Wildfire Prevention Manual – Chapter 5

Preparedness

Preparedness can be defined, simply, as the 'state of being ready'. In the context of property fires and road traffic collisions (for example) and other day to day FRS operations, this is a fully recognised and understood concept. Training for this type of incident is carried out on a regular, even daily, basis, often in conjunction with emergency service partners. This training is backed up with detailed procedural documents and safety procedures. This approach is not always adopted as rigorously in relation to outdoor fires, wildfires however. In addition, with regards to wildfire, a wider concept of preparedness is required involving not only Fire and Rescue Services and emergency service partners but also the actual communities that are identified as being at risk. This chapter will therefore explore not only how FRS can prepare, but also how partners and the community can be ready – with FRS support but not necessarily with day to day involvement – in three parts:

Part 1 — Fire and Rescue Services

Part 2 — Preparation for Partners

Part 3 — Community Preparedness

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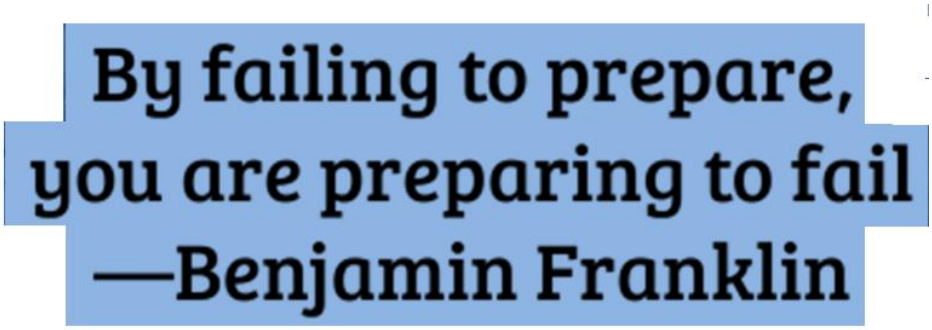
Fire and Rescue Service Preparedness

The Civil Contingencies Act 2004 places a legal duty on FRSs (through a Local Resilience Forum (LRF or Local Resilience Partnerships in Scotland) and the creation of a Community Risk Register (CRR)) to co-operate with partners, thereby reaching an agreed position on the risks affecting their area and on any planning and resourcing priorities required as a result. In other words – to be prepared.

These risks (and the level of each of them) will vary across every area of the UK. However, every area **has** a wildfire threat. This process should both recognise and consider the potential impact of which upon their services.

FRS fully appreciate the need for this preparedness in the context of day to day Fire Service Operations and do so to a high standard. Perhaps, due to the sporadic nature of wildfire in the UK, pressures driving service delivery in other areas and some historical difficulties in fully determining (or even accepting) the risk, preparedness in respect of wildfire has yet to reach the same standard consistently across the UK.



There is now however a growing appreciation that preparing for wildfire with the same methodology, and to the same standard, as other incident types will stand Services in good stead. However, to be truly 'ready', this preparedness will need to develop effective plans, and both consider and compliment the preparation undertaken by all the different partners necessary to deliver a truly effective wildfire response.

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Wildfire Planning

Planning for wildfires should start for Fire and Rescue Services with their FRS Integrated Risk Management Planning (IRMP) process, but will go much further than this and could also include (amongst other elements):

- Wildfire Strategy
- Fire Operations Plans
- Fire Growth Modelling Planning and a
- Wildfire Threat Analysis

However, to ensure the optimal use of resources in both current and future circumstances, this planning is difficult as wildfire risk varies significantly according to the location, weather and time of year as well as the biology of an area and the future climate. Wildfire incidents can be episodic in nature and whilst this may not be readily apparent, may be increasing in risk over time.

So, wildfire planning (at all levels, starting with the IRMP) and hence ultimately the response provided, should consider as a minimum:

- Location
- Prevailing weather conditions and time of year
- The potential effect of climate changes
- Status of the fuel in the natural environment

For example, in heathland, wildfire risk is generally at its highest in a hot dry spring when heather and grasses can be easily dried out in advance of ignition. The Meteorological Office may issue a high wildfire risk warning at such a time. Wildfire spread is most serious at midday when winds are drawn up hill, temperatures are at their highest and large areas of topology is in aspect.

With this information and adequate planning, a FRS may plan (for example) to vary the initial response to an outdoor fire / potential wildfire dependant on the time of day, time of year and / or location.

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Wildfire Strategy

Effective preparation for FRS should start with understanding / accepting the risk and developing an effective strategy to deal with it. This strategy should encompass all the activities required of a FRS and can focus on, but not be limited to, typically:

- Ensuring personnel are adequately prepared for wildfire. This should include ensuring personnel are trained / exercised, their topographical knowledge is refreshed and that, whilst doing this, they update local wildfire plans.
- The response to any wildfire is effective with the right vehicles, equipment and tactics supported by relevant documentation. This should include having effective access to any asset nationally or internationally as required.
- Ensuring communities are both engaged with and are fully prepared
- Essential work with land managers / owners to not only ensure that their land is managed in the most effective way to prevent wildfires occurring or spreading in an uncontrolled manner, but also to ensure that land management schemes consider wherever possible the needs of the FRS through the creation of fire land management plans
- Partnership working to deliver effective and sustainable education, enforcement schemes and other general prevention activity

The strategy will help to ensure that the communities within the remit of the FRS remain safe and that the disruption to the economic infrastructure of a region is not compromised as climate change increases the risks posed by wildfire, which are not only becoming more unpredictable in existing at risk areas, but also putting new areas at risk. (Ref: The UK Climate Change Risk Assessment (CCRA): Government Report. Jan 2012. DEFRA ISBN: 9780108511257 – Link)

All of the above should be driven (and backed up) by the creation of a suitable and sufficient **Wildfire threat analysis**

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Wildfire Strategy

Once developed the strategy should enable a FRS to be fully prepared for the future, but it will also allow them to deal with the current growing threat including exploring opportunities to progress national resilience and policy in regard to wildfire response and reduction. With the enormous challenges FRS are faced with in dealing with large scale (and, more so, high numbers of) wildfire events, the development of nationally co-ordinated and resilient wildfire response will be to the mutual benefit of everyone.

Any strategy developed should look to compliment any existing work streams, particularly partnership initiatives, wherever possible. The strategy should project and guide the direction of the Service for at least the following 5 years and probably – more realistically – up to 10 years, with adequate review periods built in. The strategy will help to ensure that the communities within the remit of the FRS remain safe and that the disruption to the economic infrastructure of the Region is not compromised as global warming increases the risks posed by wildfire, which are not only becoming more unpredictable in existing at risk areas, but also putting new areas at risk.

Every FRS will have their own needs with regards to a strategy. A template to assist if required is included below:

Link Draft Wildfire Strategy

Link Draft Wildfire Strategy – Strategic Plan

There are a number of benefits to having an effective wildfire strategy, all of them immediately obvious to the UK FRS. Improved firefighter safety, with wildfire presenting currently perhaps one of the greatest risks for firefighters in the UK, is the main driver here. However, improved safety for our communities and reduced costs to not only the FRS but also its partners and society as a whole should also provide sufficient incentive to develop and deliver a suitable strategy.

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Fire Operations Plans

FRSs already ensure that any wildfire risks identified within their areas are subject to an operational assessment - through their IRMP process. The assessment should address not only the risk, but also operational response requirements associated with an incident at that location. However, unlike structural fire risk, wildfire risk varies significantly according to the weather and time of year as well as future climate. **Wildfire incidents are, as already mentioned, episodic in nature and, whilst not readily apparent, may be increasing in risk over time.**

Operational response requirements will be discussed later in this chapter, being the last element of the many that are required to deal with wildfire, with the immediate focus on fire operations plans.

To be truly robust and resilient, these fire plans should be developed in consultation with the relevant land managers / owners and, whilst there is no legal duty for them to assist with the production of a fire plan, it is obviously advantageous for them to do so. A collaboratively produced fire plan will see an improved response to a wildfire incident and help reduce the longer term impacts on the land owner's property and the overall environmental damage.

There are a number of pieces of information that a fire plan should include. The following list highlights most areas that the plan should cover, but should not be considered exhaustive:

- Estate/Land Owner Contact(s)
- Neighbouring Estate Contact(s)
- FRS Rendezvous Points
- Access and Turning Points
- Colour coded roads and tracks (for use by different types of vehicle)
- Available Equipment and Assistance
- Communications, Water Supplies and Identified Hazards
- Priority Areas (i.e. SSSI/SPA/SAC and water courses)
- OS mapping and digital photography of area
- Infrastructure
- Priority areas for human risk (e.g. The location of vulnerable communities).
- Any areas known to be historically high risk of ignition

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Fire Operations Plans

An example of a widely accepted fire plan format (from Northumberland FRS) is included below:

Link Fire Plan

It would be ideal if the information gathered for the purpose of constructing such a plan is in a standardised format that can be applied with consistency, not only across any one FRS but across the whole UK Fire Service and their partners wherever possible. To achieve this a standardised way of gathering the data would be required and one way for fire and rescue services to achieve this could be to use a modified version of an existing (and accepted) process – for example one that is already being used widely by fire protection departments. Risk data for land could then be gathered and stored in the same way as building risk data.

In this way, similar to building plans being produced to provide prior knowledge of the risk for operational crews, a standard geographical map can detail, consistently, key risk information.

Following such a process, initially focussing on known regular risk locations and expanding to include new risks as sites are identified, the number of the fire plans held in the UK FRS will significantly increase. With it will come an ever increasing workload, with the maintenance of the existing operational plans as well as the creation of new ones, but it is one that is essential to meet the growing threat faced in the UK.

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Fire Operations Plans – Gathering Risk Data

Most information that the UK FRS requires to identify high wildfire risk areas may have already been gathered by land owners, many of whom will be regularly seeing evidence of anti-social behaviour and fire setting on their land but possibly not reporting it. The risks may also be known by the local fire crews if they are responding to incidents regularly in these locations. It is worth considering that, for varied reasons, the IRS reporting system currently does not identify or even record this incident type accurately.

RVP

It is vital going forwards that the **location recorded in IRS is standardised across all FRS**. It needs to be within the burned perimeter, so not the rendezvous point or location of the person calling in the incident. It should ideally be the suspected ignition point (for modelling risk of ignition in GIS) or the approximate centre of the burned area.

When a high wildfire risk site is identified a standardised method of data gathering will ensure the risk information is accurate, current and available to all in the event of a wildfire. With better information operational staff will be able to implement the most effective operational plan and reduce both the overall effect of the fire and the number of these incidents growing into uncontrolled wildfires. Surrey FRS developed their risk information gathering process because the traditional method of local stations holding information on risks did not meet the changing requirements of this type of incident. The issues to be resolved included:

HYDRANTS IN THIS AREA CHECK MAP

- Outdated information being held on each risk
- Variations in mapping held by the FRS and land managers
- Improved communication between the Service and land managers
- No process for maintaining accurate contact details of land managers
- Variations in grid referencing & mapping types held
- Ineffective incident command due lack of risk information

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Fire Operations Plans – Gathering Risk Data

Surrey standardised the risk information held, along with the process for collecting it, by aligning it to the Services existing risk information gathering process, one that is used widely around the UK, the SSRI process. This has resulted in:

- Standardised process for data gathering resulting in more accurate risk information
- Standardised mapping format Including OS grid referencing
- Electronic storage of each risk on data systems and frontline appliances
- Annual information refresh, to maintain accurate information and contact data.

This has resulted in a number of different documents being produced to allow the process to be followed consistently, as follows:

Wildfire Risk Data Gathering Process	
Checklist	This document confirms the required documentation to complete the process
Risk Mapping Flowchart	A simple flowchart to allow the process to be completed
Mapping Icons	The sheet of icons to be used during the creation of the risk maps
Asset Register Form	Assists with the creation of an asset register consisting of both FRS and partner resources
SSRI Page A Supplement	Supplement to SSRI form to facilitate the wildfire risk data gathering process
Insurance and Indemnity Form	Insurance and indemnity waiver form

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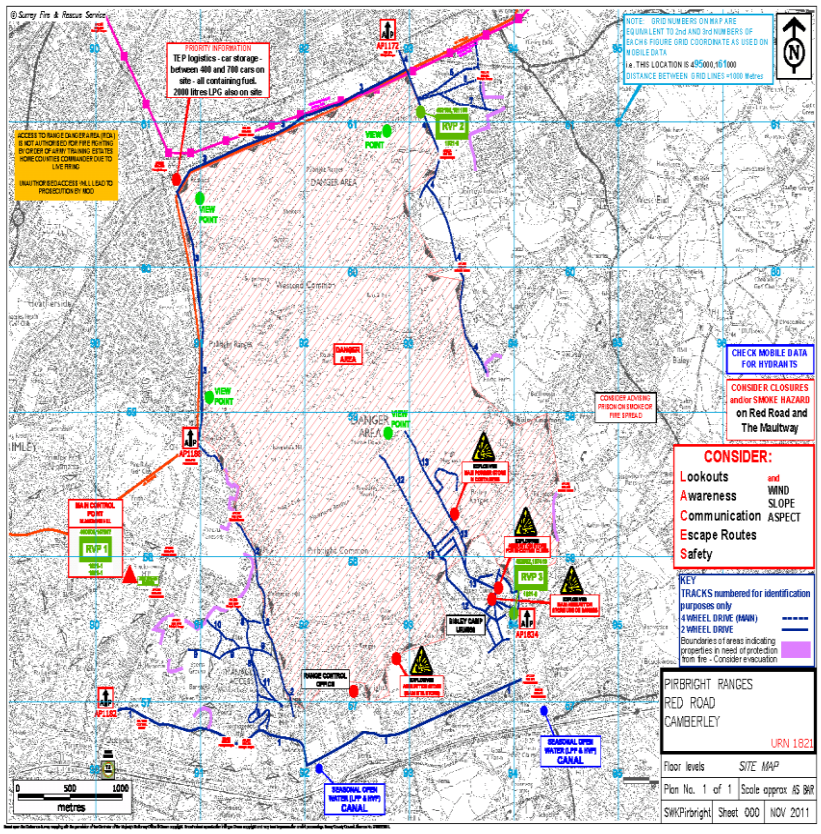
Fire Operations Plans – Gathering Risk Data

In addition to the icons offered above there is a civil contingencies lexicon and symbology that has been designed to be used on Civil Contingencies Act maps and plans. It may be that with potentially a number of slightly different standards in use in the UK at the present time the adoption of these symbols as a national standard brings benefits to the UK FRS and their partners.

Link — CCA Symbols

Link — Lexicon of terminology

Example of a finished fire plan from Surrey Fire and Rescue Service using the above process (please note that image is not to scale and is for information purposes only)



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Fire Operations Plans – Gathering Risk Data

To assist with the construction of a standardised system of operational fire planning and the creation of fire plans it is important to have a standard set of symbols. One such, agreed by the South East England Wildfire Group (SEEWG) and some FRS within the region is attached below for reference:

Link CAD Symbols

To compliment the asset data gathering process instigated by this process it is important to have a method of collating the data and maintaining it in a format that is widely accepted and usable.

One such method is in the process of being put in place in the South East Region and has been accepted by the CFOA wildfire group, as follows:

Link Contacts and Asset Register

Most Fire and Rescue Services use similar data gathering processes, including Northumberland FRS and an example is included below:

Link NFRS Wildfire Fire Plan Information Gathering Template

As emphasised throughout this chapter (and the manual as a whole), partnership working is key to achieving the best possible outcome with regard to preventing wildfire. One of the most effective examples of this would be the Fire Operations Group in the Peak District National Park.

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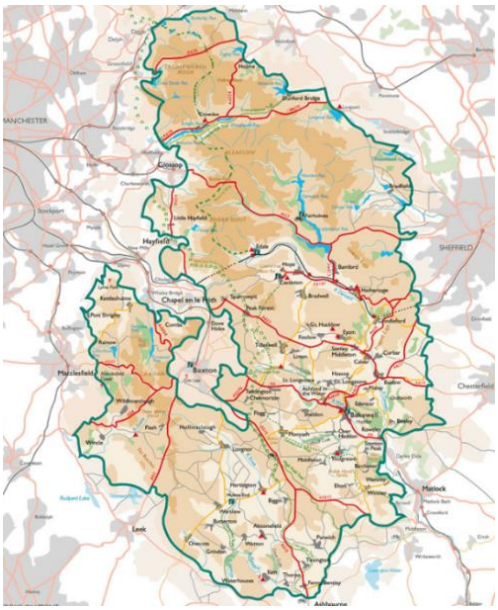
Fire Operations Plans – Peak District National Park

In the Peak District National Park (PDNP) there were over 400 fires recorded by National Park rangers in the 33 years from 1976 to 2009. The moorlands in the Peak District are very accessible to the public and as a result receive very high annual numbers of visitors, increasing the risk from both accidental and malicious fires. Additionally, prescribed fires used for grouse moor and grazing management, although when well-managed can help prevent a build-up of fuel load, sometimes burn out of control. The Peak District moorland landscape comprises large areas that are vulnerable to ignition as a result of, for example, their peat soil or vegetation type and condition. The high numbers of potential access related ignition sources, combined with the vulnerable habitats make the PDNP extremely susceptible to wildfire during any prolonged dry periods.



With the environmental consequences of wildfire being severe and fighting moorland fires being both dangerous and expensive, the Peak District Fire Operations Group (FOG) and Moors for the Future partnership worked with geography researchers at the University of Manchester to create a stakeholder informed map of wildfire risk across the moorlands of the PDNP. The map was based on the reported locations of the past fires recorded by Park rangers.

The aim of this project was to inform the strategic planning for future FRS / partner response into the risk areas. Indirectly, it has also informed other areas of preparedness / prevention work - for example identifying areas at high fire risk with inadequate water sources available for firefighting purposes and the formulation of land management plans with integrated wildfire risk reduction work.

Further information can be found on the partnerships website:

Link Peak District National Park Fire Operations Group

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Preparedness – Dorset FRS

Dorset FRS are also well advanced with the concepts of wildfire preparedness and the importance of the creation of fire operations plans. They also work in partnership throughout the risk areas in the county, combining the efforts of partners and targeting all sections of the community (including their own workforce) to reduce the risk and leave everyone as prepared as possible:

- **Premise Risk Profiles (PRP) are prepared by firefighters**
- **Stations regularly visit heathland sites**
- **Firefighters are made aware of the conservation importance of heathland**
- **Land Managers are trained in Fire and Rescue Service Incident Command System**
- **Site Managers and firefighters identify areas of high fire loading and remove it where possible via the PRP process**
- **Partners, Police and Firefighters regularly visit schools and youth schemes to deliver education packages**
- **Media campaigns are used to deliver simple fire safety messages**

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Fire Growth (Spread) Modelling

One avenue of preparedness not yet fully explored by the UK FRS, but one that is used widely overseas, is that of using the data available to predict fire growth in risk areas in any given set of conditions. There are many uses for a fire growth map either in preparedness phase for a FRS and partners, before a fire occurs, or actually during an incident to assist with operational planning / tactics.

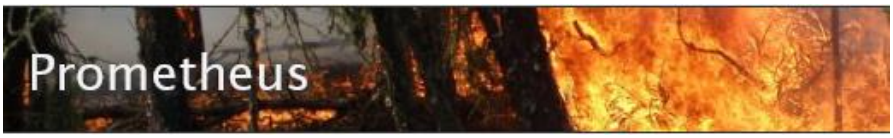
Preparedness Uses:

- Assessing the effectiveness of alternative fuel management strategies.
- Planning prescribed burns.
- Studying the role of fire in establishing and maintaining landscape patterns.
- Providing spatial and temporal estimates of smoke emissions.
- Examining the impact of climate change scenarios on area burned.
- Supplementing fire behaviour training and education programs

Operational Uses:

- Forecasting wildland fire growth for operational decision support
- Providing forensic support for wildfire investigations

'Prometheus' is one such wildland fire growth simulation model, widely used in Canada and now available to use in the UK. Thomas Smith (Dept. of Geography, King's College London) has produced a guide that will enable UK FRS and partners to use the Prometheus software to predict fire behaviour within the provided fuel, topography and weather parameters.



Link [Promotheus Guide]

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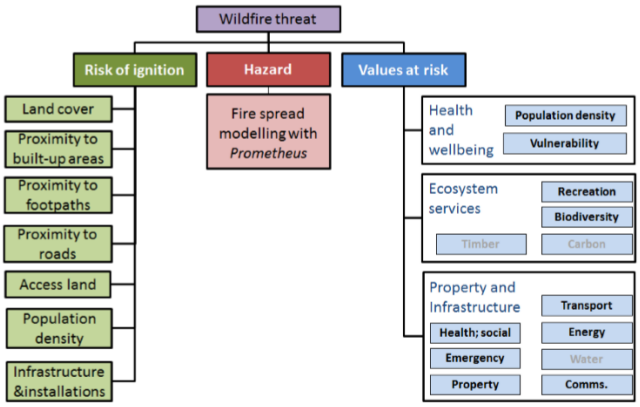
Wildfire Threat Analysis

A methodical and comprehensive Wildfire Threat Analysis (WTA) can help inform a Fire Authorities Integrated Risk Management Plan (IRMP) and inform directly their day to day preparedness and prevention activities. This concept is well established overseas, particularly in New Zealand and Canada for example. Work, funded by the Natural Environment Research Council (NERC), tested the concepts within the context of the UK.

A WTA evaluates wildfire threat as a combination of three separate modules:

- Risk of Ignition (RoI) of a vegetation fire, regardless of size
- Hazard of fire spread – modelling using Prometheus
- Values at Risk (VaR), i.e. the assets potentially affected.



It then uses a GIS to develop and combine map layers for each of the three modules. A WTA can be defined as follows:

A systematic method of identifying the level of threat an area faces from wildfire. The level of threat is generally related to a combination of ignition potential, potential fire behaviour and the values threatened. These factors may themselves be derived from other combinations of factors, for instance, potential fire behaviour can be determined from a combination of climate, topography and fuels.

Link — Wildfire Threat Analysis - UK Project

Link — Wildfire Threat Analysis Workbook – New Zealand

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Operational Preparedness - Training

Training, in all its different formats, can be used to help – as part of an overall package - prepare the FRS, its partners and the community as a whole for a wildfire event. For the UK Fire Service, training specifically tailored for wildfire is an area that many are now focussing on and any package delivered to their personnel should focus on a number of different areas, including as a minimum:

- An overview of wildfire operations
- Firefighting tactics and the application of the Incident Command System in a wildfire scenario
- Communications and navigation on the fire ground

The last area – communications and navigation – is particularly important and easily overlooked. Poor communication or an inability to navigate accurately around a wildfire incident will place personnel at risk and see the escalation of a wildfire incident.

Adequate training will ensure personnel have a good understanding of wildfire behaviour (and the prediction of it) and are able to apply control measures and use the incident command system effectively during a wildfire incident. Personnel will also need to have a good understanding of the terminology used in a wildfire scenario.

The South East region have agreed a training package that compliments the Scottish Wildfire Operational Guidance widely accepted and used within the UK, attached below for consideration:

Link Introduction to Wildfire Operations

Link Wildfire Tactics and Incident Command

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Maintaining Operational Preparedness

After sufficient initial / refresher training it is important, alongside refreshing strategies and updating fire operations plans, to maintain operational competencies. There are many ways to assist with the maintenance of competence with regards to wildfire firefighting, including:

- A regular exercise programme
- Table top exercising
- Vehicle and equipment familiarisation
- Map reading exercises
- Regular visits to risk sites to enable personnel to become familiar with them – as well as maintain the annual (or other regular interval) inspection programme of these sites
- Lectures on the risk sites undertaken as a part of a planned programme of station training

Exercises

FRS are extremely professional at both training and exercising. However, with actual incidents nationally reducing year on year the need for more and more realistic training is growing almost exponentially. This is, perhaps, even more of an imperative for wildfire incidents with the exposure to / experiential learning from them being less than for other, more common, incident types.

This lack of exposure can lead to some major concerns for FRS with a wildfire risk, including:

- FRS wildfire policy and procedures not being fully understood by operational fire officers

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Exercises

- No assurances for FRS that any wildfire training provided has been understood and can be utilised effectively on the incident ground
- The ability of crews to navigate a wildfire incident ground, whether utilising grid references via an MDT or mapping of any form, may not be at an appropriate level.
- Level 2/3 commanders may be unfamiliar with the terminology and risks associated with a large wildfire incident resulting an inability to effectively manage such an incident.

All the above, along with other locally identified problems can result in a risk to a FRS ability to manage a significant wildfire incident effectively. A well thought out exercise / series of exercises will help provide FRS (and partners) with the assurances they require.

The starting point for any exercise should be to determine the aims and objectives. Whilst the aim might be as simple as 'to assess and confirm the ability of a FRS to respond effectively to a wildfire incident', typical objectives could include:

- Confirm the practical understanding of wildfire firefighting techniques and procedures by Level 1 commanders and crews
- Confirm the ability of Level 1 commanders and crews to navigate off road terrain utilising OS grid references and MDT or mapping as required
- Confirm the understanding of wildfire incident command and control strategies by Level 2/3 commanders
- Confirm the ability of FRS personnel to integrate with (and utilise) local land managers and partners to assist with wildfire incidents
- Confirm the consistency of approach by all agencies to this incident type
- Confirm the value of subject matter experts at this incident type and their ability to support the decision making process
- Confirm the ability of Service Command Support capabilities to support both incident commanders and partner agencies as required at a wildfire incident

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Exercises

- Confirm the ability of an HVP to provide a continuous water supply (via an improvised water main) at a remote incident
- Confirm the effectiveness of communications over a large scale incident

Many FRS and other partners will have undertaken wildfire exercises, both with partner organisations and on a stand-alone basis. Some may not. In either case there may be a need for a set of planning documents and the following have been obtained from Dorset (Exercise Erica), Northumberland (Operation Kingswater) and Surrey (Exercise Bracken), two counties with a high wildfire risk and a regular wildfire exercise regime.

Wildfire Exercise Planning Documents – Generic	
Generic Risk Assessment	This document covers most of the anticipated risks likely to be encountered on a wildfire exercise

Wildfire Exercise Planning Documents – Erica (DFRS)	
Exercise Plan	A comprehensive planning document
Command Assessment	A template to assess command performance
Briefing and Tasks	Exercise brief and tasks sheet
Exercise Report	Final report on the exercise outlining the key learning points

Wildfire Exercise Planning Documents – Bracken (SFRS)	
Exercise Brief	A crew briefing document
Way Points	Way points map references and physical descriptions
Map Reading Cards	Cards for crews linking to way point info

Wildfire Exercise Planning Documents – Kingswater (NFRS)	
Exercise Final Report	Final report on the exercise outlining the key learning points
Debrief Template	Exercise debrief template

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Rural Affairs Officers

There is clearly a lot of work that FRS can undertake and the difficulty will be whereabouts in the organisation this work is carried out with the pressures that every officer faces. There is a compelling case to assign this work, funding permitted, to a dedicated officer with a clear year round remit along the following lines:

- Working with land owners, managers and communities to show how they can work with FRS in the emergency phase of an incident and the preparation for it
- Year round educational talks to local partners, councils, forums etc.
- General public education and engagement activities, including youth engagement programmes
- Schools education programmes
- Firewise, Fire Adapted Communities and Ready, Set, Go programmes
- Improve FRS operational response to wildfires including consideration of information gathering, pre-planning, operational training and tactics, exercising, vehicles and equipment
- Assurance through a robust audit programme
- Organisational learning through an exercise and incident review process
- Promote regional cooperation, including activities such as the standardisation of equipment
- Promote and support the use of fire operations groups
- Promote and support the use of Subject Matter Advisors (SMAs), leading for the FRS in this area and being able to advise at operational incidents
- Promote closer emergency service cooperation to prevent wildfires and also, potentially, at wildfire incidents

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Rural Affairs Officers

One key part of the information gathering process referred to above would be the data collected for IRS. Wildfires are spatial events, so really need not a single point, but also the **fire perimeter** to be recorded post-fire, and archived with the IRS record. Fire perimeters would allow:

- Data fields such as conservation status and land cover type to be automatically added entered into IRS (so saving FRS officers' time), or allow entries to be corrected later
- Burnt area to be more accurately estimated
- the centre point of the burned area to be extracted automatically

- Fire frequency at each location to be calculated by overlaying fire perimeters from each fire season (as is already undertaken in Dorset).

Perimeters would need to be tagged with the FRS incident number to allow cross-referencing to IRS.

Although this information gathering is a (traditionally considered) 'post fire activity, it will help Fire and Rescue Services (and their partners, particularly land managers) understand where fires do (actually and accurately) occur. This will help target prevention activity where it is needed most, saving ultimately time, resources and money.

Whether FRS consider the investment in a 'Rural Affairs Officer' viable or not, the information gathering referred to above is a vital part of any FRS work.

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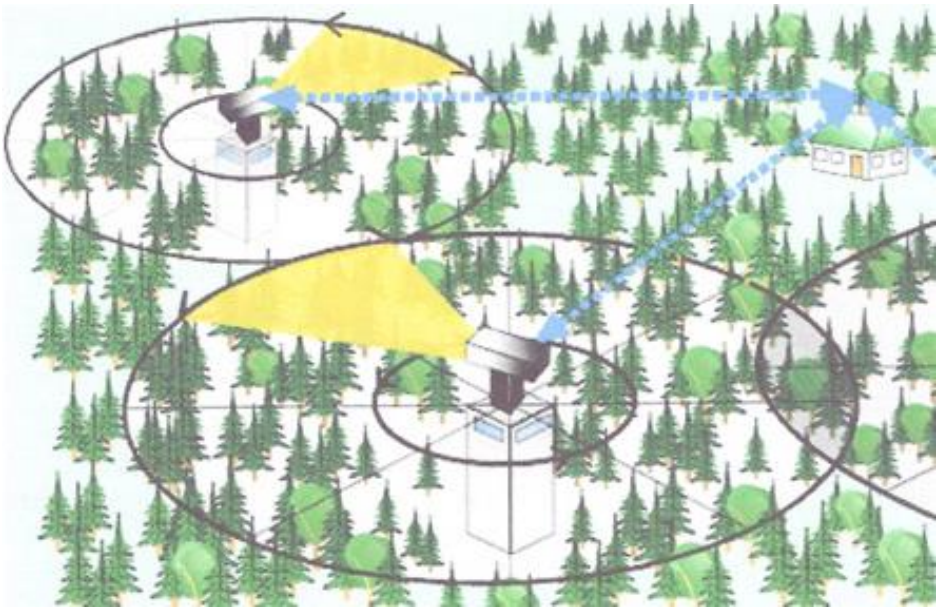
Early Detection

There is a growing awareness in the UK of the catastrophic consequences of wildfire. There is also in many FRS and partnerships an ongoing effort to mitigate wildfire through early detection (as well as preparedness planning) to enable a quicker response. Examples of this have been discussed previously in the manual – the use of wildfire patrols for example or volunteers in high risk areas at high fire risk times. The sooner a fire is detected, the quicker the response and the ability to prevent the wildfire getting out of control is improved.



In countries where there are manned lookout towers the average fire detection time is around five minutes. This method has its problems however – high costs if personnel are paid, inability to guarantee volunteers when required and human error in both circumstances.

The popularity of more reliable, potentially faster, computer vision-based video analysis systems capable of producing automatic fire alarms are therefore growing. Further, early warning camera systems - with high spatial and temporal resolution - will allow FRS and partners to accurately implement fire prevention, detection, and preparedness plans.

Some camera systems seek to detect flames using infra-red and / or visible-range cameras, others look to detect the smoke emitted by a wildfire. Other, infrared cameras (or sensor-based systems) have the ability to detect a rise in temperature. These are, however, much more expensive than regular camera based systems. Whilst it is almost impossible to view flames from a wildfire on a camera system unless the fire is very near to the camera, smoke from a fire is usually visible from much further away.

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Early Detection

Wildfire detection algorithms have been developed to recognize the existence of (wildfire) smoke within the viewing range of the camera monitoring high risk areas. Tower-based, automatic forest fire early recognition systems are being utilized around the world including the UK in Northumberland. This endeavor, a partnership between Northumberland National Park Authority, Northumberland Fire and Rescue Service and TMS Europe is the first of its kind in the UK.

Typical alert times range from around four minutes for a single tower setup to approximately two minutes for multi-tower systems with a high degree of accuracy. The system installation, maintenance, and service require experienced personnel that also have to be familiar with the local area to help determine if there really is a fire.

The Human Element

All the technology in the world will not prevent or abate wildfire disasters without incorporating the human elements of awareness and participation. In fact, it could be said that all disaster-related activities are people-centered. The objective of people-centered early warning systems is to empower individuals and communities threatened by hazards to act in sufficient time and in an appropriate manner so as to reduce the possibility of personal injury, loss of life, damage to property, the environment, and loss of livelihoods.

A complete and effective early warning system comprises four inter-related elements: risk knowledge, monitoring and warning service, dissemination and communication, and response capability (see figure below). A weakness or failure in any one part could result in failure of the whole system.

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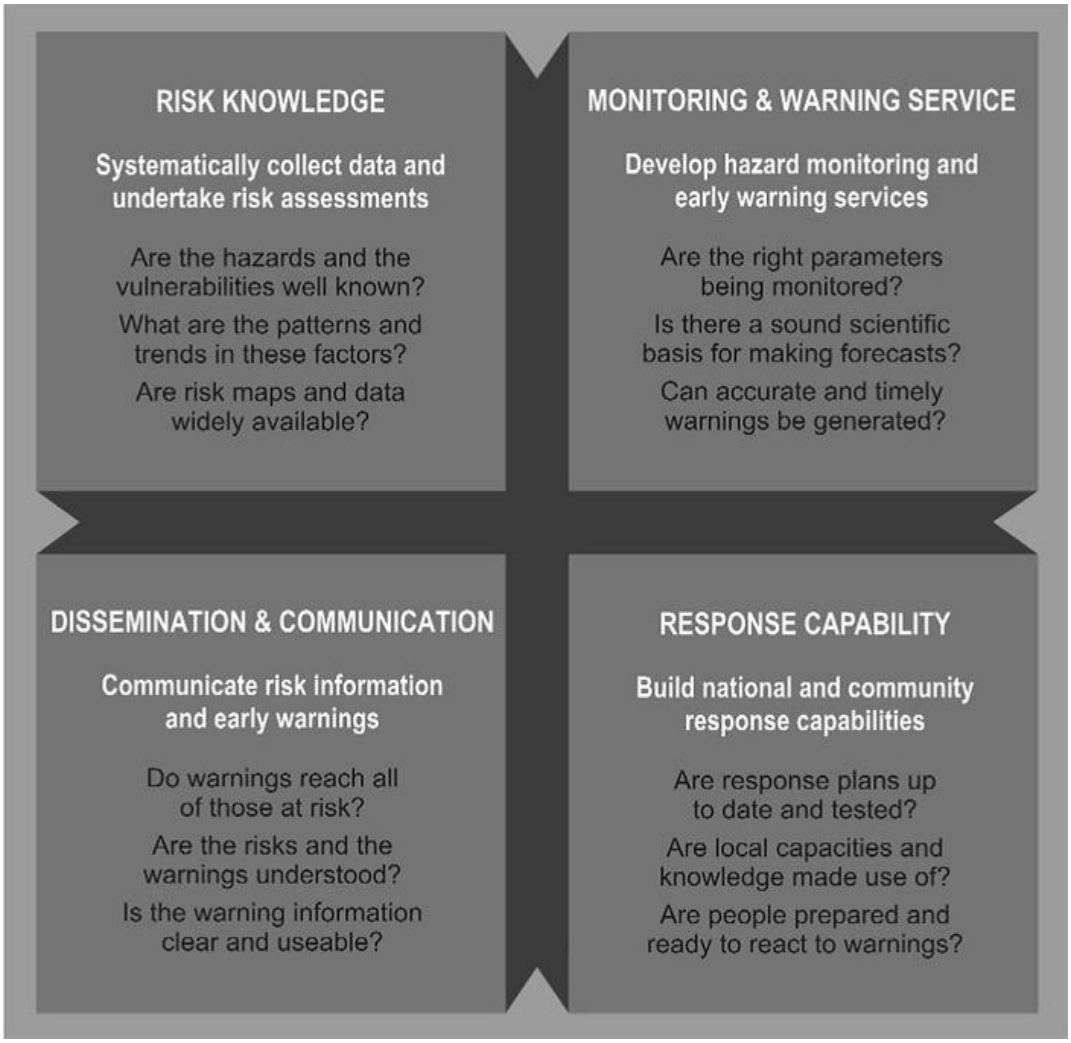
Early Detection



Whilst this chapter has referred to tower warning systems, either mechanical or manned, previous chapters have referred to the use of volunteers on the ground in high risk areas. Whilst this method clearly does not have the same range (or coverage) potential as a tower system, applying the above principles to the use of volunteers can achieve excellent results.

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Response

This chapter has examined many of the elements that, if adopted, can assist the FRS to make effective plans to deal with a wildfire. The final element of this work has to be to ensure that, in order to justify the time and effort spent understanding the risk and making effective plans, the speed and weight of the response to a wildfire supports this preparation and enables a successful outcome to any wildfire event.

However, at times when resources are stretched the topic of response may be, more than any other topic in this chapter, an emotive one. Across the UK, many Services class outdoor fires in such a way that they will usually only mobilise, in normal circumstances, a single appliance which may then proceed to a potential wildfire incident at normal road speed without the assistance of blue lights.

Whilst for the majority of outdoor fires this approach is a sensible use of resources, the possible detrimental effect of an increased attendance time to a wildfire that this provides can then be amplified by vehicle being potentially unsuited to the conditions (off road requirement etc.) that it finds itself confronted with. This leaves FRS facing the challenges of providing a more suited response at times when the risk is higher.

However, when advanced planning dictates, or the Met' Office says that the wildfire severity index is high dependent upon the criteria set, Fire and Rescue Services should prepare themselves by amending / upscaling their planned response to outdoor fires / potential wildfires. This amended response could be applied in a number of different (basic) ways, including:

- To any outdoor fire across a County / FRS area
- To specific geographical areas – where wildfires are known to occur historically at high risk times.
- To areas identified by any risk assessment or wildfire threat analysis carried out

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Response

These amended attendances could then be refined further to specific times of day or to be weather dependent, for example, if logistically feasible. Whatever methodology adopted it is clear that a part of being prepared should be to ensure that the speed and weight of attack to a possible wildfire (along with the firefighting tactics employed) should be appropriate to the wildfire threat. Many FRS, particularly those with a significant rural area, will already have considered and amended their response but, as the threat from wildfire encroaches into more urban areas, this is now a task that every FRS should consider.

Surrey Fire and Rescue Service, as a part of a total refresh of their wildfire planning, preparation and response, amended their normal response (at designated high wildfire risk times) to predetermined locations as follows:

Wildfire Response:

Unimog x1, Landrover x1, Appliance x1, Water carrier x1, Wildfire Officer x1
NB – mobilising priority is provided to the specialist appliances
To: All high fire risk areas, as determined historically
When: Spring and summer months to coincide with the summer strategy

In the above case study, the initial operational response to a potential wildfire is significantly higher than they would be to a reported fire at the same location out of the identified high risk period. Dependent on the planning carried out this high risk period may be narrowed down, meaning for example that on a cool morning or afternoon in late summer a normal outdoor response is sent.

This, however, is an ambitious response that, whilst it utilises fully the specialist appliances that are available and the training that the operational personnel have received, may be unachievable in other FRS. This is not to say that an enhanced response should not be put in place, just that it will need to suit each FRS dependent upon the circumstances. So, an alternative to the above for example may be to mobilise two appliances (travelling under blue lights) along with additional specialist vehicles as available.

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Response and Prescribed Burning

There is a strong argument for inserting anything about prescribed burning in the prevention chapter of this manual. Although it can be used effectively in both a prevention and a response scenario, I have included it in this chapter to demonstrate how it can benefit the response planning of a Fire and Rescue Service by reducing the overall resources needed at a wildfire. The previous pages refer to a wildfire response based on utilising more appropriate appliances and equipment and this follows in that theme and offers FRS a different approach.

Prescribed burn in Portugal

Prescribed Burning:

A prescribed burn, also known as hazard reduction burning, backfire, is a wildfire set intentionally for purposes of forest management training, farming, habitat restoration or greenhouse gas abatement.

Back burning involves starting small fires along a man-made or natural firebreak in front of a main fire front and is utilized in controlled burning and during wildfire events. Back burning reduces the amount of fuel that's available to the main fire by the time that it reaches the burnt area.

There is a growing movement within the UK to implement the use of prescribed burning, not only for fuel management as part of a (pre fire season) prevention campaign, but also actively during a wildfire (back burning).

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Response and Prescribed Burning

Where burning can be used effectively as part of an operational response it can provide, among others, the following benefits:

- Reduction in the time taken to extinguish a wildfire and mitigate their severity
- Reduction in the overall number of personnel and appliances required at an incident, reducing response costs
- Improved firefighter and public safety, protecting lives by reducing the build up of flammable fuel loads

Other benefits, when carried out as part of an ongoing land management plan can include, amongst many others:

- Maintaining biodiversity
- Rehabilitating vegetation after disturbances such as timber harvesting or mining
- Undertaking research on fire and its interaction with the environment

Hand prescribed burning with drip torches.
(Photo © Jennifer Eliot/Parks and Wildlife)

Safety and Effectiveness

Safety needs to be a primary concern when carrying out prescribed burns. Whilst a simple concept, prescribed burning depends on some complex factors that are not always predictable and therefore there is always an element of risk associated with a prescribed burn. There needs to be rigorous planning and scrutiny of any prescribed burn, in accordance with the circumstances that it is to be deployed (ie pre fire season or during a serious wildfire to prevent a further escalation of the fire). The benefits of instigating a prescribed burn however can be great. During a wildfire, fire behaviour is directly affected by the amount of fuel (vegetation) available to it. **Reducing the vegetation and hence the fuel is far more likely to succeed in stopping a wildfire than any direct attack on it.**

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Response and Prescribed Burning

More than one FRS now routinely make use of prescribed burning as a tool for intervention and prevention. South Wales do not use it in isolation but as a part of their overall wildfire toolbox (see case study) which includes activities already detailed in this manual (Project Bernie for example). Northumberland FRS utilise it in their collaborative burning project which also encompasses training, equipment and youth education.

Link — Northumberland FRS Collaborative Burning Project

Case Study SWFRS:

On Sunday 26th March fire crews attended a large grass fire spreading towards forestry being fanned by a strong easterly wind in the Maesteg area. 4 pumps were in attendance and the level 3 officer in attendance asked for the attendance of a burn team. They attended along with WM Hope and using Firemet, mapping and satellite photographs a plan was put in place to carry out an operational burn to stop the fire. Pumps in attendance were reduced from 4 to 1 along with a burn team who then carried out a burn to extinguish the fire. The final fire footprint was approx. 70 hectares.

There are several good examples included in the case study and appendix attached below that demonstrate the use of prescribed burning as a part of the response of a FRS to a developed wildfire. Some of the included examples demonstrate not only a much more effective way of dealing with a wildfire, but also a significant reduction in the resources needed to do so.

Link — South Wales Project

Link — South Wales 2017 – Appendix

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Partnership Preparation

Many of the initiatives detailed for FRS in the previous section are also relevant to partner organisations / individuals. Indeed, many of these initiatives have been driven by them – wildfire threat analysis and fire growth modelling for example. This section will focus on those additional activities undertaken by partnership groups within the UK which others can take up relatively easily to help with the future prevention of wildfires.

Fire Groups

There is no doubt that wildfire incidents are dealt with more effectively and efficiently when a collaborative approach is adopted. The concept of partnership working is very well established with UK FRS and there is also a growing recognition that without a renewed focus and strategy, by all partners, for dealing with wildfire events, then the likely outcome will be:

- A significantly increased operational commitment
- Increasingly stretched resources
- Increased associated costs

It is important the FRS look to move their focus from incident response to more effective and robust pre-planning and prevention. To do this they will need to increase the assistance available from partnerships to deliver these changes, it being impossible to address future wildfire risk in isolation.

There are a number of partnerships which have been developed to bring wildfire stakeholders and practitioners together to improve planning, prevention and response, and at the same time enhancing cross sector liaison and facilitating the sharing of knowledge and best practice. These groups, such as the South East England Wildfire Group (SEEWG) , Northumberland Fire Group or the Peak District National Park Fire Operations Group bring a number of benefits to FRS, the partners organisations and the UK as a whole, including:

- The development of closer links between the FRS and partners (and potential partners), that can provide tactical and logistical operational assistance in the event of a wildfire incident.

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Fire Groups

- The creation of a useful framework to help provide a collective response to wildfire emergencies. This will help maximise the effective and efficient use of resources, prevent duplication, and to some degree minimise and share cost.
- The creation of invaluable points of contact, networking and capacity building.
- An opportunity for effective restoration plans to be developed to address longer-term environmental impacts.
- The alleviation of many of the problems routinely confronted at large wildfire incidents through the enhanced preparedness that these groups can offer

However, with the success of a Fire Group depending greatly on good working relationships, trust and a shared belief of the mutual benefit of collaborative working, it needs to be structured in such a way that it empowers all partners to play a full and meaningful role in the group.

Case Study Northumberland Fire Group

Group Membership

The membership of a wildfire group will depend upon the local circumstances at the time. Some will be formed where there are numerous potential partners, and in other areas the opportunities to involve other agencies may be more limited. To obtain the maximum benefit from a group then a balanced blend of the following stakeholders should be sought:

- National Stakeholders
- Regional Stakeholders
- Local stakeholders

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Fire Groups

Governmental and National stakeholders may include:

- Scottish Natural Heritage
- Natural England
- Scottish Environment Protection Agency
- Environment Agency (UK, Northern Ireland)
- National Parks
- National Trust/National Trust for Scotland
- Forestry Commission or Forestry Commission Scotland
- Crown Estates, Ministry of Defence
- Water Authorities
- Local Authority Emergency Planner / Development Control Planner
- National Resources Wales

Non-government organisations may include (for example):

- National Game Keepers Association
- National Farmers Union and NFU Scotland
- The Heather Trust
- The Moorland Association (Scotland Moorland Forum)
- Wildlife Trust, Woodland Trust
- The Countryside and Business Association
- Scottish Land and Estates

Local stakeholders may include:

- Local FRS personnel
- Local community representatives
- Local community leaders

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Fire Groups

Features of a Successful Fire Group

- The group should be a consortium made up of equal partners.
- The secretariat of the group should ideally have an understanding of wildfire and links with the rural sector.
- The group should have a clear mandate.
- There should be a willingness to work together for the benefit of the group.
- There should be effective methods of communication between members, meetings should be held when necessary but kept to a manageable number.
- The development of local fire plans should be a priority, copies should be held by the local land manager and the FRS.
- Standard operational procedures should include active partner involvement, the role of partner agencies within the plan should be fully understood by FRS and other partners

Further, to ensure the group maintains focus and has clear aims and objectives, it should work to an agreed plan. Plans however can be time consuming to produce and even agree amongst partners from such varied backgrounds. The South East England Wildfire Group are working to the second iteration of their three-year plan and, with the majority of the aims and objectives in it being common to all Fire Operations Groups, a copy of it is included below for reference, adaptation and use as required.

Link Fire Operations Group Plan

To both support and where required guide the work of local groups as well as deal with the national issues that exist outside the scope of these groups a number of national bodies have been formed since the Scottish Wildfire Forum (SWF) in 2004, including the English Wildfire Forum (now the England and Wales Wildfire Forum EWWF) in 2007.

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National Wildfire Bodies

These forums are unfunded and committed to promoting and developing a wider understanding of wildfire, its impact and associated risks. They help create a strategic forum between fire and rescue services, national land management agencies, environment and conservation groups and other relevant stakeholder agencies in Scotland, England and Wales. They also develop and communicate wildfire prevention, protection and mitigation strategies to Government, stakeholders and their wider communities.

The FRS have their own national body, the Chief Fire Officers Association (CFOA) Operational Wildfire Group, created in recognition of the raised awareness of and risks posed by wildfire incidents, the with membership open to all UK FRSs. Some of the key prevention / preparedness aims of the CFOA Wildfire group are to:

- Raise the awareness of risks and dangers of Wildfire incidents within the UK FRS community.
- Offer advice and support to Fire and Rescue Services regarding Wildfire pre-planning, prevention and response.
- Encourage and support Fire and Rescue Services to work in partnership with local and regional land management agencies to develop more effective planning and response networks, i.e. Fire Operations Groups.
- Identify and share best practice in relation to Wildfire Incidents.

- Develop an effective marketing, lobbying and communications strategy to support the activities of the Working Group.
- Seek to support improved data quality, collection and statistical analysis of wildfire events from the CLG Incident Recording System and external partners.

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Community Preparedness

This manual has looked at how individuals in a community, perhaps together with their neighbours, can help prepare and protect themselves from wildfire. However, to be truly prepared, a community needs to prepare collectively, which sees all those people or businesses that leave a footprint of any size in any particular community, with a role to play.

Further it is well documented that the risks to both people and communities are greatest where a RUI (Rural Urban Interface) exists. For this reason, it makes sense for communities to fully understand the risk associated with living in these areas.

One, highly effective, method of preventing wildfires from threatening communities that have a RUI is to eliminate (or remove) the risk before the fires occur as a part of their preparations. If it were as simple as removing the fuel, then this element would be easy to achieve. However, the distribution of land ownership across the UK is complex and there is little legislation available to enforce good land management in relation to fire prevention. Good land management practices have been covered, as far as they can be, in a previous section however and this section is designed to look at how a community as a whole can cooperate to help reduce the risk from wildfire through a number of different practices.

FIRE ADAPTED COMMUNITIES

In many areas of the world where populations are regularly put at risk from seasonal wildfires, FRS, local authorities and communities are well practised in the actions each play in the event of wildfires. There are many examples of where this practice – referred to as ‘Fire Adapted Communities’ has saved both property and lives.

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Fire Adapted Communities

The Chief Fire Officers Association (CFOA) along with the International Association of Fire Chiefs (IAFC) and the National Fire Protection Association (NFPA) in North America have agreed a Memorandum of Understanding (MoU) for the sharing of resources. This includes the well-established 'Fire Adapted Communities programme' which uses tools, supported – in the USA - by federal and state agencies, to prepare its homes, neighbourhoods, businesses, infrastructure, natural areas, and surrounding landscape for wildfire.

Wildfires that threaten rural urban interface communities are destructive not just to homes and the eco-system but also threaten utilities such as drinking water and electricity. They disrupt daily life by closing roads and businesses, and are a significant drain on local and federal budgets. The Fire Adapted Communities initiative provides a resource for residents, businesses and government to implement community-wide plans to address various wildfire threats and concerns.

A Fire Adapted Community (FAC) is one where its members understand and accept their wildfire risk and have taken pro-active steps to improve the safety and resilience of their infrastructure, homes, landscapes and community assets to withstand a wildfire. The more action the community takes, the more fire adapted it becomes. The Fire Adapted Communities (FAC) programme provides a collection of resources to help individuals and communities learn about and prepare for wildfire. The initiative aims to offer the latest developments in wildfire safety, best practices, toolkits and programs of the nation's leading wildfire organizations. There is a wealth of material available to use freely from their website:

Link www.fireadapted.org.

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Wildfire Prevention Manual – Chapter 5

Fire Adapted Communities

The reader may ask what makes the FAC programme different from the numerous other successful education programmes plans and regulations that can help a community address their wildfire risk. Fire Adapted Communities emphasizes collaboration, community protection and personal responsibility, and recognizes that multiple approaches are more effective than **any one** single program.

So, for example, becoming Firewise is a great first step toward improving the chances of a home's survival from wildfire, but there are many other ways to help protect the entire community. Using the additional tools offered by the program to become a Fire Adapted Community will help protect important community-wide assets to enjoy in the future.

In the USA there exists the FAC coalition, which is a group of organizations, coordinated by the National Fire Protection Association and United States Forest Service, committed to helping people and communities in the WUI adapt to living with wildfire and reduce their risk for damage, without compromising fire-fighter or civilian safety. Their enthusiasm to share their learning has ensured that the FAC program and its benefits are available for UK communities to follow. The two clear immediate benefits of the FAC program are:

- It provides clear defined responsibility for all parts of the community to follow.
- It identifies that wildfire management does not just fall to the role of the fire authority

Link FAC Guide

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Wildfire Prevention Manual – Chapter 5

Community Preparedness

There are a large number of resources available from the links already provided, the web site as a whole. The following link, although created for the American market, also provides some useful information:

Link — Wildfire - Preventing Home Ignitions (pt 1)

Link — Wildfire - Preventing Home Ignitions (pt 2)

It is vital that communities not only work together but also work well with their local Fire and Rescue Service. It is also likely that a community will want to run more than one programme / initiative and hence it is important that they understand how they work together. The International Association of Fire Chiefs Ready, Set, Go! (RSG!) Programme seeks to enable just this and to improve the dialogue between FRS and the communities they serve.

Ready, Set. Go!

The programme helps FRS teach individuals and communities in high risk wildfire areas – within the rural urban interface (RUI) – how to best prepare themselves and their properties against wildland fire threats. The program's tenets help residents be:

- *Ready* with preparedness understanding
- *Set* with situational awareness when fire threatens, and to
- *Go* early when necessary.

The RSG! Programme works in complementary and collaborative fashion with existing wildland fire public education efforts, like Firewise, and amplifies their messages to individuals.

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Ready, Set, Go!

As already discussed, the NFPA's Firewise Communities Program encourages local solutions for wildfire safety by involving homeowners, community leaders, planners, developers, firefighters and others in creating fire-adapted communities – places where people and property are safer from the risk of brush, grass and forest fires.

Firewise principles can help individuals and communities accomplish the "**Ready**" tenet of RSG by providing the proven steps to empower individual homeowners to lower their property's wildfire risk and to work with their neighbours to make their community safer.

Used together, the Ready, Set, Go! and Firewise Communities programs can save lives and property by:

- **Defining the risk and responsibility.** Whilst fire is a natural process, the loss of homes to wildfire is not inevitable. Once residents understand what causes homes to ignite, they have a better understanding of their role in protecting their families, homes and property from wildfire – all year round.

- **Empowering individual action.** Ready, Set, Go! and Firewise provide individuals and communities with specific guidelines for reducing risk within the home ignition zone.

- **Encouraging community-level engagement.** By taking a fire-adapted community approach to wildfire preparedness, communities can greatly reduce their wildfire vulnerability. The Firewise Communities Recognition Program facilitates this process with a framework for communities to work with partners to organise, plan, and conduct activities each year that make a difference in community wildfire safety.

- **Furthering firefighter and resident safety during a fire event.** A fire-resistant property enables firefighters to focus on containing the wildfire itself, rather than defending individual structures. Ready, Set, Go! also brings fire departments and residents together to build important understanding, preparedness, and action.

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Ready, Set, Go!

There are a vast number of resources available to support RSG! Initiatives available from the web site. Two useful 'rack cards' with the basics of the RSG! Programme included on them are provided below for reference:

Link RSG! Rack Card 1

Link RSG! Rack Card 2

Community Emergency Response Teams

With the promotion of community resilience and the pressures on FRS and their partners, the potential for the inclusion of community members in FRS activities both before and during emergency incidents has never been higher. In the USA for example the use of community emergency response teams (CERT) for basic disaster response in areas such as fire safety, light search and rescue, team organization, and disaster medical operations is widely used and accepted.

Link CERT Programme

In the UK the use of these teams has the same potential but not everyone (including Fire and Rescue Services) has currently bought into the concept of community preparedness and their use is currently less widespread.

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Community Emergency Response Teams

In every part of the UK, there is an incredible resource that is not utilised to its potential, either through the official CERT programme or other local initiatives. The Federal Emergency Management Agency (FEMA) in the USA recommends the following roles for a standard, ten-person team:

- **Team Leader (TL)**. Would take the Incident Commander (IC) role until the arrival of someone more competent. The TL assesses the scene and assigns initial actions for team members, assuming the role of Safety Officer until assigned to another team member. The TL will set up the scene including designating treatment area and vehicle traffic routes etc. Crucially the TL will communicate and coordinate with the incident commander, and other authorities as required, passing on much needed information to allow a fully informed operational plan to be developed.
- **Safety Officer**. Checks team members prior to deployment, determines safe or unsafe working environments, supervises operations (when possible) where team members and victims are at direct physical risk and raises the alarm when unsafe conditions arise.
- **Fire Suppression Team (2 people)**. Suppress small fires as needed and assist generally as required by the team leader.
- **Search and Rescue Team (2)**. Search and rescue as safe to do so under the conditions. Assisting generally as required by the team leader.
- **Medical Triage Team (2)**. Provide triage for victims found at the scene as required and assisting with other tasks as required.
- **Medical Treatment Team (2)**. Provides medical treatment to victims within the scope of their training and assists with other tasks as required.

The greatest asset that these teams may bring however (in an emergency situation) is information – the location of the vulnerable and elderly, locations most at risk and extent of the incident on arrival for example, allowing incident commanders to make informed decisions about their actions and the best use of resources.

Preparedness Contents

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