the River Derwent, Derbyshire, May 9th 2016. 200 + acres of heather moorland burned.**

National Park rangers have confirmed that this fire was started by a discarded portable barbeque that was still smouldering on a Monday after the weekend in an area that is well-used by the public. The fire was reported to the shooting tenant and his gamekeeper at around 12 noon and burned for about 12 hours. The fire index was 0 on the Saturday before the fire and Low on the Monday it took place and open access areas were not closed to the public.

The fire ‘back burnt’ through a wood into heath and bracken, managed to cross an area of blanket bog (despite the ground being wetter than normal because of heavy rain on the Saturday prior) and destroyed large areas of bilberry, heather, some woodland and a fence leaving only a small area around an active spring undamaged. The area had traditionally been rotationally burnt and grazed but both these management tools for managing fuel load have been reduced, with no controlled burning in that area for the past nine years. Only an adjacent clough (valley), green grazed by sheep prevented the fire spreading over miles of burnable long vegetation to the town of Glossop.

This fire had 70+ fireman and farmers/keepers (six of these with ATV’s and foggers), plus rangers and NT staff, in attendance at a very high financial cost and also removing the FRS from attending to fires in priority areas for public safety for a long period. There were a number of problems in getting the fire service and ATV vehicles to the fire as, for the last six years, Natural England has prevented any action requested to repair and improve 4X4 access routes. In this instance an Argocat, operated by an experienced National Park Ranger, overturned and an air ambulance had to be called, delaying the fire fight.

The result of this was that 150 acres were unnecessarily burnt. In addition, clough areas are being fenced off and there are no longer grazed green valleys to help stop any campfire spread from moor to moor as they now feature burnable woody material and dead grass. Vegetation across the area has been allowed to grow to levels not seen in hundreds of years and there are very real fears that, with climate change upon us, the incidence of wildfires in these areas that are close to population centres could increase to unacceptable levels.

**Future Action**

In summary, this highly experienced moorland manager recommends locally agreed and approved changes/improvements in the burning regime to create firebreaks and the creation of better access for fire vehicles and ATV’s + foggers. It is also the case that some key areas could be mown several times and then grazed intensively to create a firebreak and he also uses cutting to create breaks where mown areas are subsequently burned to remove the brash. A more flexible system of warning of fire risk to the public locally could, for example, feature a large ‘dial’ as signage to the entrance to the moor which could be easily changed as conditions do.

**Case Study 2: Wildfire on Goathland Moor, Yorkshire, Saturday 31st August 2013, A619 600 metres north of Brocka Beck on East side of the carriageway.** **Approximately 3 acres burned.**

This was caused by a walker ‘discarding something’ within a metre or two from the road and exacerbated by a stiff breeze blowing from the west.

Fire crews attended quickly and the moor owner’s estate 4x4 tractor and swipe (cutting machine) was largely responsible for eradicating much of the fire by quickly cutting round its perimeter. The initial fire tenders attending ran out of water after a very short period and a lack of any nearby water sources could have been a major issue if the fire had not been tackled quickly. The heather in the path of the fire was relatively recently burnt and there was a good network of controlled previous fire burns which slowed down and frustrated the progress of the fire front.

The Fire Brigade did an excellent job of damping the whole area down and the two estate mobile fire fogging units were then able to blast water into the hot spot areas. FRS deployed approximately four tenders and a Scottrack (which broke down and could not be used). The damping down operation carried on until dark when the fire service retired and keepering staff continued the hot spot treatment, also monitoring the site through the night.

The Fire Brigade and estate teams were all quickly on site with all the necessary equipment and worked well together as a co-team on the ground with skilled estate staff. The areas that had been the subject of prescribed burning slowed the fire down and reduced its intensity allowing the fire front to be tackled.

**Future Action**

More temporary or other landscape-sensitive frames or mounting points for notices at key sites along the A169 could be installed to enable a higher level of warning signage for passers-by during high risk periods.

Under the terms of the HLS agreement in place, there is a no burn or mow zone between the fence and the mown grass verge next to the A169 so this area is a high fuel load risk. Consideration should be given to mowing, on a 2/3 year cycle, the 4m beyond the 2m grass verge, but the local authority is unable to carry out this work.

The lack of useable water sources in the area meant that greater numbers of FRS tender vehicles were needed than would otherwise have been the case, reducing fire-fighting capacity in urban areas where there is a greater risk to life.

There is a case for funding, perhaps within existing HLS, mechanisms for a strategic network of small water pockets in key heathland and peatland areas to capture water sources for both fire prevention and mitigation that would also have a range of other associated environmental benefits. This creation of open water features to capture rain water would not only provide a source of on-site water but would also help to improve biodiversity, reduce soil erosion and potentially reduce flooding impact on lower areas by slowing the flow of water.

**Case Study 3: Wildfire on moorland between West Nab and Deer Hill (co-ordinates SE 06001000, OS 110), South West of Meltham, Holmfirth, West Yorkshire, Sunday 18th April 2010. Approximately 200 acres of mixed grassland/cotton grass moorland with some dwarf shrub including heather.**

In the opinion of the Peak Park ranger and the shooting tenant, the cause of this fire was deliberate arson. It started on National Trust land which had tussocky grass cover and a high level of flammable molinia and spread rapidly eastwards on an area of cotton grass and heather moorland.

The Fire Severity Index at the time was only level 2, despite local dry, sunny and windy conditions and therefore there was no public information/media campaign to warn of the dangers. The whole area is open access, with the exception of a ‘fallout’ zone adjacent to a local rifle range. The moorland is in the last stages of recovery from a wildfire that burnt for three weeks in the 1970’s, severely damaging the deep peat. A range of remedial work, including extensive heather re-seeding, has taken place over the years first through work by the grouse shooting club and then under ESA and HLS plans. Across the whole moor (700 – 800 acres) it is estimated that about £500,000 of private and public money has been invested in its ecological recovery.

In this wildfire case, the FRS received a huge amount of on the ground help from the shooting syndicate members, National Trust and National Park staff, and their friends and families which all helped to get the fire essentially out by late afternoon. Key in this particular situation was the use of the Peak Park’s ATV and fire fogger which was seen by all parties concerned as a critical tool in the efforts to contain the fire.

The shooting tenant has been carrying out considerable work under the ESA Conservation Plan for Meltham Moor, including altering ongoing drainage regimes to help create peat pools. Part of the area concerned was bombed in 1943 and a good big water pool was the result. Additional resources had included the provision of 200 litre water drums at strategic points across the moor but these were vandalised at the time of the 2010 fire and were unusable.

**Future Action**

A limited (as proscribed by Natural England because of the presence of deep peat) regime of strategically burning blocks of older heather has been in place since the 1990’s. The tenant feels that this should be extended and some restrictions relaxed to take into account local conditions. Natural England did fund the purchase of an Argocat for wildfire control and routine burning, which the shooting syndicate has found extremely helpful. It also helps with the mowing management regime as it can tow a locally hired quad-x to reach many areas of moorland that tractors cannot. The subsequent removal of brash is also key to wildfire prevention.

The shooting tenant also commented on the very positive and welcome effect brought about by an increased understanding of wildfires by the local FRS over the past ten years, increased levels of liaison among all concerned parties and the resulting adaptations in the ways that they are dealt with on the ground.

**Case Study 4: Two fires on/adjacent to, Bleasdale Estate, Lancashire. 12th April 2003, Harden & Syke, Sunday 25th May 2008, grid reference 59704720.**

12th April 2003 a fire was started deliberately by a farmer trying to burn the moor in dangerous conditions, destroying c. 400 acres. The moor gamekeepers and those of the neighbouring shooting estate at Abbeystead had stopped management burning several days before because of the locally understood dangers and dry conditions. It started on, and mostly affected, neighbouring United Utilities owned land and was extinguished by various personnel including UU staff, countryside rangers and others, but the firefighting action was mostly carried out by local gamekeepers and farmers with previous experience of moorland fires. It was controlled and restricted in its path until it reached a river bed and adjacent area of previously burned vegetation, where it was finally contained. The FRS attended the blaze but at the time they had no specialist equipment and properties were not threatened, so they left after a couple of hours and the local ‘team’ completed the firefight.

Sunday 25th May 2008. Fire Severity Index recorded as follows:

18th – 20th May FSI 3

21st – 22nd May FSI 4

23rd May FSI 2

24th May FSI 4/5

25th /26th May FSI 5

27th May FSI 2

A discarded cigarette caused this fire which started near a footpath and was put out by local farming tenants and gamekeepers, with a combination of a network of previous burns and a drop in wind allowing the firefighters to extinguish it. 80 acres were burnt. The landowner suggested closure of this open access land in the days before the fire but it was denied by Natural England as it was a Bank Holiday. Some flyers warning of the risk were paid for and put at all entrance areas to open access land by the landowner, but there was no media coverage.

**Future Action**

Following these wildfire instances (and an earlier severe one in May 1999), the moorland landowner has subsequently worked closely with United Utilities and the local FRS to explore a range of methods for prevention and mitigation against future wildfire. A major joint practical exercise in 2012 on Bleasdale Moor and subsequent frequent communication with Lancashire FRS has re-iterated the point from all parties that prevention is better than cure. Where there is a large fuel load, plenty of oxygen and a source of ignition you have perfect conditions for a bad fire. This should really be self-evident, but has not been built into the current regulatory system.

As a result of these initiatives and discussions a wide range of preventative measures have been put in place. After consultations with the Lancashire Fire Operations Group, Bleasdale Estate has purchased & located water tanks at strategic points across the moor and access points have been mapped that are suitable for different vehicles – whether firefighting ones or 4x4’s. An extended list of contact numbers to ring in the case of wildfire has been developed and this includes a wide range of other organisations including Pennine Rescue, Bay Search and Rescue (who have some low pressure vehicles for moving men and equipment) and others.

There have been significant attempts at re-wetting areas at Bleasdale and Google Maps show the 34,000 metres of drain/grip blocking that have been initiated in the last four years over a relatively small moor size of 2,000 acres. The moor owner, however, makes the point that in extremely dry conditions the upper moss layer is still flammable and has informed Natural England in the past by email of desiccation cracks appearing in blanket bog on Bleasdale in dry conditions.

Attempts at mowing have been a problem here as the slopes of Bleasdale Fell are very steep, there are soft areas that are not suitable for flail mowers and it is very much regarded as a back-up tool where practicable. The removal of brash in fire prevention remains a problem due to the terrain. Neighbouring United Utilities went through some extensive research to find equipment that could tackle these physical challenges, including purchasing a machine that is used on steep slopes in the Alps, but this proved unsuitable for conditions in the UK and was subsequently discarded.

The landowner observes that while fires occurring in April and May, following the winter period, remove the top heather layer, the underlying peat with its root structures and seeds are to some degree protected. As well as destroying fencing, moss layers and vegetation cover are removed but these can still grow back in the following season and some vegetation recovers naturally within 4-5 years.

Lancashire is one of the wettest counties in the UK, but late summer fires in a very dry year still have a devastating effect on deep peat with unmanaged vegetation and heathland areas. In a very dry year, summer fires can burn underground, popping up in unexpected places and destroying the seed bed and root structures. There is no regrowth and the sterile peat is washed away and the build-up of thousands of years of peat can be consumed by a severe wildfire, recovery can take hundreds of years. As an example there was a severe fire in the area in 1947 affecting Bleasdale and neighbouring Abbeystead estate and the black scars it caused were still clearly visible as recently as the 1980’s. Fire control by use of fire breaks and land management techniques, including controlled burning, is vital in preventing upland wildfires.

**Case Study 5: A spate of wildfires on Darwen Moor in 2014, 2015 and 2016.**

Darwen Moor is very well used by the public who are generally responsible and co-operative at times of high fire risk. However, the area has suffered a spate of fires both on the shooting tenant’s land and adjacent areas owned and managed by United Utilities at Belmont who, unlike the shooting tenant, do not carry out a programme of controlled burning due to concerns over dissolved organic carbon (DOC) entering drinking water supply which above certain levels is expensive to treat. United Utilities’ wildfires have been observed to be much more severe and longer lasting – a matter of days rather than the hours that fires burned on the shooting tenant’s moorland as follows:

2014 a fire lasted around 10 hours, taking out over 80 acres, and attended by 20 firefighters, two ATV/fogging units and local farmers and keepers. It started by the side of a footpath and was only halted because it hit several firebreaks which had been created by controlled burning in the previous year, one of which saved the fire from entering a large forestry plantation.

2015 a fire started by a footpath lasted around 2 hours and burnt around 50 acres. This was halted by firebreaks – these created only a week before, again by controlled burning.

2016 an area of 7 acres was burnt at the foot of the fell which was deliberately started by two youths who were subsequently apprehended by the local police. This fire was halted by the combination of a natural firebreak and a previous burn.

All the fires occurred on dry sunny days with large scale public usage and the two larger ones were reported on local television.

The shooting tenant in question has two other moors under management at Waddington and Claughton in Lancashire where there has been a rotational burning plan in place for a number of years. Unlike Darwen, they have suffered no serious fires in the past three years. The tenant observes that, at Darwen, there has also been a major reduction in grazing stock which has increased the fuel load and exacerbated the fire risk. Attempts at flailing or mowing areas here to create firebreaks has had limited success and were in danger of damaging areas in contravention of farming tenants’ environmental schemes.

As a result of the spate of fires on both the shooting tenant’s and United Utilities moorland at Darwen, the local FRS has purchased special vehicles to assist in the control of moorland fires and tracks are well maintained to allow for easy access.