Title:	Wildfires
Project Executive:	CFO Alex Bennett, Northumberland FRS
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National Operational Guidance – Wildfires first edition version one (ARCHIVED on 20-09-2017)

Wildfires guidance

This guidance on wildfires has been developed for fire and rescue services operating throughout the whole of the UK.

Fire and rescue services may also find it useful to refer to the Scottish Government's [Wildfire Operational Guidance](#) that was published in 2013. The publication was produced specifically for Scotland but it remains a good source of detailed information on wildfire operations and contains useful illustrations that can be used by all fire and rescue services in the UK for training purposes. The Scottish Government's publication also provides specific information on wildfire preparedness, pre-planning and partnership activities; these are important topics but are outside the scope of National Operational Guidance.

The following guidance for wildfires does not replace the Scottish Government's publication, but ensures that guidance on wildfire incidents is now available for fire and rescue services across the whole of the UK. It should also be noted that the two documents are compatible with one another; this guidance for wildfires focuses solely on wildfire operations, while the Scottish Government's publication addresses wildfire issues in a much broader context.

Introduction

This section of the guidance identifies the hazards and control measures that must be considered when writing policies and procedures for dealing with wildfires. For the purpose of this guidance, a wildfire is defined as any uncontrolled vegetation fire where a decision or action is needed about its suppression. A wildfire will meet one or more of the following criteria:

- Involves a geographical area of at least one hectare (10,000 square metres)
- Has a sustained flame length of more than 1.5 metres
- Requires a committed resource of at least four fire and rescue service appliances/resources
- Requires resources to be committed for at least six hours
- Presents a serious threat to life, environment, property and infrastructure

The level of wildfire risk is not evenly spread across the UK; it varies considerably between seasons and between different regions of the UK. The key factors influencing wildfire risk are the prevailing weather conditions, vegetation types and the local topography.

Historically the UK has experienced periodic severe wildfire seasons. These seasons have tended to coincide with extended periods of warm and dry weather, and have sometimes been accompanied by high winds. The risk of wildfires is also affected by the size, condition and dryness of the fuel. Increased rainfall before warm, dry periods can cause rapid vegetation growth that can increase the risk of wildfires when the vegetation later dries. These are the conditions that provide the ideal environment for the development and spread of large and destructive wildfires.

Wildfires can be particularly challenging incidents for fire and rescue services to deal with because of their erratic nature, their potential size, scale and intensity and because of the rural and rural-urban interface environments in which they tend to occur. Large wildfires can be very resource intensive and this can create challenges for fire and rescue services in maintaining operational resilience and emergency cover.

Wildfires can have beneficial and/or negative impacts on the environment; the potential environmental impact is an important factor when planning how to deal with wildfires. The aim of developing guidance for

wildfire control and effective firefighting tactics is to reduce the negative impacts that can be caused by these incidents.

In 2013 the Scottish Government published the Wildfire Operational Guidance, highlighting that:

> *"The impact of such a high volume of wildfire events in such a short concentrated period presents obvious challenges to FRSs in responding to the wildfires whilst maintaining their ability to meet other emergency operational demands and manage operational budgets."*

In recognition of their potential impact, 'severe wildfires' were added to the National Risk Register for Civil Emergencies in 2013 and 2015. In 2013, the National Risk Register stated:

> *"While the impact of wildfires is relatively low compared with other emergencies, the location of severe wildfires could cause damage or disrupt transport and energy infrastructure (for example, roads, airports, pipelines and power lines), commercial property and homes and crops. They also result in air pollution from smoke and fumes and could contaminate water and habitats and pose a health and safety risk."*

National Operational Guidance: Fires and firefighting provides the operational response for smaller, outdoor fires, along with generic information about firefighting media and techniques. This piece of guidance provides the more specific operational response for wildfires.

Intraoperability and interoperability

Given the potential size and scale of wildfire incidents, the guidance acknowledges that operational activity may involve more than one fire and rescue service and/or may also involve land management agencies and other rural sector stakeholders. Planning and preparation will help fire and rescue services to work effectively with adjoining fire and rescue services and other rural sector stakeholders.

Land owners and managers have local knowledge that may assist fire and rescue services attending a wildfire. Pre-planning should enable fire and rescue services to identify who to contact and how to contact them. Local land managers may be able to provide information about access, animals, livestock and visitors. They may also be able to provide specialist vehicles and equipment.

This guidance has been developed for UK fire and rescue services. However, it could also be used as a source of information for rural sector stakeholders, such as land managers, to gain an understanding of the fire and rescue service's operational activities.

Fire and rescue services legislation

Fire and Rescue Services Act 2004

Fire and Rescue Services (Northern Ireland) Order 2006

Fire and Rescue Services (Emergencies) Order (Northern Ireland) 2011

Fire (Scotland) Act 2005

Police and Fire Reform (Scotland) Act 2012

Civil Contingencies Act 2004

The Civil Contingencies Act 2004 (Contingency Planning) (Scotland) Regulations 2005

Northern Ireland Civil Contingencies Framework 2005

Emergency Workers (Scotland) Act 2005

Emergency Workers (Obstruction) Act 2006

Health and safety legislation

Corporate Manslaughter and Corporate Homicide Act 2007

Health and Safety at Work etc. Act 1974

The Management of Health and Safety at Work Regulations 1999

Provision and Use of Work Equipment Regulations 1998

Personal Protective Equipment at Work Regulations 1992

Land management and the countryside legislation

Hill Farming Act 1946

The Heather and Grass Burning Code 2007 (England)

The Heather and Grass etc. Burning (Wales) Regulations 2008

The Heather and Grass Burning Code for Wales 2008

The Muirburn Code 2011 (Scotland)

Countryside Management Publications: Heather Moorland (Northern Ireland)

Wildlife and Countryside Act 1981

Nature Conservation (Scotland) Act 2004

The Environment (Northern Ireland) Order 2002

Wildlife and Natural Environment Act (Northern Ireland) 2011

Wildfire and Natural Environment Act (Scotland) 2011

Forestry Act (Northern Ireland) 2010

Environmental Protection Act 1990

Environmental Permitting (England and Wales) Regulations 2010

Environmental Damage (Prevention and Remediation) Regulations 2009

Environmental Damage (Prevention and Remediation) (Amendment) Regulations 2009

Environmental Damage (Prevention and Remediation) (Amendment) Regulations 2010

Environmental Damage (Prevention and Remediation) (England) Regulations 2015

Environmental Damage (Prevention and Remediation) (England) (Amendment) Regulations 2015

Environmental Damage (Prevention and Remediation) (Wales) Regulations 2009

Environmental Damage (Prevention and Remediation) (Amendment) (Wales) Regulations 2015

Environmental Impact Assessment (Forestry) (England and Wales) Regulations 1999

Environmental Impact Assessment (Forestry) Regulations (Northern Ireland) 2006

Environmental Impact Assessment (Forestry) (Amendment) Regulations (Northern Ireland) 2007

Environmental Impact Assessment (Agriculture) (Wales) Regulations 2007

Environmental Impact Assessment (Agriculture) (Northern Ireland) Regulations 2007

Environmental Impact Assessment (Scotland) Regulations 1999

Environmental Impact Assessment (Scotland) Amendment Regulations 2009

Conservation (Natural Habitats, etc.) Regulations 1994

Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995

Ancient Monuments and Archaeological Areas Act 1979

Roads (Scotland) Act 1984

Highways Act 1980

Highways (Amendment) Act 1986

Water and waste legislation

Groundwater Regulations 1998

Water Industry Act 1999

Water Industry (Scotland) Act 2002

Special Waste Regulations 1996 (as amended)

England and Wales:

Hazardous Waste (England and Wales) Regulations 2005 (as amended)

Scotland:

Water Environment (controlled Activities) (Scotland) Regulations 2011

Sewerage (Scotland) Act 1968 as amended

Environmental Liability (Scotland) Regulations 2009

Northern Ireland:

Hazardous Waste Regulations (Northern Ireland) 2005 (as amended)

Water (Northern Ireland) Order 1999

Waste Management Regulations (Northern Ireland) 2006

Environmental Liability (Prevention and Remediation Regulations (Northern Ireland) 2009

Risk management plan

Each fire and rescue authority must develop their strategic direction through their risk management plan. To determine the extent of their firefighting capability, strategic managers will consider their statutory duties and the foreseeable risk within their area.

Work to identify risk and prepare operational plans should consider all stakeholders including rural sector partners, local emergency planning groups and the fire and rescue service risk management plan.

Responsibility of fire and rescue services

Fire and rescue services are responsible, under legislation and regulations, for developing policies and procedures and to provide information, instruction, training and supervision to their personnel about foreseeable hazards and the control measures used to mitigate the risks arising from those hazards.

This guidance sets out to provide fire and rescue services with sufficient knowledge about the potential hazards their personnel could encounter when attending wildfires. Fire and rescue services should ensure their policies, procedures and training cover all of the hazards and control measures contained within this guidance.

The LACES safety protocol

Introduction

LACES is an internationally recognised safety protocol, adopted in a number of countries worldwide to improve and manage safety at wildfire incidents. LACES can be fully adjusted to different circumstances and the scale and complexity of wildfire incidents. When implemented correctly, LACES is clear, concise and easily understood by all personnel. It can also be easily applied through the incident command system detailed in The foundation for incident command and National Operational Guidance: Incident command.

LACES is an acronym and stands for:

Lookouts

Awareness

Communications

Escape routes

Safety zones

LACES should be implemented at the earliest possible opportunity at all wildfire incidents. It should be continuously reviewed, revised and communicated to all personnel throughout the duration of the incident. It should also be used as a key foundation and guiding principle for developing safe and effective tactical plans for wildfires.

The ultimate responsibility for implementing and communicating LACES should sit with the incident commander. However, LACES is most effective if all personnel have an awareness of what it is and how it should be implemented. Fire and rescue services should consider providing appropriate training for personnel in how to use and implement LACES effectively.

Lookouts

Lookouts are a key element of LACES. The main role of a lookout is to manage and maintain safety by observing and monitoring the fire and personnel.

Consider deploying two different types of lookouts at wildfire incidents:

- Team lookouts (safety officers)
- Tactical lookouts (sector safety officers)

The generic responsibilities of crew/team and tactical lookouts align with the generic responsibilities of a safety officer, as outlined in The foundation for incident command and National Operational Guidance: Incident command. Lookouts, like safety officers, should not be tasked with managing crews or teams and should not be involved in delivering tasks that have been assigned to crews or teams.

Although the responsibilities of lookouts closely align to those identified for safety officers, the term 'lookout' has been retained and adopted in this guidance in order to align the terminology with the internationally recognised and accepted LACES acronym. There are also additional specific responsibilities that should be assigned to team and tactical lookouts at wildfire incidents, as explained later in this section.

Depending on the circumstances of the incident, multiple team and tactical lookouts may be needed to adequately maintain safety. For large and/or more complex wildfire incidents, the incident commander should consider appointing a safety sector commander to co-ordinate the role of all lookouts and/or safety officers. The responsibilities of the safety sector commander are outlined in the 'Safety briefings' control measure in The foundation for incident command.

All lookouts must be trained to understand the full range of hazards that exist in the wildfire environment, which includes a good understanding of fire behaviour at wildfires (refer to hazard 'Fire behaviour' for further information). All lookouts must also be trained in how to use and implement LACES at wildfire incidents. In addition, tactical lookouts must receive more advanced training in these key areas compared to team lookouts.

Team lookouts (safety officers)

The primary role of a team lookout is to observe and monitor a crew or team deployed at a wildfire incident. Depending on the circumstances of the incident, it may be desirable or necessary to join together a number of crews to form a larger team.

In addition to the responsibilities for safety officers outlined in The foundation for incident command and National Operational Guidance: Incident command, team lookouts should be deployed to ensure the safety of all team members and should:

- Ensure that all personnel are fully briefed on the situation, their task and the implementation of the LACES safety protocol

- Ensure all team members operate within the LACES safety protocol at all times

- Monitor personnel and ensure safe working distances are maintained between personnel using hand tools and equipment, and between personnel and vehicles

- Establish and maintain communications with tactical lookouts and other personnel as appropriate

- Communicate relevant information to the team, other teams and with other personnel within the command structure

- Plan, evaluate and monitor escape routes and safety zones and communicate any changes to the team and other members of the incident command structure

- Monitor and communicate any observed and predicted changes in fire behaviour and firespread to the team, the incident commander and other personnel as appropriate

- Monitor and report any observed or predicted extreme fire behaviour to the team, incident commander, tactical lookouts and other personnel as appropriate

- Monitor and report the location of members of the public, vehicles and aircraft not involved in firefighting operations to the incident commander and other personnel as appropriate

- Initiate and monitor the withdrawal of personnel from areas that become too hazardous

Team lookouts should take up a position where they can observe the activities of all team members and the area surrounding the team. Team lookouts should continually review their position throughout the incident, relocating as the incident progresses, to maintain sight of all team members. If visibility is limited by topography, smoke or other conditions then multiple team lookouts may need to be deployed to observe and monitor a single team and the surrounding area.

It may be necessary to deploy team lookouts to monitor teams using, or positioned near to, vehicles. When performing this role, team lookouts should:

- Position themselves in a place that enables them to view the vehicle, driver, team and the surrounding area

- Continually identify, monitor and communicate escape routes to the driver and team

- Monitor fire behaviour and firespread and inform drivers and the team of any changes

- Monitor the surrounding area, taking into account other personnel or members of the public that may be present in the area, and ensure that the vehicle does not drive into a hazardous area and/or does not present a hazard to others

- Initiate and monitor the withdrawal of the team, driver and vehicle from the area if the operation becomes too hazardous

Tactical lookouts (sector safety officers)

Team lookouts may work in close proximity to the fire front and it may be difficult for them to gain a full appreciation of what is happening across the whole incident ground, particularly in relation to unseen fire behaviour and spread. It is for this key reason that tactical lookouts may also be needed at wildfire incidents.

In addition to the responsibilities for safety officers as outlined in The foundation for incident command and National Operational Guidance: Incident command, tactical lookouts should also be appointed and deployed by the incident commander, operations commander and/or sector commander(s) to:

- Monitor all teams and personnel within their area of responsibility and ensure they operate within the LACES safety protocol at all times

- Gather and review information on:

  o Fuel type, condition and arrangement

  o Topography

- Monitor current weather conditions and obtain weather forecasts from command support

- Use a wildfire prediction system to:

  o Predict future fire behaviour and firespread

  o Identify windows of opportunity, trigger points and critical points

  o Inform the implementation of the LACES safety protocol

- Brief the incident commander and other personnel, as appropriate, on predicted fire behaviour, firespread and potential windows of opportunity, critical points and trigger points

- Monitor and communicate any observed and predicted changes in fire behaviour, firespread and/or weather conditions to the incident commander and other relevant personnel (for example, team lookouts and crews/teams within their assigned area)

- Monitor and report any observed or predicted extreme fire behaviour to the incident commander, team lookouts, other tactical lookouts and other personnel as appropriate

- Monitor and report the location of members of the public, vehicles and aircraft not involved in firefighting operations to the incident commander and other personnel as appropriate

- Plan, evaluate and monitor access, egress and escape routes

- Plan, evaluate and monitor safety zones

- Establish and maintain good communications with team lookouts, other tactical lookouts and other relevant personnel within the incident command system (for example, the incident commander, sector commanders, etc.)

- Exchange information with relevant personnel and other agencies (for example, land managers and personnel working for other organisations)

- Initiate and monitor the withdrawal of personnel from areas that become too hazardous

Tactical lookouts should adopt a systematic approach to monitoring and should be deployed to a good vantage point with direct sight over their assigned area. Tactical lookouts may monitor the whole incident, one or more sectors, and one or more teams, depending on the requirements of the individual incident.

Careful consideration should be given to topography when identifying suitable locations for tactical lookouts. For example, a tactical lookout positioned on top of a convex slope may be unable to see personnel working below.

Contour lines shown on
a topographical map

A) Straight slope

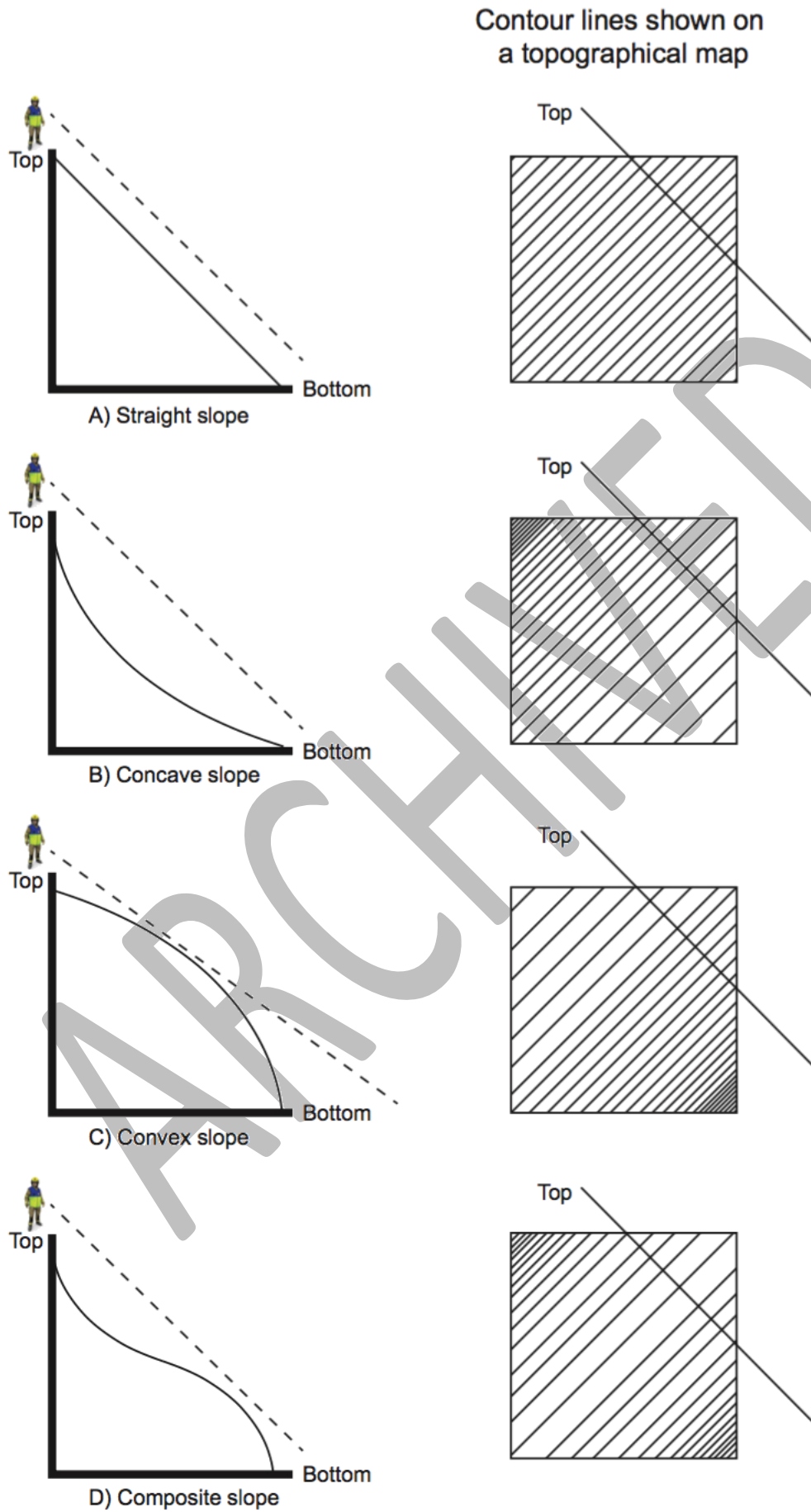B) Concave slope

C) Convex slope

D) Composite slope

Figure 1: Diagrams showing how different types of slope can affect field of vision or line of sight.

It may be necessary or desirable to deploy multiple tactical lookouts at different locations to observe the entire incident and/or all personnel deployed. For example, multiple tactical lookouts may be required in the following circumstances:

- Large and/or complex wildfires

- Where visibility is restricted due to the topography and/or smoke

- When both ground resources and aircraft are deployed

- When wildfires may cause damage to high value sites or areas, such as:

    o Property

    o Infrastructure

    o Utilities

    o Designated or sensitive sites (ecological and heritage)

If more than one tactical lookout is to be deployed at a wildfire, the incident commander should consider appointing a safety sector commander to co-ordinate the role of the tactical lookouts, team lookouts and any other safety officers deployed. The responsibilities of the safety sector commander are outlined in the 'Safety briefings' control measure in The foundation for incident command.

Figure 2: Illustration showing the appropriate positioning of multiple and tactical team lookouts.

The location of tactical lookouts should be continually reviewed throughout the incident. Wildfires are dynamic and tactical lookouts may need to be relocated as the incident progresses. Relocation may be required due to:

- Movement of personnel and resources out of sight

- Smoke

- Changes in the direction of firespread

- Changes in weather conditions

- Changes in tactics and deployments of personnel, vehicles and equipment

Incident commanders need to carefully consider how safety will be maintained if a tactical lookout needs to leave their vantage point to relocate. It may be necessary to deploy additional tactical lookouts or other resources (such as aircraft), perhaps on a temporary basis, to ensure both the fire and personnel are continually monitored. If additional tactical lookouts cannot be deployed, personnel working on the incident ground should be instructed to stop their current task and deploy to a safety zone until the tactical lookout is deployed at their new vantage point.

Awareness

All personnel should be responsible for establishing and maintaining situational awareness at wildfire incidents. All personnel should ensure they remain vigilant, continually evaluate their surroundings and communicate any hazards through the appropriate levels within the incident command system.

Information communicated by lookouts can help to significantly enhance situational awareness of all personnel at the incident ground.

Refer to control measure 'Establish and maintain situational awareness' for further information.

Communications

Establishing and maintaining effective communication is vital for maintaining safety at wildfire incidents, and in successfully implementing a tactical plan to resolve the incident. Information needs to be continually exchanged between personnel for safety and effectiveness and to enhance and maintain situational awareness. Refer to National Operational Guidance: Operations for further information about communication methods.

The size and topography of wildfire incidents may make establishing and maintaining effective communications challenging. Some wildfires occur in locations that have communication black spots that can prevent the successful transmission of messages across the incident ground. Teams may also be required to work considerable distances from one another so it may not always be feasible to rely on verbal messages and runners as a contingency plan. It is therefore important that communications are monitored and reviewed throughout the incident. A plan for using an alternative communication system in the event that the initial system fails should always be made before deploying teams.

Incident commanders should therefore consider a range of ways to communicate, including:

- Radios (airwave and incident ground)

- Mobile phones

- Satellite phones

- Line of sight relays (particularly on hilly or mountainous terrain)

- Repeater units

- Command and control units or mobile communications units

- Specialist communications provided by other agencies (for example, mountain rescue teams)

- Ground to air and air to ground communication (when deploying aircraft)

- Runners

Many wildfire incidents will require a multi-agency response. The incident commander should therefore consider how communications will be established and maintained between the fire and rescue service and other organisations. If other emergency services are present at a wildfire incident, the Joint Emergency Services Interoperability Principles (JESIP) Joint Doctrine: The Interoperability Framework should be implemented, as detailed in National Operational Guidance: Incident command.

Clear, concise briefings are a vital part of the communication strategy for all wildfire incidents. Good briefings ensure that all personnel are situationally aware and that personnel are deployed safely, effectively and efficiently. Refer to National Operational Guidance: Incident command for further information about briefings and National Operational Guidance: Operations for further information about logistical arrangements and communication.

The following actions should be carried out when briefing personnel:

- Explain how the LACES safety protocol will be implemented and managed throughout the incident

- Explain the emergency evacuation procedure and evacuation signal

- Describe the situation, including information on:

  o Location and size of the incident

  o Observed and predicted direction of firespread

  o The topography over which the fire is burning and any effects it may have on the fire

  o Fuel type, condition, arrangement and any changes

  o Weather forecast (short and medium term, if available)

  o Observed and predicted fire behaviour

- Describe the scene of operations and identify potential hazards and control measures to personnel

- Explain the tactical plan (or appropriate parts of the tactical plan)

- Outline:

  o The role and tasks of the team

  o The role and tasks of other teams (as appropriate)

  o The location and tasking of crews or teams already deployed

- Outline how the team will operate and complete the task

- Explain contingency plans

- Provide information on logistical issues, including:

    o Predicted length of deployment

    o Reliefs

    o Welfare issues

    o Roll call

- Provide information on the command structure and communication:

    o Lines of command

    o Means of communication

    o Communication processes and procedures

It is important that all information communicated throughout the incident is clear and concise. Wherever possible, locations should be identified using appropriate grid references – refer to the Map reading knowledge sheets for further information. Personnel receiving transmitted information should always acknowledge receipt and confirm their understanding.

Escape routes

Escape routes are pre-planned routes to be used in an emergency situation, to take personnel away from danger to a safety zone.

Escape routes should be identified and communicated to all personnel before their deployment at a wildfire incident. An emergency evacuation procedure and an evacuation signal, which indicates that personnel should leave their area of work and use an escape route, should also be identified and communicated to all personnel before their deployment at the incident.

Escape routes should be:

- Pre-planned, to avoid confusion and panic

- Communicated to all personnel during initial briefings and through further communication throughout the incident

- Monitored throughout the incident and changed as required, with all personnel being informed of any changes as soon as possible

Escape routes should also be:

- Established at the earliest opportunity

- Kept as simple as possible – using the closest and clearest route

- Upwind of the fire

- Downslope of the fire

- Avoiding re-entrants and saddles

Consider marking, demarcating or illuminating escape routes where possible; this should help to ensure all personnel are made aware of them.

When parking vehicles and equipment, personnel should ensure that they do not block escape routes. It is good practice to identify and communicate an alternative route to provide a contingency should a primary escape route be compromised. It is also good practice for personnel to be deployed to review potential escape routes, to assess their suitability and to estimate the time taken to travel along the escape route to a safety zone.

Although an escape route may seem suitable during the initial stages of an incident, conditions and circumstances may change. The importance of continually monitoring the suitability of escape routes throughout a wildfire incident cannot be understated. The following are some examples of changes in conditions that may slow or impede progress along an escape route:

- Fire behaviour and firespread

- Condition of route or terrain

- Weather conditions

- Reduction in visibility (for example, due to smoke or darkness)

- Fatigue among personnel, which may increase the time taken to travel along an escape route

Safety zones

Safety zones are predetermined areas of safety where personnel can find refuge from a wildfire. Safety zones should be:

- Pre-planned, to avoid confusion and panic

- Connected by appropriate escape routes, to enable access by personnel

- Continually monitored throughout the incident and changed as required

- Communicated to all personnel during initial briefings and through further communication throughout the incident

Any changes made to safety zones should be communicated to all personnel at the earliest opportunity.

Safety zones need to be a sufficient size to accommodate all personnel and to allow the minimum separation of at least four times the maximum flame length between personnel and the flames. This guideline is based upon radiant heat only, so a greater distance may be required to compensate for convective heat, particularly if there are strong winds.

Safety zones should also be:

- Close enough to be effectively used

- Devoid of fuel (or contain the minimum of fuel)

- Upwind of the fire

- Downslope of the fire

Safety zones should not be located:

- Beneath aerial fuels (canopies or crowns)

- Beneath or near overhead power lines, gas pipelines or oil pipelines

- Within saddles or re-entrants

- Where access is via steep uphill escape routes

The burned area (also referred to as the 'black area') may be considered an appropriate safety zone if it satisfies the criteria explained above and there is no remaining fuel that might sustain the fire should it change direction and burn back into the black area.

Refer to the 'safety management' section of The foundation for incident command for generic guidance.

Hazard and control statement

Hazards	Control measures
Wildfires	Commence information gathering
	Refer to wildfire fire plans
	Refer to Site-Specific Risk Information (SSRI)
	Establish and maintain situational awareness
	Consider appropriate wildfire suppression tactics and develop and implement a tactical plan
Fire behaviour	Apply generic control measures [as detailed for the hazard of 'Wildfires']
	Use a wildfire prediction system
Undetected firespread	Apply generic control measures [as detailed for the hazard of 'Wildfires']
	Carry out direct observation
	Consider using thermal imaging cameras
	Consider using aerial observation
	Carry out damping down and turning over
Failure to adequately identify and mobilise resources	Apply generic control measures [as detailed for the hazard of 'Wildfires']
	Request and mobilise internal and external resources
	Have mutual aid or memoranda of understanding arrangements in place
	Consider requesting and mobilising National Resilience assets
	Consider requesting military aid
Failure to work safely and effectively with others and their vehicles or equipment	Apply generic control measures [as detailed for the hazard of 'Wildfires']
	Identify appropriate organisations that could provide assistance and develop an effective multi-agency response
	Provide supervision
	Consider using specialist vehicles or equipment

Hazards	Control measures
Scene of operations and terrain	Apply generic control measures [as detailed for the hazard of 'Wildfires']
	Identify and monitor access, egress and escape routes
	Establish scene safety and cordons
	Operate effectively at night
	Operate at a safe distance from an electrical hazard when attending a wildfire
Physiological hazards	Apply generic control measures [as detailed for the hazard of 'Wildfires']
	Wear appropriate personal protective equipment (PPE) and respiratory protective equipment (RPE)
	Implement task rotation
	Provide rest breaks
Moving, using and entrapment of vehicles	Apply generic control measures [as detailed for the hazard of 'Wildfires']
	Consider routes for access, egress and escape of vehicles
	Park vehicles appropriately
	Use vehicles appropriately
	Consider the impact of firefighting activities on access, egress and escape of vehicles
Presence of people	Apply generic control measures [as detailed for the hazard of 'Wildfires']
	Minimise public access to the vicinity of the wildfire
	Consider evacuating members of the public
	Seek assistance to deal with the threat of deliberate fire setting
Presence of animals	Apply generic control measures [as detailed for the hazard of 'Wildfires']
	Avoid or isolate animals
	Rescue or evacuate animals
Inappropriate or uncontrolled use of aircraft	Apply generic control measures [as detailed for the hazard of 'Wildfires']
	Notify the appropriate authorities about potential hazards to aircraft
	Consider deploying fixed-wing aircraft or helicopters
	Consider deploying unmanned aircraft
	Establish communications with aircraft
	Manage the safety and security of take-off and

Hazards	Control measures
	landing areas for aircraft
Environmental impact	Apply generic control measures [as detailed for the hazard of 'Wildfires']
	Consider the protection of public health
	Consider the protection of ecological and heritage assets
	Consider the environmental impact of firefighting

Wildfires

Hazard	Control measures
Wildfires	Commence information gathering
	Refer to wildfire fire plans
	Refer to Site-Specific Risk Information (SSRI)
	Establish and maintain situational awareness
	Consider appropriate wildfire suppression tactics and develop and implement a tactical plan

Hazard knowledge

The generic control measures for this hazard should be applied when dealing with any wildfire, irrespective of its size, location or complexity.

Wildfires can be large and complex incidents that need to be carefully managed to prevent them from becoming protracted and resource intensive.

Wildfires may occur in rural areas, urban areas and the rural-urban interface and access may be limited or challenging, both for vehicles and for personnel on foot.

Control measure – Commence information gathering

Control measure knowledge

It is crucial that as far as reasonably possible the precise location of the wildfire, direction of firespread, site hazards and weather conditions are identified and communicated in a timely manner to all arriving resources and other responding agencies or services.

Strategic actions

Fire and rescue services should:

- Provide suitable maps and/or mapping systems – refer to National Operational Guidance: Operations for information about mobilising

- Provide personnel with access to weather forecasts and reports

Tactical actions

Incident commanders should:

- Request a weather report from the fire control room

- Establish the precise location of the wildfire

- Establish the direction and rate of firespread – refer to the hazard of 'Fire behaviour'

- Identify suitable rendezvous points (RVPs) and/or holding areas

- Determine suitable access routes for vehicles – refer to the hazard for 'Moving, using and entrapment of vehicles'

- Communicate information to the fire control room, arriving resources and any other responding agencies or services, including information such as:

  - Easily identifiable fixed reference points on the landscape (i.e. natural or manmade features such as hills, streams, roads or buildings)

  - Map references in an appropriate format – refer to Map reading knowledge sheets

- Carry out a 360 degree survey – refer to the control measure 'Carry out a 360 degree survey' in National Operational Guidance: Fires and firefighting

- Consider using local knowledge, wildfire fire plans and/or Site-Specific Risk Information(SSRI)

- Implement the LACES safety protocol at the earliest opportunity

Control measure – Refer to wildfire fire plans

Control measure knowledge

Wildfire fire plans (sometimes referred to as wildfire response plans) can help to improve the safety and effectiveness of the response should a wildfire occur.

Wildfire fire plans should be prepared before an incident and include a range of important information such as:

General information

- Contact names and details for land owners and/or land managers

- Contact names and details for neighbouring land owners

- Communication methods and procedures

- Rendezvous points (RVPs)

- Significant hazards

- Access points and access, egress and escape routes for personnel

- Equipment available

- Building and site plans

- Location and type of animals (refer to the hazard 'Presence of animals' for further information)

- Location and type of any hazardous materials (refer to National Operational Guidance: Hazardous materials for further information)

- Stock maps and plans (for woodland)

- Designated or sensitive sites (refer to the hazard 'Environmental impact' for further information)

- Specialist resources

- Maps of the area

- Digital photography of the area

Information on the provision of water

- Water supplies on site

- Any pre-planned arrangements to provide additional water supplies to the site

- Plans for potential deployment of high volume pumps (HVPs)

- Areas of hard standing that may be suitable for parking HVPs and for temporary dams

Information on vehicle movement and parking

- Access, egress and escape routes for vehicles

- Any narrow access or egress routes that that may require vehicle marshalling and/or one-way systems

- Any limitations to the types of vehicles that may be able to use specific access, egress or escape routes

- RVPs and suitable holding or parking areas for vehicles

- Turning and passing areas for vehicles

- Areas of hard standing that may be suitable for vehicles

- Road and bridge weight limits and surface hazards

Information on utilities

- Location of overhead power lines

- Location of gas or oil pipelines

Information related to aircraft

- Helicopter authorisation details

- Pre-planning for using aircraft

- Potential impact of a wildfire and/or firefighting operations on aircraft and airports

Information on military training areas and shooting ranges/areas

- Location of areas containing unexploded ordnance

- Location of shooting ranges/areas (both civilian and military)

- Potential impact of a wildfire and/or firefighting operations

Strategic actions

Fire and rescue services should consider developing wildfire fire plans, which could include these steps:

- Identify relevant wildfire sites and their risks, and prioritise them according to the level of risk

- Gather information for inclusion in the wildfire fire plans

- Carry out familiarisation visits to identified sites

- Record and capture the information gathered from familiarisation visits and other sources

- Establish a delivery method to present the information in a clear and timely manner

- Schedule reviews and audits for the validity and accuracy of wildfire fire plans

- Consider organising joint training to test the use of wildfire fire plans, involving other organisations as appropriate

Tactical actions

Incident commanders should:

- Refer to wildfire fire plans during an incident, if they are available

Control measure – Refer to Site-Specific Risk Information (SSRI)

Control measure knowledge

Site-Specific Risk Information (SSRI) includes pre-planning of firefighting tactics. Further information can be found in National Operational Guidance: Operations.

Strategic actions

Fire and rescue services must:

- Assess the hazards and risks in their area, and establish site-specific risk plans for locations where hazards and risks are significant

Tactical actions

Incident commanders should:

- Refer to Site-Specific Risk Information (SSRI) during an incident, if available

Control measure – Establish and maintain situational awareness

Control measure knowledge

Situational awareness concerns the perception and understanding of a situation, and the anticipation of how the situation may develop. Refer to National Operational Guidance: Incident command for further information.

Understanding the location, land use and occupancy will help incident commanders to make safe, informed decisions at wildfires.

Depending on the size and complexity of the incident, other emergency services may attend, making effective joint working critical for safety on the incident ground. Further information can be found in National Operational Guidance: Incident command and the Joint Emergency Services Interoperability Principles (JESIP), Joint Doctrine: The Interoperability Framework.

Strategic actions

Fire and rescue services should:

- Consider developing wildfire fire plans

- Make wildfire fire plans and Site-Specific Risk Information (SSRI) available to attending personnel

- Provide an effective communications network – see the LACES safety protocol

Tactical actions

Incident commanders should:

- Ensure that all personnel at the incident are situationally aware

- Develop, monitor and continually update a tactical plan

- Regularly gather and review information on the:

    o Fire – location, size, intensity, direction of firespread and rate of firespread

    o Topography – aspect, slope, the position of fire on the slope as well as any topographical hazards

    o Fuel – type, condition, arrangement and changes throughout the incident

    o Weather – current and predicted temperature, relative humidity, wind direction and wind speed

- Continually assess and review the developing incident

- Consider the following sources of information throughout the incident:

    o Information as listed in the control measure knowledge for 'Refer to wildfire fire plans'

    o Weather forecasts (for example, from the Met Office, Hazard Manager, FireMet or portable weather stations)

    o Land owners, land managers and gamekeepers

    o Countryside and national park rangers

    o Other agencies (e.g. environmental agencies, forestry organisations, national park authorities, etc.)

    o Utility companies

    o Local residents

- Provide clear, concise and structured briefings to all personnel (refer to LACES safety protocol)

Control measure – Consider appropriate wildfire suppression tactics and develop and implement a tactical plan

Control measure knowledge

Generic information about fire suppression, firefighting media and techniques can be found in National Operational Guidance: Fires and firefighting. Fire and rescue services may need to consider and use a range of tactics and tactical modes when dealing with wildfires.

Refer to the 'tactical mode' section of The foundation for incident command and to the control measure 'Risk assessment at an incident' in National Operational Guidance: Incident command for further guidance on tactical modes.

The main types of suppression tactics that can be implemented during a wildfire incident are:

- Direct attack

- Indirect attack

- Aerial attack

- A combination of some, or all, of the above

Direct attack

Direct attack is where personnel and resources work at, or very close to, the burning edge of the fire. During direct attack, firefighters attack the fire aggressively by using hand tools and beaters and/or by applying water and/or retardants.

Direct attack can be applied on different parts of the wildfire:

- Flank attack – Attacking the fire along the flank or both flanks simultaneously, usually moving from the tail towards the head

- Head attack – Attacking the head of the fire. This attack method is usually only successful on lower intensity fires and when the flanks of the fire have already been extinguished. This type of attack will be dangerous on moderate to high intensity fires. Crews should never be deployed in front of the fire and/or in unburnt fuel.

- Tail attack – Attacking the tail of the fire. A tail attack may sometimes be accompanied by a flank attack, with direct attack crews starting at the tail and moving along the flanks.
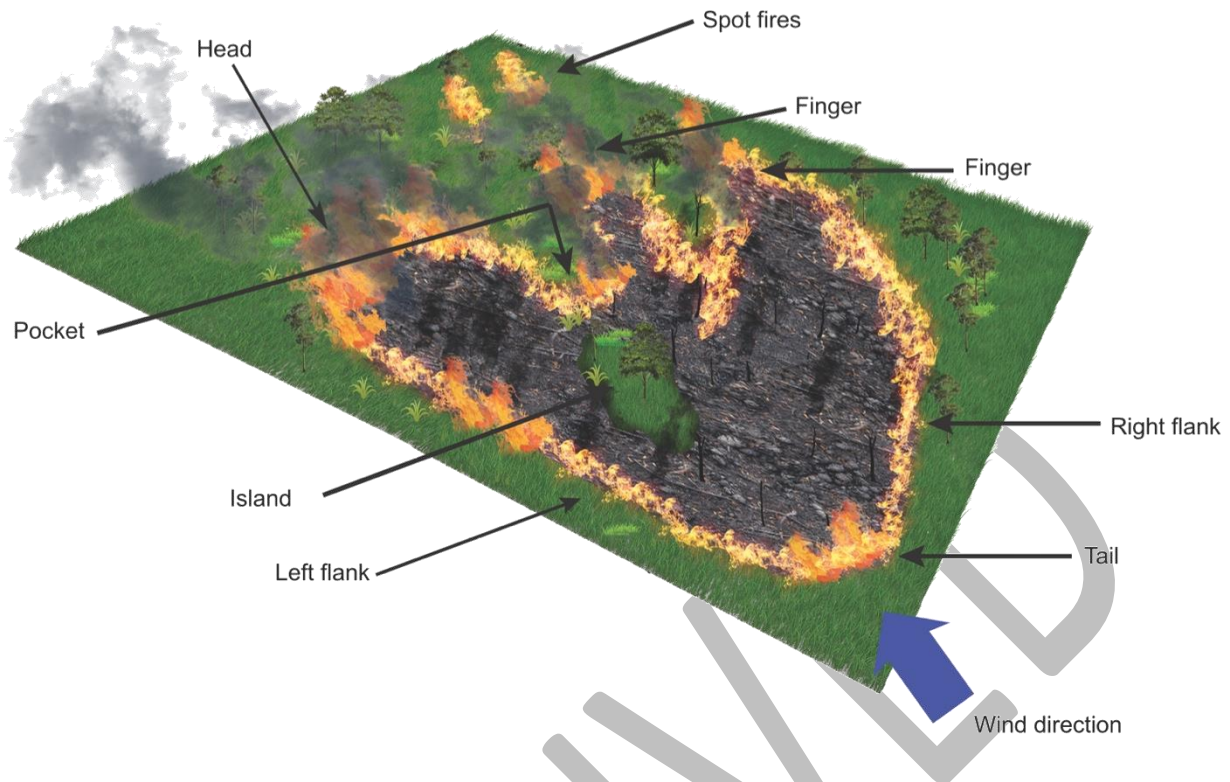
Figure 3: Illustration showing the parts of a wildfire

Direct attack using hand tools, beaters and knapsack sprayers can be a very successful suppression tactic when deployed against fires of low or moderate intensities (flame lengths up to 1.5 metres). Applying water and/or foam retardant using pressurised systems may still prove a successful suppression method for fires with flame lengths of 1.5 to 3.5 metres. Personnel working with hand tools, such as beaters, should be withdrawn from the attack until flame lengths are reduced below 1.5 metres.

When using direct attack, personnel and vehicles should always approach and attack the fire from the rear and, where possible, work from an area of fuel that has already been burned. This prevents personnel and vehicles from being deployed in unburnt fuel in front of an advancing fire, which presents a significant hazard. It also helps to reduce the likelihood of personnel or vehicles being outflanked by the wildfire.

If personnel are tasked with using hand tools, particularly edged tools such as pulaskis or rake hoes, care should be taken to ensure that adequate space between personnel is maintained. The spacing required to maintain safety will depend on the type of tool in use and the task being undertaken. It is generally accepted that the safe working distance for swinging tools is twice the length of the tool plus the length of the arm, or approximately three metres; however, this should be risk assessed on an individual basis.

Indirect attack

Indirect attack is where personnel and resources complete suppression activities some distance away from the fire front. This type of attack can be used on flames of any length, but it is often used for high and extreme intensity fires where it is not safe to implement direct attack methods.

Indirect attack methods include creating or using existing firebreaks and fuel breaks as control lines, creating new control lines or using fire as a suppression method.

There is an important distinction between firebreaks and fuel breaks:

- Firebreaks are areas where there is a change or discontinuity in fuel that will reduce the likelihood of combustion, fire intensity and/or the rate of firespread. Firebreaks may be suitable control lines.

- Fuel breaks are areas where vegetation and all other combustible materials have been removed to expose the mineral soil. Fuel breaks may be constructed and may be suitable control lines.

Firebreaks and fuel breaks are two examples of potential control lines. Control lines are constructed or natural barriers, including treated fire edges, which are used to control a fire. They can be constructed manually, mechanically or by applying water or retardants (which are called wet lines).

The minimum recommended width for a control line is 2.5 times the flame length, although it may be necessary or desirable in some circumstances to increase the width of a control line to ensure it is sufficient to contain firespread.

When constructing control lines, it is vital that the rate of firespread is taken into account so that there is sufficient time for personnel to construct the control line and leave the area before the fire arrives. Refer to National Operational Guidance: [Fires and firefighting](#) for further information on fuel breaks.

Parallel attack is a specific type of indirect attack where control lines are created along the flanks of the fire towards and around the head of the fire. This suppression method is usually most effective when performed using appropriate vehicles, such as tractors pulling swipes or flails, or bulldozers.

Another indirect attack method is the use of controlled burning. Controlled burns can be lit in advance of the fire to:

- Widen any existing control lines

- Create new control lines

- Burn out fuel ahead of the advancing fire

- Alter fire behaviour

Controlled burning at wildfires can be separated into two distinct methods:

- Defensive burning – lighting a controlled fire to remove fuel in front of an advancing fire, and extinguishing the controlled fire before the wildfire arrives. This method is normally applied some distance from the fire front and should be planned in good time

- Offensive burning – lighting a controlled fire and allowing it to burn into the approaching fire front. This is a higher risk strategy that requires careful assessment and planning

Suitable control mechanisms are required to ensure that controlled burning is completed safely and appropriately at wildfire incidents. Only those personnel that have received appropriate training, and have the relevant experience, should be allowed to use controlled burning as a suppression method.

Aerial attack

Aircraft may be deployed at wildfire incidents to use direct and indirect attack methods.

- Direct aerial attack involves aircraft dropping water or fire retardants onto the burning area

- Indirect aerial attack involves aircraft dropping water or fire retardants in front of the burning area to form control lines or to strengthen existing control lines

Aircraft and unmanned aircraft may also be used to support other tasks or activities at wildfire incidents. Refer to the hazard 'Inappropriate or uncontrolled use of aircraft' for further information about deploying aircraft at wildfire incidents.

Important considerations for developing tactical plans for wildfires

Each type of suppression tactic has relative strengths and weaknesses. The safety and effectiveness of selecting a particular tactic, at a particular time and place, will depend on a number of important factors, including the:

- Current and predicted fire behaviour and firespread (refer to hazard 'Fire behaviour' and control measure 'Use a wildfire prediction system')

- Scene of operations and terrain (refer to hazard 'Scene of operations and terrain')

- Resources available

When selecting appropriate suppression tactics, the following should be considered and identified in the tactical plan:

- Windows of opportunity – a period of time, or location on the landscape, when or where it will be particularly beneficial to adopt particular suppression tactics or actions

- Trigger points – a pre-designated point in time, or place, or a change in conditions, when or where tactics will be changed. For example, if a wildfire reaches a particular trigger point on the landscape, the incident commander may decide it is necessary to adopt alternative tactics to maintain safety and effectiveness. To provide another example, if extreme fire behaviour is observed on an area of the incident ground then this may trigger a withdrawal of personnel from this area to a safety zone.

- Critical points – a point in time or place, when or where there will be a significant change in firespread, rate of spread and/or fire intensity

Flame length can be used as a visual indicator of fire intensity and is a useful guide for selecting appropriate suppression tactics and methods. Personnel should be aware that flame length differs from flame height, as explained in the diagram below.
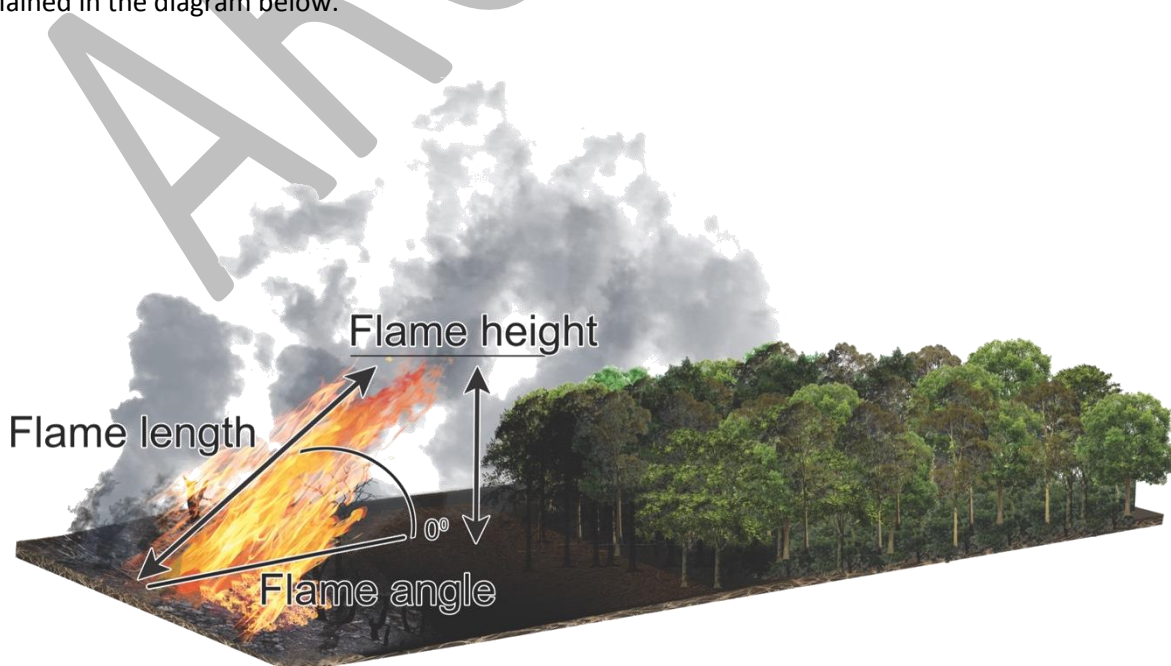
Figure 4: Illustration showing the angle of the flame and demonstrating the difference between the flame length and height

Fire intensity	Flame length	Tactic	Primary suppression methods
Low	0 to 0.5 metres	Direct attack	• Using hand tools • Applying water using knapsack sprayers • Applying water using pressurised water systems
Moderate	0.5 to 1.5 metres	Direct attack	• Using hand tools supported by knapsack sprayers to reduce fire intensity • Applying water using pressurised water systems
High	1.5 to 3.5 metres	Direct attack	• Applying water using pressurised water systems • Using aerial operations
		Indirect attack	• Using control lines • Making a parallel attack • Applying retardants along control lines • Defensive and offensive use of fire • Using aerial operations
Extreme	More than 3.5 metres	Direct attack	• Using aerial operations
		Indirect attack	• Using control lines • Defensive use of fire • Using aerial operations

Wherever possible, personnel should commence fire suppression activities from a strong anchor point to help prevent a wildfire escaping and threatening the success of the operation, and/or the safety of personnel. An anchor point is a location on the landscape that can act as a sufficient barrier to firespread. Appropriate anchor points will prevent a fire burning around and outflanking personnel working near the wildfire. Anchor points may need to be strengthened before use or created by hand or machine.

Figure 5: Illustration showing the use of an anchor point to protect firefighters from being outflanked by a wildfire

Another important consideration for developing a tactical plan is the time of day. The hours of darkness are generally characterised by cooler temperatures, higher fuel moisture and higher relative humidity levels, all of which can substantially reduce fire intensity. Reductions in fire intensity during the hours of darkness can therefore provide windows of opportunity for suppression. However, there are hazards associated with personnel working at night and/or during reduced visibility (refer to hazard 'Scene of operations and terrain'). Any activities and operations completed during the hours of darkness must be fully risk-assessed, and the hazards must be balanced against the potential benefits.
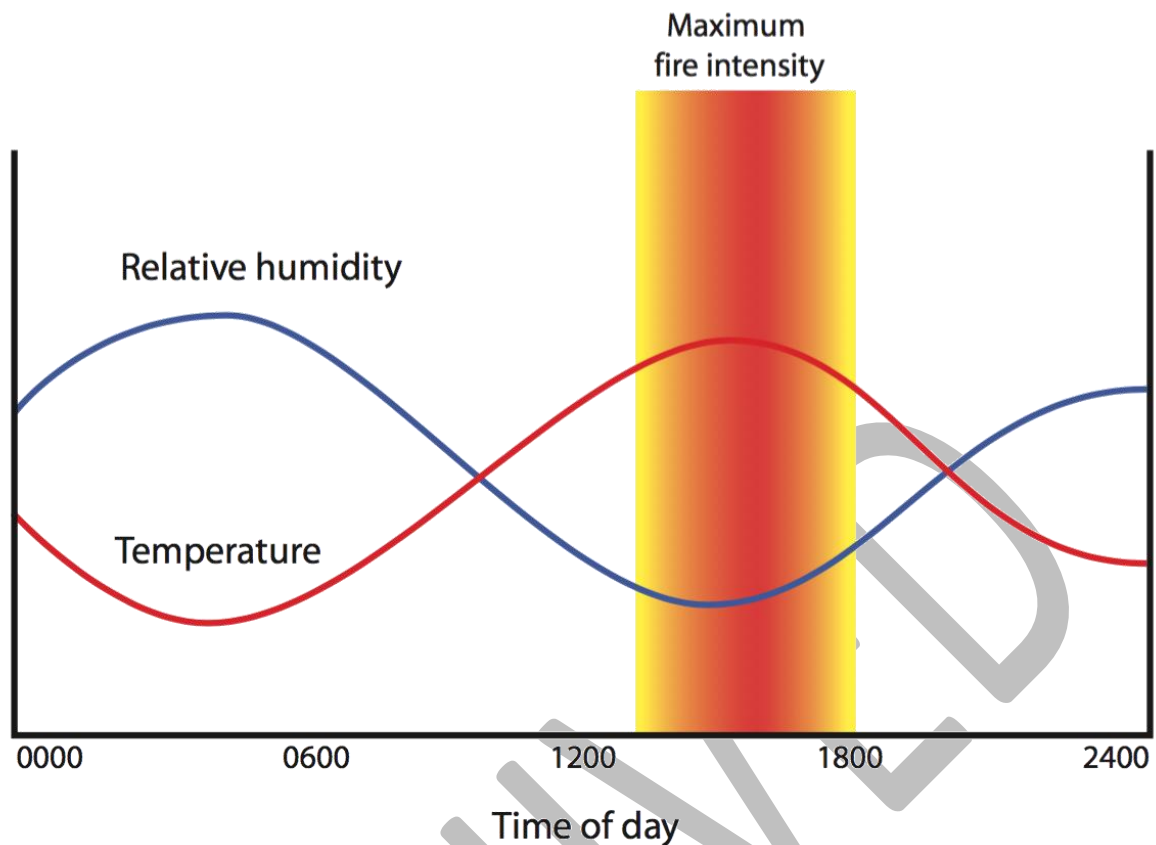
Figure 6: Diagram showing the effect of temperature and relative humidity on fire intensity

Refer to the Scottish Government's Wildfire Operational Guidance for further information about wildfire suppression methods.

Strategic actions

Fire and rescue services should consider:

- Providing specialist equipment to personnel for carrying out suppression operations, for example:
    - o Wildfire-specific hand tools
    - o Powered hand tools
    - o Knapsacks
    - o Drip torches
    - o Portable pumps
    - o High pressure suppression systems
    - o Deep penetration lances
- Providing specialist vehicles for wildfire incidents, for example, to provide off-road capability
- Providing appropriate personal protective equipment (PPE) and respiratory protective equipment (RPE) (refer to National Operational Guidance: Operations)
- Providing appropriate firefighting media (refer to National Operational Guidance: Fires and firefighting)

- Making suitable arrangements with other agencies, organisations, land owners/managers, to provide suitably trained personnel, equipment and vehicles that can be used to assist with suppression operations. Examples of specialist equipment and vehicles include:

  - All-terrain vehicles

  - 4x4 vehicles

  - Fogging units

  - Tractors with mechanical swipes or flails

  - Bulldozers

  - Excavators

  - Water bowsers

Tactical actions

Incident commanders should:

- Select appropriate suppression tactics for use at the incident

- Develop a tactical plan, taking into account:

  - All sources of information available

  - Current and predicted fire behaviour and firespread (refer to hazard 'Fire behaviour' and control measure 'Use a wildfire prediction system')

  - Predicted fire size and incident duration

  - Available resources and their capabilities and limitations

  - Identified windows of opportunity, critical points and trigger points

  - What is threatened by the fire, and if any areas need to be prioritised for protection or evacuation

- Provide clear and concise briefings to all personnel on the content of the tactical plan

- Deploy sufficiently sized teams to safely and effectively complete the tasks they have been assigned, taking into account anchor points, the need for task rotation and rest breaks – refer to National Operational Guidance: Operations for information on task rotation and rest breaks

- Consider deploying tactical lookouts to monitor fire behaviour and the safety of personnel on the incident ground (see LACES safety protocol)

- Consider deploying team lookouts to monitor the safety of teams of personnel on the incident ground (see LACES safety protocol)

- Regularly review the effectiveness of the tactical plan and the suppression tactics being used

- Where and when required, revise the suppression tactics and tactical plan and communicate changes to personnel

Refer to the LACES safety protocol for further information concerning the roles of tactical lookouts and team lookouts.

Fire behaviour

Hazard	Control measures
Fire behaviour	Apply generic control measures [as detailed for the hazard of 'Wildfires'] Use a wildfire prediction system

Hazard knowledge

Fire behaviour at wildfire incidents can change rapidly both in intensity and in the rate of firespread. The changes can be brought about by:

- Movement from one fuel type to another

- Changes in the landscape

- Changes in the local climate or larger scale weather patterns

The most extreme examples of fire behaviour are caused by a combination of some or all of these factors.

Wildfires only burn uniformly in all directions when they are burning within uniform fuel, on flat ground and in the absence of wind. Typically, wildfires will spread in an elliptical shape because one or more environmental factors act as a dominant force that increases the rate of firespread in a particular direction. The fire behaviour observed at the majority of wildfires can therefore be classified according to the following:

- Wind-driven wildfire – where the rate and direction of firespread is predominantly influenced by the speed and direction of the wind

- Topography-driven wildfire – where the rate and direction of firespread is predominantly influenced by the topography

- Fuel-driven wildfire – where the rate and direction of firespread is predominantly influenced by the amount, condition and arrangement of the fuel the wildfire is burning within

Some wildfires may be significantly influenced by more than one of the above factors. Different parts of the same wildfire may also be predominantly influenced by different factors. It is therefore important that environmental conditions across the whole incident ground are assessed and monitored because changes in fire intensity and rate of spread and the presence of extreme fire behaviour can all represent significant hazards to personnel.

Refer to the sections on 'The effects of fuel', 'The effects of weather', 'The effects of topography' and 'Fire development' in the Scottish Government's Wildfire Operational Guidance for further information about how fuel, weather and topography influence fire behaviour during wildfires.

Extreme fire behaviour

Extreme fire behaviour is fire behaviour that becomes erratic or difficult to predict. Extreme fire behaviour can lead to rapid and/or unpredictable firespread and behaviour, and can be sporadic or sustained over longer periods of time. Extreme fire behaviour is therefore a significant hazard to the safety of all personnel deployed at a wildfire incident and to members of the public.

Extreme fire behaviour can occur within varying parameters; however, a general rule of thumb is that extreme fire behaviour is highly likely when one or more conditions meet the 30-30-30 rule:

- Relative humidity at or below 30%

- Wind speed at or above 30 kilometres per hour

- Temperature at or above 30 degrees centigrade

Some of the situations where extreme fire behaviour is more likely to occur include:

- High fuel loading – particularly in fine fuels

- The existence of ladder fuels – particularly if there are large quantities of fine fuels

- Fire aligned with a strong wind

- Fire aligned with a steep slope

- High temperatures

- Low humidity

- Drought conditions

- Availability of combustible fuels (particularly dead fuels)

- Multiple seats of fire

Some of the common indicators of extreme fire behaviour are:

- A surge in fire intensity

- Long flame lengths

- Pulsating flames

- Large quantities of smoke

- Separate fires occurring outside the fire edge (spotting)

- Ignition of aerial fuels in the canopy

- An increase in surrounding air movement

Fires, or parts of fires, that demonstrate extreme fire behaviour have been given names that describe their behaviour, such as spot fires, torching, crown fires and the junction zone effect.

Spot fires

Spot fires occur when sparks and embers are transported by the wind or convection column and land to ignite new fires outside the main fire perimeter. During this process, burning material (sometimes referred to as flying brands or firebrands) can be carried considerable distances. Spot fires can breach control lines and can threaten access, egress and escape routes for personnel and vehicles. Spot fires can represent a significant hazard to personnel, particularly if undetected for a period of time (refer to hazard 'Undetected firespread').

Torching

Torching is a fire that burns from the ground through the surface and aerial fuels and into the crown of a tree. Torching can occur in areas where there are ladder fuels that can support firespread from the surface into the upper aerial fuels. Torching is normally localised and restricted to single trees or small groups of trees.
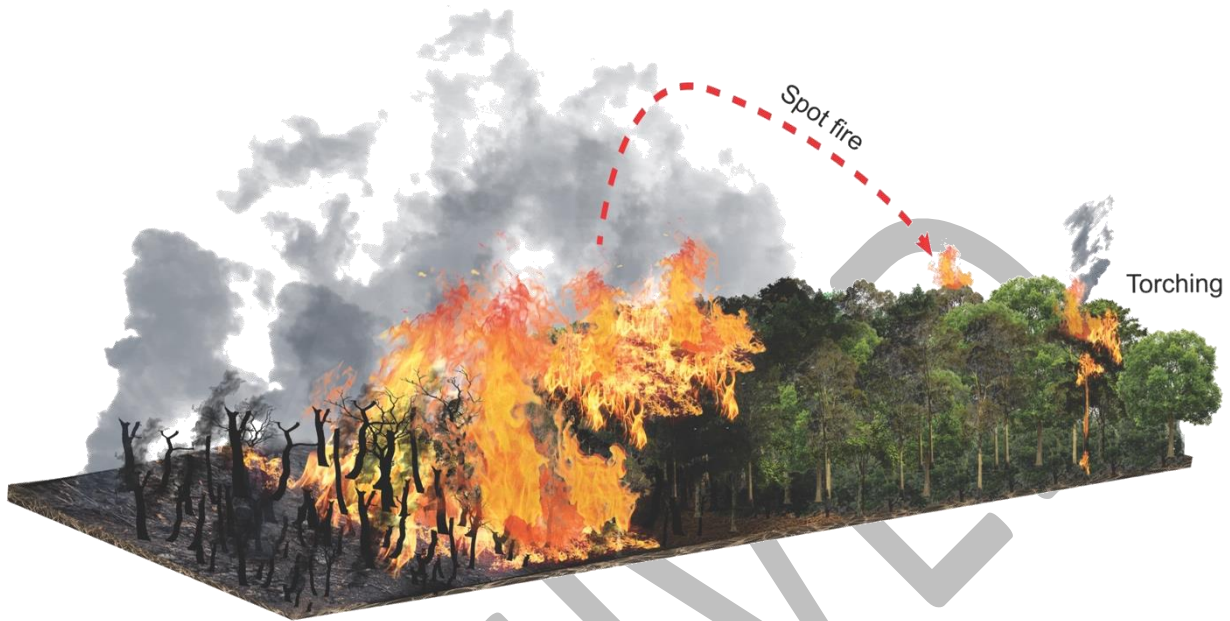

Figure 7: Illustration showing a spot fire and torching

Crown fires

Crown fires are fires that burn in the upper canopy of vegetation. Crown fires can occur in shrubs or trees and their intensity is usually dependent on the amount and condition of the fuel. For crown fires to occur, there usually needs to be sufficient and continuous fine fuels.

Figure 8: Illustration showing crown fires

Junction zone effect

The junction zone effect is an increase in fire activity caused by two fires, or two parts of a fire, burning into one another. It is caused by the in-drafts generated by each fire drawing them towards one another. This increases the speed at which the fuel is consumed and the subsequent intensity and rate of spread. The junction zone effect can also increase the likelihood of spot fires.

Refer to the sub-section on 'Extreme fire behaviour' in the Scottish Government's Wildfire Operational Guidance for further information about extreme fire behaviour at wildfire incidents.

Control measure – Use a wildfire prediction system

Control measure knowledge

Fire and rescue personnel need to understand and predict fire behaviour and extreme fire behaviour at wildfires, in order to recognise potential hazards and to manage the safety of personnel and others. The main method for predicting and anticipating likely fire behaviour is to apply an appropriate wildfire prediction system at every wildfire incident.

The key principle behind an appropriate wildfire prediction system is that fire behaviour within any given fuel is influenced predominantly by three major forces:

- Wind

- Slope

- Aspect

These three factors are referred to as the 'forces of alignment', because whenever a wildfire is supported by either the wind, slope and/or aspect it will burn with greater intensity and spread more rapidly. If the fire loses the support of the wind, slope and/or aspect the intensity and rate of spread will decrease. An understanding of how these three factors, along with the type, condition and continuity of the fuel, influence fire behaviour and firespread is of vital importance for developing safe and effective tactical plans for wildfires. More specifically, this understanding is necessary for:

- Identifying windows of opportunity

- Identifying critical points

- Selecting appropriate trigger points

- Selecting appropriate suppression tactics for use at particular times and places (see control measure 'Consider appropriate fire suppression tactics and develop and implement a tactical plan')

- Implementing the LACES safety protocol

It should be understood that sometimes the parts of the fire that show little activity (for example, lower intensity parts of the fire with lower rates of firespread) may actually have the most potential for future fire development. Tactical plans for wildfires should be based on what it is likely to happen in the future, and the initial and continuing priority must be to analyse the fire perimeter and establish what potential each part of the fire has for changes in intensity and firespread.

Refer to the section on 'The wildfire prediction system' in the Scottish Government's Wildfire Operational Guidance for further information about predicting fire behaviour.

Strategic actions

Fire and rescue services should:

- Provide personnel with appropriate topographical maps and mapping systems

- Provide personnel with weather forecasts and/or tools

Tactical actions

Incident commanders should:

- Implement the [LACES safety protocol](#) at the earliest opportunity

- Deploy tactical and/or team lookouts

- Regularly gather and review information on the:

    o Fire – location, size, intensity, direction of firespread and rate of firespread

    o Topography – aspect, slope, the position of fire on the slope as well as any topographical hazards

    o Fuel – type, condition, arrangement and changes throughout the incident

    o Weather – current and predicted temperature, relative humidity, wind direction and wind speed

- Use a wildfire prediction system to predict future fire behaviour and firespread to:

    o Identify windows of opportunity, trigger points and critical points

    o Inform the implementation of the [LACES safety protocol](#)

    o Inform the development of a tactical plan

- Continue to gather information on weather, topography and fuel, and regularly review and amend the wildfire prediction as necessary

- Brief personnel on predicted fire behaviour, firespread and identified trigger points

- Communicate any changes to predicted fire behaviour and firespread to personnel

All personnel working at wildfire incidents should inform the team lookout, tactical lookout and/or incident commander as soon as possible if they observe extreme fire behaviour.

Undetected firespread

Hazard	Control measures
Undetected firespread	Apply the generic control measures [as detailed for the hazard of 'Wildfires']
	Carry out direct observation
	Consider using thermal imaging cameras
	Consider using aerial observation
	Carry out damping down and turning over

Hazard knowledge

Undetected firespread is a significant hazard because it may lead to fires burning into areas that were not anticipated. It may compromise some or all of the following:

- Access, egress and escape routes

- Vehicles and equipment

- Personnel working at the incident

- Members of the public

- Effective implementation of the LACES safety protocol

- Other elements of the tactical plan

Three specific types of undetected firespread that are particularly challenging to identify are ground fires, spot fires and crown fires, and they should be given due consideration.

Ground fires

Ground fires are fires that burn in the fuels present below the ground surface. Ground fires usually burn in organic matter where oxygen is available, for example, burning within the roots of vegetation, buried branches, twigs or needles. In some situations, ground fires may burn in the soil itself, such as peat fires.

Peat is an extremely valuable, natural resource that plays an important role in carbon storage. It takes thousands of years to develop and is very susceptible to damage that is directly or indirectly caused by fire. Refer to the hazard 'Environmental impact' for specific control measures to minimise the environmental damage caused by peat fires, and fires in other sensitive environments.

Ground fuel fires usually burn with low intensity through smouldering combustion. They can smoulder for a significant amount of time, and travel undetected for considerable distances. They can also burn through ground fuels and then reappear at the surface and become surface fires. The unpredictability of where and when ground fires will return to the surface is a significant hazard to personnel, vehicles and members of the public. For example, ground fires may burn beneath, and subsequently breach, control lines.

Ground fires can be very difficult to locate and extinguish without access to large volumes of water and/or a means to excavate and expose the burning material. Specialist knowledge and equipment may be required to safely and effectively identify and suppress ground fires.

One of the most significant hazards posed by ground fires is that they can affect the stability of the ground that personnel may be working on. The burning of soil layers can lead to structural collapse of the ground, particularly if personnel or vehicles move onto ground where a ground fire has been burning. Also, over-hangs, holes on the ground and pan-shaped voids around tree bases are commonly produced during smouldering fires. These can lead to local subsidence of the soil and damage to roots, which can threaten the stability of trees, increasing the likelihood that they may fall. Personnel should take additional care when walking through conifer woodlands on peat soils as the lattice of shallow roots overlying burnt peat can leave dangerous trip hazards. Refer to hazard 'Scene of operations and terrain' for further information.

The smoke from ground fuel fires is produced abundantly day and night and can also represent a hazard. During periods of stable atmospheric conditions, ground fire smoke can accumulate in low lying areas. This may significantly reduce visibility for personnel working at the incident, vehicles at the incident and for

members of the public in the vicinity of the fire using, for instance, roadways and other transport routes. The hazard is further amplified when ground fire smoke accumulates at night, further reducing visibility.

Spot fires

Spot fires occur when sparks and embers are transported by the wind or convection column and land to ignite new fires outside the main fire perimeter. During this process, burning material (sometimes referred to as flying brands or firebrands) can be carried considerable distances. Spot fires can breach control lines and threaten access, egress and escape routes for personnel and vehicles. Spot fires can represent a significant hazard to personnel, particularly if undetected for a period of time.

Crown fires

Crown fires are fires that burn in the upper canopy of vegetation. Crown fires can occur in shrubs or trees and their intensity is usually dependent on the amount and condition of the fuel. For crown fires to occur, there usually needs to be sufficient and continuous fine fuels.

Control measure – Carry out direct observation

Control measure knowledge

Ground fires are, by their very nature, concealed, which means they can be very difficult to locate. It can also be very difficult to determine the depth and extent of firespread beneath the ground. The presence and location of spot fires and crown fires can also be difficult for personnel to identify when they are completing specific tasks. Spot fires and crown fires can also ignite as a result of very rapid changes in conditions and fire behaviour.

Direct observation of the scene of operations should therefore be used in conjunction with local knowledge and/or specialist advice, to identify and provide early warning of ground fires, spot fires and crown fires that may occur during a wildfire.

The primary method for monitoring the incident and providing an early warning of potential ground fires, spot fires and crown fires, is to implement the LACES safety protocol at the earliest opportunity and, specifically, to deploy lookouts. Tactical lookouts should be deployed to topographical high points and can also be deployed effectively as aerial observers (refer to the control measure 'Consider using aerial observation' for further information):

- On a fixed-wing aircraft

- On a helicopter

- To accompany the operator of an unmanned aircraft to observe images/video transmitted to the ground from the unmanned aircraft

At some wildfire incidents it may also be necessary or beneficial to deploy tactical lookouts in mobile reconnaissance roles, using appropriate vehicles.

Strategic actions

Fire and rescue services should consider:

- Providing fire and rescue service personnel with equipment to enable them to carry out observation and reconnaissance safely and effectively

- Undertaking pre-planning activity to identify and record areas that may be susceptible to ground fires, spot fires and crown fires

Tactical actions

Incident commanders should:

- Implement the [LACES safety protocol](#) and deploy team and tactical lookouts at the earliest opportunity

- Consider the number of tactical lookouts required to survey the entire incident ground

- Brief all tactical and team lookouts on their roles and responsibilities, including details on the area that they are responsible for observing and monitoring

- Provide all tactical and team lookouts with information about the potential presence and location of ground fuels, smouldering fuels and aerial fuels

- Position tactical lookouts in a place where they are able to fully observe their area of responsibility

- Consider requesting local knowledge and/or specialist advice to identify potential locations for ground fires, spot fires and crown fires and the likely areas of firespread

Control measure – Consider using thermal imaging cameras

Control measure knowledge

Ground fires may not be visible to the naked eye as there may not be clear visual indicators such as smoke or flames. Fire and rescue service personnel should consider using thermal imaging cameras to identity the emission of hot gases or hot spots, which may be an indicator that there is a ground fire.

It is worth noting that most police helicopters, including those operated by the National Police Air Service (NPAS), have thermal imaging cameras. Other aircraft such as unmanned aircraft can also be equipped with thermal imaging cameras. Using thermal imaging cameras from the air can be a very effective technique for identifying hotspots, smouldering ground or surface fires and any undetected fire behaviour and firespread (including crown fires and spot fires).

Fire and rescue service personnel should be aware of the limitations of thermal imaging cameras at a wildfire incident – thermal imaging cameras may not detect a very deep-seated fire, for example.

Strategic actions

Refer to National Operational Guidance: [Fires and firefighting](#) for information about using thermal imaging cameras.

Fire and rescue services should:

- Consider making local arrangements for using police helicopters and unmanned aircraft with thermal imaging cameras for wildfire incidents

Tactical actions

Refer to National Operational Guidance: <u>Fires and firefighting</u> for information about using thermal imaging cameras.

Incident commanders should:

- Ensure that a systematic approach for using thermal imaging cameras is adopted, such as using a grid system to scan and search the area

Control measure – Consider using aerial observation

Control measure knowledge

Aircraft can provide aerial observation for wildfires. In the case of undetected firespread an aerial view can provide early warning of spot fires and an early indication of potential ground fires.

Unmanned aircraft can also be used to provide aerial observation for wildfires. However, arrangements should be put in place to monitor the images relayed back to the pilot from the unmanned aircraft.

Refer to the hazard 'Inappropriate or uncontrolled use of aircraft' for further information about the deployment of aircraft at a wildfire incident.

Further information about working and communicating with aircraft can be found in <u>National Operational Guidance: Transport</u>.

Strategic actions

Fire and rescue services should consider:

- Making suitable arrangements for the provision of aerial support. Refer to the hazard of 'Inappropriate or uncontrolled use of aircraft' for further information.
- Appointing personnel to perform the role of aerial observer

Tactical actions

Incident commanders should:

- Establish communications between aerial and ground resources (refer to control measure 'Establish communications and manage aircraft')
- Consider deploying a tactical lookout to a fixed-wing aircraft or helicopter to carry out aerial observation
- Consider deploying a tactical lookout to accompany the operator of an unmanned aircraft to carry out aerial observation

Personnel deployed as aerial observers should:

- Identify and report any signs of undetected firespread to the incident commander

Control measure – Carry out damping down and turning over

Control measure knowledge

Damping down and turning over (sometimes referred to a mopping-up) involves extinguishing a fire completely once it has been brought under control, to prevent escape or re-ignition.

Once a fire has been contained it is important to extinguish all remaining burning material, especially near the outer edge of the fire perimeter, where burning material may be lying within unburnt fuel. Once the outer perimeter has been secured, personnel should work inwards, exposing and extinguishing hot spots or burning fuel as they go. Personnel must walk with great care to prevent them from sinking into holes left by the fire and also to guard against flames that might flare up.

To secure the area, existing control lines may be strengthened or new ones constructed. Pockets of remaining fuel can also be burned out using controlled burns (see control measure 'Consider appropriate fire suppression tactics and develop and implement a tactical plan' for further information). In cases of ground fuel fires, especially in peatlands, specially designed deep penetration lances can be used to suppress any remaining ground fires during the damping down and turning over stage. When using deep penetration lances, the nozzle should be jabbed into the smoking ground and water applied until the peat takes on the appearance of porridge – a sign that it is saturated with water. This ground piercing should be continued until the fire has been extinguished.

Excavation may be needed to expose the ground fuel fire or to create a fuel break. Depending on the depth of the ground fire this can be achieved by personnel using hand tools. For larger and/or deeper ground fuel fires, heavy machinery such as tractors or excavators may be required. If excavation is necessary, use only the width and depth needed to stop the fire. Personnel should not cause more damage than necessary, carrying out minimal digging and restricting soil disturbance to hot areas near the control line wherever possible. Any decision to excavate or create a fuel break to extinguish a ground fire should be made, wherever possible, in consultation with the responsible land owner or manager and, if appropriate and available, the relevant environmental agency.

Damping down and turning over may take a considerable length of time and, depending on the size of the incident and the vegetation involved, may continue for a number of hours or days. Therefore, it is recommended that fire and rescue services consider making arrangements to obtain assistance from other organisations.

At an appropriate point during the damping down and turning over phase, and when safe to do so, it is also recommended that the incident is formally handed over to the appropriate land owner or land management agency. Fire and rescue services should consider using handover agreement forms for this task.

Refer to the control measure of 'Damping down and turning over' in National Operational Guidance: [Fires and firefighting](#).

Strategic actions

Fire and rescue services should consider:

- Developing appropriate incident handover forms

- Providing specialist equipment for carrying out damping down and turning over, for example:

- o Wildfire-specific hand tools

- o Powered hand tools

- o Knapsacks

- o Drip torches

- o Portable pumps

- o High pressure suppression systems

- o Deep penetration lances

- Providing appropriate firefighting media – refer to National Operational Guidance: <u>Fires and firefighting</u>

- Making suitable arrangements with other agencies, organisations, land owners/managers to provide suitably trained personnel and equipment to assist with damping down and turning over. Examples of specialist equipment and vehicles include:

- o All-terrain vehicles

- o 4x4 vehicles

- o Fogging units

- o Tractors with mechanical swipes or flails

- o Bulldozers

- o Excavators

- o Water bowsers

Tactical actions

Incident commanders should:

- Start damping down and turning over at the earliest opportunity

- Adopt a systematic approach to damping down and turning over such as:

- o Observe

- o Expose

- o Extinguish

- o Monitor

- Liaise with the responsible land owner or land manager and/or the relevant environmental agency about the potential need to excavate or create a fuel break to suppress a ground fire

- Implement an appropriate inspection routine to ensure that the fire is fully extinguished

Failure to adequately identify and mobilise resources

Hazard	Control measures
Failure to adequately identify and mobilise resources	Apply generic control measures [as detailed for the hazard of 'Wildfires']
	Request and mobilise internal and external resources

	Have mutual aid or memoranda of understanding arrangements in place
	Consider requesting and mobilising National Resilience assets
	Consider requesting military aid

Hazard knowledge

Wildfire incidents often need a multi-agency response and in many cases may require specialist teams and equipment. The resources required include people, knowledge, skills and equipment, which may need to be sourced internally, from other fire and rescue services or from external agencies. It may also be necessary to request National Resilience assets and/or military aid.

The scale and impact of wildfires can be substantial and the correct and timely deployment of resources is of significant importance for a successful resolution. Without the required resources, wildfires may become more protracted and damaging.

Control measure – Request and mobilise internal and external resources

Control measure knowledge

Fire and rescue services should understand the requirements of the Civil Contingencies Act 2004 and, in particular, collaborate with local emergency planning groups and partner agencies to identify local risks. This collaboration should include an understanding of the contribution the fire and rescue service and other agencies make to the community risk register. Fire and rescue services should understand the relationship between their risk management plan and the community risk register, and understand the arrangements for obtaining Site-Specific Risk Information (SSRI) and developing wildfire fire plans.

Strategic actions

Refer to National Operational Guidance: Operations for information on how to request and mobilise internal and external resources.

Tactical actions

Refer to National Operational Guidance: Operations for information on how to request and mobilise internal and external resources.

Control measure – Have mutual aid or memoranda of understanding arrangements in place

Control measure knowledge

Fire and rescue services should have an awareness and understanding of all relevant protocols, which should include identifying any cross-border arrangements with neighbouring fire and rescue services or other agencies. They must be aware of mutual aid arrangements and should develop memoranda of understanding (MoUs) to suit the needs of their risk management plan.

Refer to National Operational Guidance: Operations for further information, including strategic actions and tactical actions regarding mutual aid and memoranda of understanding.

Control measure – Consider requesting and mobilising National Resilience assets

Control measure knowledge

Fire and rescue services should be aware of National Resilience capabilities. This should include an understanding of the arrangements contained in the national frameworks, which should in turn ensure participation in mutual aid and access to resources such as high volume pumps (HVPs) and HVP tactical advisers.

Strategic actions

Fire and rescue services should:

- Pre-plan for using HVPs in wildfire risk areas to ensure effective deployment, with consideration given to:

    o Access routes

    o Water supplies

    o Hard standing

    o Parking and turning areas

    o Routes for hose lines

- Consider consulting with the nearest HVP tactical adviser when pre-planning and developing tactical plans for the deployment of HVPs for wildfires

Refer to National Operational Guidance: Operations for information on how to request and mobilise National Resilience assets. Further information concerning HVPs and HVP tactical advisers is available on the National Resilience website.

Tactical actions

Incident commanders should:

- Give early consideration to requesting HVPs

- Consider requesting a HVP tactical adviser

- Give careful consideration to how, when and where to deploy HVPs, taking into account predicted fire behaviour and firespread

Refer to National Operational Guidance: Operations for information on how to request and mobilise National Resilience assets.

Control measure – Consider requesting military aid

Control measure knowledge

Military aid may be available to support specific tasks in a wildfire incident. It is also possible that the incident may be adjacent to, or on property owned by, the Ministry of Defence.

Military assistance can be requested through Military Aid to the Civil Authorities (MACA) in response to a wide range of contingencies and emergencies, including a natural disaster, network failure or disruption or criminal activity. The provision of MACA is guided by three criteria:

Military aid should always be the last resort. The use of mutual aid, other agencies, and the private sector must be otherwise considered as insufficient or be unsuitable.

The Civil Authority lacks the required level of capability to fulfil the task and it is unreasonable or prohibitively expensive to expect it to develop one.

The Civil Authority has a capability, the need to act is urgent and it lacks readily available resources.

Refer to [Operations in the UK: The Defence Contribution to Resilience](#) for further information about MACA and requesting military aid.

Strategic actions

Fire and rescue services should:

- Have arrangements in place for requesting military aid

- Ensure all requests for military aid through MACA are made through the established channels outlined in [Operations in the UK: The Defence Contribution to Resilience](#)

When making requests for military aid, fire and rescue services should:

- Identify the desired effect or outcome rather than make requests for specific units or equipment. For example, fire and rescue services should not ask for tracked vehicles to move equipment, but should instead request assistance to move equipment over rough terrain.

Tactical actions

Incident commanders should:

- Consider requesting the deployment of military aid if appropriate

Failure to work safely and effectively with others and their vehicles or equipment

Hazard	Control measures
Failure to work safely and effectively with others and their vehicles or equipment	Apply generic control measures [as detailed for the hazard of 'Wildfires']
	Identify appropriate organisations that could provide assistance and develop an effective multi-agency response
	Provide supervision
	Consider using specialist vehicles or equipment

Hazard knowledge

Fire and rescue services need to consider the wider collaborative partnership approach to wildfires within their area. Wildfires can have a direct and indirect effect on the environment and the economy, therefore, a significant number of organisations (or individuals) have a vested interest in sharing best practice in

planning, preventing and responding to wildfires. Fire and rescue services may be assisted at wildfire incidents by other organisations that supply their personnel or volunteers, their knowledge of the area and its associated hazards, or provide additional resources such as vehicles or equipment.

Fire and rescue services need to consider the potential significant benefits of working with other organisations at wildfire incidents, but they also need to implement appropriate control measures to ensure that all organisations work together safely and effectively.

Note that for this hazard, wherever the term 'organisation' is used, this could also apply to an individual who is assisting the fire and rescue service.

Pre-planning

It is essential that organisations supporting fire and rescue services at wildfire incidents do so in a safe, controlled and competent manner that will minimise the risk of harm or damage to personnel, the general public, property, animals and the environment.

Fire and rescue services need to be aware that other organisations that may attend a wildfire may not be familiar with operating in a fire environment or be aware of fire and rescue service procedures. Similarly, fire and rescue services may not be familiar with the equipment, policies and procedures of other organisations that may attend. Pre-planning and exercises can help to significantly improve shared situational awareness and to promote safe working practices among all the attending organisations. Effective pre-planning can also improve the effectiveness and efficiency of multi-agency wildfire suppression operations.

Fire and rescue services should consider developing partnerships and good working relationships with other organisations to pre-plan for wildfire incidents. These partnerships can be established to:

- Share knowledge and understanding

- Enable familiarisation of policies and procedures

- Prepare for wildfire incidents, for example through the collaborative development of wildfire fire plans (refer to control measure 'Refer to wildfire fire plans' for further information)

- Pre-plan the response to wildfire incidents

- Exercise for a multi-agency response to wildfire incidents

A number of successful partnerships have already been established around the UK to pre-plan and exercise for a multi-agency response to wildfires. Some of these multi-agency groups that address wildfires are called wildfire groups or fire groups, while others have been called fire operations groups; these groups may also engage in other activities related to wildfires such as wildfire prevention.

The selection of appropriate rendezvous points (RVPs) for all attending organisations can be a critical activity and where possible should be pre-planned. Rendezvous points (RVPs) need to accommodate all of the resources attending from all organisations and need to be a safe distance from operational activity. Refer to control measure 'Refer to wildfire fire plans' for further information.

Learning from incidents and training is a key factor for developing effective multi-agency working at wildfires. Processes can be established to identify and share learning both locally, regionally and nationally to inform and develop best practice. Some land owners have been working their land for many years and are aware of how fire will travel, develop and damage the environment. This awareness may come from

previous experience of wildfires and/or from involvement in vegetation management through prescribed burning. They may have a range of options that could assist the incident commander including techniques, equipment and joint learning opportunities that could influence future policies and procedures.

Fire and rescue services may also find benefits in assisting land owners with prescribed burning, as this can provide personnel with live fire training and experience. Fire and rescue services should carefully plan and risk assess this type of training. Any training involving prescribed burning operations must be completed in accordance with relevant rules, regulations and guidance on burning vegetation. Refer to the following for further information:

- The Heather and Grass Burning Code 2007 (England)

- The Heather and Grass etc. Burning (Wales) Regulations 2008

- The Heather and Grass Burning Code for Wales 2008

- The Muirburn Code 2011 (Scotland)

- Countryside Management Publications: Heather Moorland (Northern Ireland)

Refer to the section on 'Preparedness, pre-planning and partnerships' in the Scottish Government's Wildfire Operational Guidance for further information on pre-planning.

Equipment

Other organisations often have access to a wider range of specialist equipment, such as agricultural vehicles and off-road vehicles, which can assist fire and rescue services in dealing with wildfires more safely and effectively. However, fire and rescue services may not be familiar with the equipment or working practices of other organisations. It is essential that, when other agencies are assisting fire and rescue services, in particular on the incident ground, there is a clear, common understanding of any hazards associated with the actions of each organisation. The identified hazards should be effectively controlled and details should be communicated to personnel that may be exposed to them.

Pre-planning activity should be considered to assess the degree of interoperability between the fire and rescue services and non-fire and rescue service equipment. This activity should also take into account variations in the procedures of the organisations that may be operating the equipment.

Identification and scoping of any cost implications of using non-fire and rescue service equipment or vehicles at wildfire incidents should be included in pre-planning activities.

Control measure – Identify appropriate organisations that could provide assistance and develop an effective multi-agency response

Control measure knowledge

Identifying organisations that can competently support the fire and rescue service in planning for, and responding to, wildfires is a key consideration. Knowledge and understanding in working collaboratively should be developed to improve interoperability and the safety of all personnel attending wildfire incidents.

Organisations that may be able to provide assistance at wildfire incidents and/or with pre-planning for wildfire incidents include:

- Land owners and land managers – have a responsibility for the management of livestock and may be able to provide local knowledge, equipment, vehicles and communications support

- Multi-agency groups that address wildfires – for collaborative support with resources and advice

- Mountain rescue and search and rescue teams – for local knowledge, transport over terrain, communications and medical support

- Local authority emergency planning officers – for evacuation, creation of rest and reception centres and traffic management

- Environmental agencies, national park authorities and other organisations responsible for protecting natural resources, nature and landscapes – for specialist knowledge and advice regarding environmental protection, designated and sensitive sites and access to mapping and geographic information systems (GIS)

- Utility companies – for water supplies and locations of wind turbines, power lines and pipelines

- Forestry organisations – for local knowledge, equipment and vehicles and specialist knowledge concerning woodland and removal of trees

- Agricultural contractors – for equipment and vehicles

- Other fire and rescue services – for regional or national support, and National Resilience assets including high volume pumps (HVPs)

- Military – for transportation of personnel and equipment

- Police – for traffic control, evacuation and aerial reconnaissance

- Ambulance service – for treatment of casualties

- Transportation providers – if roads, railways or airspace may be affected and to provide aircraft for firefighting operations

- Media – for providing warnings and information to the public

Strategic actions

Fire and rescue services should:

- Develop strategic pre-planning for wildfire incidents

- Consider including shared cross-border wildfire risks in risk management plans

- Identify and review the competencies of partner agencies and other organisations from a safety management perspective

- Consider developing service level agreements or memoranda of understanding that define the level and type of support that may be requested and provided; these may consider existing arrangements, such as those with the police for search capability

- Be aware of, or participate in, the regional and national development of multi-agency working guidance

- Consider developing multi-agency groups to address wildfires; these groups can improve multi-agency working through sharing information and resources between fire and rescue services and other organisations

Tactical actions

Incident commanders should:

- Consider which organisations may be able to provide support

- Be aware of memoranda of understanding or other arrangements that exist

Control measure – Provide supervision

Control measure knowledge

Fire and rescue services need to have an awareness of the capacity, capability and skillset of other organisations – refer to National Operational Guidance: [Operations](#) for further information. This approach will enable incident commanders to develop an effective multi-agency response and safe system of work at wildfire incidents.

The control, co-ordination and supervision of other organisations' assets at a wildfire incident should be managed appropriately. Fire and rescue service personnel are trained to understand the incident command protocols. However, this may not be the same for other people, who may require a high level of supervision when operating in the inner cordon. Their actions could cause serious injury or death to fire and rescue service personnel or others. Pre-planning and exercises could help to develop guidance and agreed working practices.

Strategic actions

Fire and rescue services should:

- Consider sharing policies and procedures for wildfires, as these will help to inform other organisations about the role and activities of the fire and rescue service

- Consider developing joint policies and procedures to provide awareness and understanding of the incident command structure

- Develop multi-agency knowledge of the roles, capabilities, knowledge, equipment and procedures of each organisation, and provide access to this information for appropriate personnel

- Be aware of the level of support that can be provided by other organisations; for example, it may not be feasible for them to provide the same level of support throughout a protracted incident

- Ensure that fire and rescue service personnel have an appropriate level of awareness of the vehicles or equipment that may be used by other organisations

- Consider joint training and familiarisation exercises

- Understand how to request support from other organisations and have processes in place for fire control rooms and incident commanders to do so

- Consider using the expertise, including knowledge of the area, of other organisations in pre-planning and developing wildfire fire plans and Site-Specific Risk Information (SSRI)

- Develop a communications strategy that allows interoperability on the incident ground and at tactical or strategic command points

Tactical actions

Where non-fire and rescue service personnel are deployed, incident commanders should:

- Identify and use the appropriate skills, vehicles or equipment of other organisations

- Use joint decision making and apply situational awareness methodology

- Ensure all personnel are closely supervised when operating in the inner cordon

- Share information about the fire and rescue service command structure and incident ground safety protocols with other organisations present

- Agree a structure and process for communications, information gathering and/or deployment of resources from other organisations

- Deliver clear briefings to fire and rescue service personnel and personnel from other organisations before deployment

- Implement the [LACES safety protocol](#) and brief other organisations on what LACES is and how it will be implemented

- Declare the activity and appropriate system of work, for example, what personal protective equipment (PPE) is required for all personnel

- Refer to specific advice or guidance, wildfire fire plans and Site-Specific Risk Information (SSRI) that may involve other organisations

- Record the activities of other organisations, including where the personnel, vehicles or equipment of other organisations have been deployed

- Effectively use the local knowledge of other organisations to identify topographical and other hazards

- Consider medical support requirements, especially for remote locations, including routes, skills and equipment that may be required

- Implement effective cordon controls to assist in monitoring personnel from other organisations deployed onto the incident ground, which would support roll calls if required

To establish good communications between multiple organisations attending a wildfire incident, incident commanders should consider:

- Deploying fire and rescue service personnel to accompany personnel from other organisations on the incident ground to ensure safe systems of work and good communications

- Exchanging radios to enable personnel from the fire and rescue service and other organisations to communicate directly

- Using communications systems used by other organisations attending

Control measure – Consider using specialist vehicles or equipment

Control measure knowledge

Other organisations may have a variety of equipment that could prove beneficial for firefighting operations. This equipment would need to be identified and competent personnel would be required to operate it. This can create additional hazards, as other organisations may not be used to working with fire and rescue

service personnel. Therefore, close monitoring of their performance, and detailed briefings on what is required, will be required from the sector commanders and incident commander. Co-operation and communication are important to resolve the incident. The importance of communicating with other organisations cannot be understated.

The incident commander has the final decision as to what is used, how it is used and by whom.

When using specialist vehicles or equipment, operators from other organisations should be closely supervised to ensure they are not taking unnecessary risks, that they have the correct personal protective equipment (PPE) and they are aware of the presence of fire and rescue service personnel.

It is reasonable to assume that other organisations will take responsibility for their own vehicles or equipment at wildfire incidents and will use safety guidance applicable to their sector.

Strategic actions

Fire and rescue services should:

- Ensure that all fire and rescue service personnel are aware that specialist equipment should only be operated by competent personnel

- Consider pre-planning activities to confirm equipment arrangements and insurance coverage

Fire and rescue service should also consider carrying out joint training so that firefighters can gain an awareness of the equipment used by other organisations.

Tactical actions

Incident commanders should:

- Communicate with personnel from the other organisations to gain a knowledge of the vehicles and equipment being used

- Ensure that specialist vehicles and equipment are only operated by competent personnel from the providing organisation using their industry safety guidance

- Ensure all personnel are closely supervised when operating in the inner cordon

- Ensure detailed tasking and constant monitoring

- Ensure that if there is an unavoidable need for firefighters to use equipment that belongs to another organisation, that they are given adequate training in its use

Scene of operations and terrain

Hazard	Control measures
Scene of operations and terrain	Apply generic control measures [as detailed for the hazard of 'Wildfires']
	Identify and monitor access, egress and escape routes
	Establish scene safety and cordons
	Operate effectively at night
	Operate at a safe distance from an electrical hazard

	when attending a wildfire

Hazard knowledge

Wildfires are potentially hazardous regardless of their size or intensity, and the risks to personnel are not limited to those posed exclusively by the fire. There are generic hazards that may be encountered while gaining access to or operating at a wildfire; they should form the basis of a more detailed risk assessment process based on the local circumstances within individual fire and rescue services.

A large range of potential hazards may be present at a wildfire incident, as a result of the varied environments these incidents may occur in. The hazards may be even more pronounced because the locations and environments may be unfamiliar to fire and rescue personnel.

Wildfires can also spread over large areas of the landscape. This may mean that personnel are required to operate in several different locations throughout their deployment, and may encounter different hazards as they move around the incident ground. While it may be possible to move around the incident in vehicles, the location of some wildfires means there may be limited vehicle access. This in turn may mean that personnel need to carry equipment long distances and/or over rough terrain, increasing the likelihood of manual handling injuries, slips, trips and falls and other physiological hazards (refer to hazard 'Physiological hazards').

Some hazards present at the scene of operations may be identifiable on topographical maps, but personnel should be aware that the landscape and hazards may have changed after the maps were made. For example, areas of forest that appear on the map may have been thinned or clear felled, changing the hazards that were present and potentially creating new hazards.

The hazards present at the scene of operations can be controlled and mitigated by identifying safe access, egress and escape routes, implementing scene safety and cordons, and by ensuring personnel operate from safe distances from electrical hazards. It is also critical that all personnel maintain situational awareness of the fire and their surroundings to identify potential hazards, implement control measures and maintain safety. Personnel must be briefed about the hazards present at the incident ground and this should form part of the implementation of the LACES safety protocol.

Terrain

Poor conditions underfoot will increase the risk of slips, trips and falls. The terrain may present hazards, either en route to, or at, the scene of operations, including:

- Tree roots
- Holes
- Stump holes
- Steep gradients
- Cliffs
- Quarries
- Disused mines and shafts
- Bogs, marshes and fens

- Irrigation ditches

- Walls, hedges and fencing

- Shooting ranges (commercial or military)

- Hunting areas

Reduced visibility and working at night

Visibility at the scene of operations may be reduced through smoke, weather conditions or lack of daylight. This may mean that:

- Personnel are unable to see the fire

- Personnel are unable to see each other

- Personnel may become isolated, disorientated or lost

- Commanders may have difficulty in monitoring the location of all personnel

- Other hazards at the scene of operations, as outlined in this section, may be concealed from view

The current and future levels of visibility at the scene of operations need to be carefully considered in tactical plans for wildfires. Also, the direction and impact of smoke travel should be considered when deploying personnel at the incident, and when identifying any potential impact on members of the public and transport routes. For example, smoke could reduce visibility on public roadways or affect air traffic.

Electricity

Electricity can jump gaps and does not require direct contact. The ability of electricity to jump gaps increases with voltage, and may also be increased as smoke is produced or water jets applied.

Undulating ground conditions can result in fire and rescue service personnel inadvertently coming close to overhead power cables, and equipment and vehicles can also accidentally come into contact with power supplies. Where dense smoke or flames rise towards high voltage power lines the smoke plume has the potential to affect overhead power lines as the electricity can short circuit and arc to earth. Personnel could be at significant risk where water jets are used in proximity to overhead power lines for firefighting, as they have the potential to conduct electricity.

Where an electrical hazard is identified that could pose a realistic risk to fire and rescue service personnel, consideration should be given to requesting that the supply is isolated. However, where electrical isolation cannot be achieved, the incident commander must ensure that fire and rescue service personnel, and personnel from other agencies, operate at a safe distance from an electrical hazard.

Shooting ranges/areas and military training areas

Ordnance, ammunition and weapons may be present in shooting ranges/areas and military training areas. Unexploded ordnance and ammunition may also be present at areas previously used for shooting or military training. Extra care should be taken when attending incidents in or near these areas.

For wildfire incidents on or near military training areas or shooting areas, fire and rescue services should always liaise closely with the Ministry of Defence, or Ministry of Defence land agents, before deploying personnel.

Open water

The term 'open water' includes ponds, lakes, watercourses, coastal water, etc. Water may be hazardous to personnel, through contact with contaminated water, or by falling into water or slurry pits, which could result in serious injury or drowning.

Hazardous materials

Hazardous materials, such as stored or discarded chemicals, asbestos and compressed gas cylinders, may be present. Refer to National Operational Guidance: Hazardous materials for further information.

Pipelines

Gas or oil pipelines may be present either above or underground, which may present a hazard.

Control measure – Identify and monitor access, egress and escape routes

Control measure knowledge

When identifying access, egress and escape routes, all of the hazards at the scene of operations and the current and predicted weather conditions should be considered. These routes should be monitored and reviewed continuously throughout the incident.

Team briefings should include information on access, egress and escape routes. Any changes to these routes need to be communicated to all personnel as soon as possible.

The ability to read and understand topographical maps is critical in identifying access, egress and escape routes. However, the suitability of routes should also be confirmed through observation or reconnaissance.

Strategic actions

Fire and rescue services should:

- Provide suitable maps and/or mapping systems

- Ensure personnel have an appropriate understanding of topographical maps

- Ensure personnel have appropriate navigation skills

- Consider developing wildfire fire plans

Tactical actions

Incident commanders should:

- Implement the LACES safety protocol at the earliest opportunity

- Clearly define access, egress and escape routes to personnel and confirm their understanding

- Ensure the routes are appropriate to the tasks being performed

- Where possible, mark or clearly delineate routes

- Consider illuminating routes if there is reduced visibility

- Provide team briefings that include information on access, egress and escape routes

- Continually monitor routes

- Communicate any changes to routes to all personnel as soon as possible

Control measure – Establish scene safety and cordons

Control measure knowledge

Refer to National Operational Guidance: <u>Incident command</u>.

Strategic actions

Refer to National Operational Guidance: <u>Incident command</u> for generic strategic actions. Fire and rescue services should:

- Provide topographical maps and associated equipment

Tactical actions

Refer to National Operational Guidance: <u>Incident command</u> for generic tactical actions. Incident commanders should also consider requesting external specialist advice from:

- Land owners or land managers

- The responsible person or site specialist

- Industry experts (for example, National Grid)

Control measure – Operate effectively at night

Control measure knowledge

The hours of darkness are generally characterised by cooler temperatures, higher fuel moisture and higher relative humidity levels, all of which can substantially reduce fire intensity, rate of spread and the likelihood of extreme fire behaviour. Operating at night can therefore provide windows of opportunity for suppression.

However, there are enhanced hazards associated with personnel operating at night. Reduced visibility at night is also likely to increase the time taken to complete tasks and may reduce the effectiveness of some activities.

Any activities and operations completed at night must be fully risk-assessed, and the hazards balanced against the potential effectiveness and benefits.

Strategic actions

Fire and rescue services should:

- Provide personnel with appropriate personal protective equipment (PPE) and equipment for operating at night

- Provide an effective communications network for operating at night

- Ensure personnel have appropriate navigation skills for operating at night

Tactical actions

Incident commanders need to carefully assess the potential hazards and benefits before deciding whether to deploy personnel at night.

When deploying personnel at night, incident commanders should always:

- Implement the [LACES safety protocol](#)

- Review the area during daylight before deploying personnel at night

Incident commanders should also consider:

- Developing an effective communications strategy for use at night

- The challenges of establishing and maintaining communications between personnel on the ground and aircraft at night

- Marking and illuminating access, egress, and escape routes and safety zones, where possible

- Deploying additional tactical and team lookouts and changing their positions at night to take into account reduced visibility

- Limiting operations to specific tasks that will have a significant impact on fire behaviour or spread

- Limiting the number of personnel deployed to the minimum number required to safely and effectively complete specific tasks

- Preventing lone working on the incident ground

- Deploying teams to complete operations close to roads, recognised paths or tracks where possible

- Deploying personnel with thermal imaging cameras to identify hotspots and undetected firespread (see control measure 'Consider using thermal imaging cameras' for further information)

- Deploying personnel with appropriate experience or training to lead teams at night

Control measure – Operate at a safe distance from an electrical hazard when attending a wildfire

Control measure knowledge

Electricity can jump gaps and does not require direct contact.

Undulating ground conditions on-site can result in fire and rescue service personnel inadvertently coming close to overhead power cables. Ladders and other equipment can accidentally come into contact with power supplies.

As voltage increases, so does the ability to jump gaps. This may also increase as smoke is produced and water jets applied.

Where an electrical hazard that could pose a realistic risk to fire and rescue service personnel is identified, it should, if possible, be isolated and earthed or otherwise made safe by a competent person.

However, where electrical isolation cannot be achieved, the incident commander must ensure that fire and rescue service personnel operate at a safe distance from the electrical hazard.

Strategic actions

Fire and rescue services should:

- Ensure fire control room records include emergency 24-hour support contact details for all local power networks

- Consider carrying out pre-incident familiarisation visits and provide personnel with information on electrical hazards and risks

Tactical actions

Incident commanders should:

- Consult all available sources of risk information

- Refer to Site-Specific Risk Information (SSRI), en route if possible, regarding electrical hazards

- Gather information from land owners, land managers, responsible person, site specialist, industry experts or wildfire fire plans

- Construct appropriate cordons using natural barriers and/or traffic tape etc. Additional safe distances need to be implemented over and above the normal cordoning requirements of an incident if there are high voltage lines, carrying 132 kV, 275 kV and 400 kV (kilovolts):

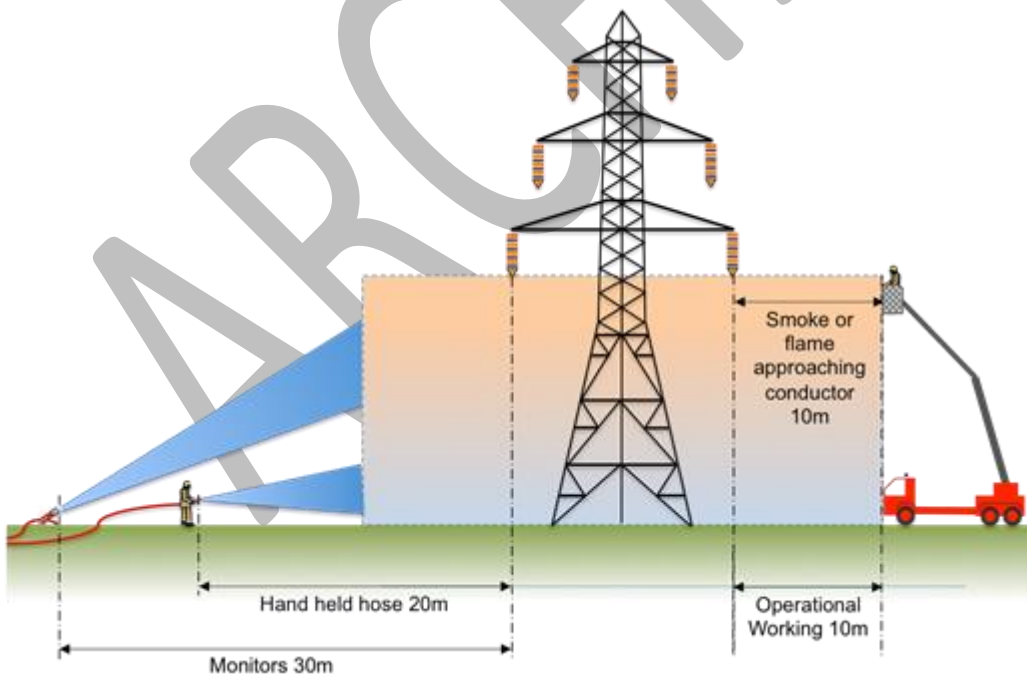| Activity	Minimum safe approach distance
When using ladders, aerial appliances or tall equipment	10 metres
In dense smoke or flames approaching conductor	A corridor 10 metres either side of high voltage lines
When using handheld jets or hose	A corridor 20 metres either side of high voltage lines
When using monitors (ground or aerial)	A corridor 30 metres either side of high voltage lines

Figure 9: Diagram showing minimum safe approach distance to high voltage lines

- Identify, implement and manage safety distances for power sources that cannot be isolated

- Brief all fire and rescue service and site personnel entering the hazard areas of the safe operating distances

- Consider requesting that the supply is isolated

Physiological hazards

Hazard	Control measures
Physiological hazards	Apply generic control measures [as detailed for the hazard of 'Wildfires']
	Wear appropriate personal protective equipment (PPE) and respiratory protective equipment (RPE)
	Implement task rotation
	Provide rest breaks

Hazard knowledge

Working in the open countryside can expose firefighters to a variety of hazards associated with the climate, flora (plants) and fauna (animals). At wildfires, firefighters may work in arduous conditions, which may expose them to the risk of heat-related illnesses. These conditions can be fatal if unrecognised or unmanaged, but they are preventable.

Firefighters may also encounter environmental hazards to health, including animal or insect bites, insect stings or irritant plants. These can lead to medical conditions including Zoonoses or Anaphylaxis. Further information on these conditions can be found in the Health precautions for firefighters' knowledge and information sheet (awaiting publication).

Physiological hazards present at wildfire incidents can be mitigated by wearing appropriate personal protective equipment (PPE) and respiratory protective equipment (RPE), implementing task rotation and providing rest breaks.

Control measure – Wear appropriate personal protective equipment (PPE) and respiratory protective equipment (RPE)

Control measure knowledge

Personal protective equipment (PPE) should provide appropriate skin coverage to protect firefighters from the fire, plants and animals, and the effects of ultraviolet (UV) rays on exposed skin. Refer to National Operational Guidance: Operations for further information.

Control measure – Implement task rotation

Control measure knowledge

Personnel working on wildfires will often need to be deployed as teams and not as crews. These teams should be of an appropriate size for the task in hand and sufficient to allow task rotation. Refer to National Operational Guidance: Operations for further information.

Control measure – Provide rest breaks

Control measure knowledge

To counteract the effects of arduous working, firefighters need regular breaks to cool down, rehydrate and rest. Refer to National Operational Guidance: Operations for further information.

Moving, using and entrapment of vehicles

Hazard	Control measures
Moving, using and entrapment of vehicles	Apply generic control measures [as detailed for the hazard of 'Wildfires'] Consider routes for access, egress and escape of vehicles Park vehicles appropriately Use vehicles appropriately Consider the impact of firefighting activities on access, egress and escape of vehicles

Hazard knowledge

Refer to National Operational Guidance: Operations for the control measure of 'Ensure appropriate mobilising and a safe and controlled approach to the incident'.

Fire and rescue service vehicles and other vehicles present could become trapped at wildfire incidents. This could be due to a vehicle being surrounded by fire or smoke, or by a vehicle being stranded on soft or uneven ground. Situations where personnel are placed in danger of being unable to escape in a vehicle, or to use a vehicle as a refuge, should be avoided.

Fire and rescue services should implement appropriate control measures to ensure all vehicles are used and moved safely at wildfire incidents. Vehicle movement around the whole area of a wildfire, both on and off-road, requires careful management as even unmetalled rural roads and tracks can be hazardous to vehicles. Fire and rescue service should also develop contingency plans in the event of any vehicle becoming trapped.

Control measure – Consider routes for access, egress and escape of vehicles

Control measure knowledge

It is important to maintain safe access, egress and escape routes for vehicles at all times. The egress and escape routes in particular should be continually assessed throughout the incident to ensure that vehicles and personnel do not become trapped.

Strategic actions

Fire and rescue services should:

- Consider developing wildfire fire plans

Tactical actions

Incident commanders should:

- Identify suitable access, egress and escape routes for vehicles

- Communicate identified access, egress and escape routes for vehicles to personnel

- Mark or delineate access, egress and escape routes for vehicles where possible

- Aim to approach the incident from upwind

- Be aware of 'bottoming out' on undulating ground

- Consider deploying personnel to review access, egress and escape routes for vehicles

When identifying access, egress and escape routes for vehicles, incident commanders should consider:

- Predicted firespread and how this might impact on access, egress and escape routes for vehicles

- Width, condition and gradient of roads and tracks, and their suitability for vehicles in attendance

- Width and weight limits of any bridges, taking into account that there is no requirement to mark the weight limit on bridges on private land (i.e. bridges not on a public highway)

- The presence of:

    o Fenced and unfenced roads and tracks, including the possible presence of livestock and animals

    o Dead ends

    o Suitable turning and passing areas

    o Locked gates, parked vehicles, machines or other obstacles that may block access or egress

- Vehicle marshalling

- One-way systems, particularly when there are narrow roads and/or limited passing places

- Public vehicle traffic and whether a request should be made to the police for traffic control – refer to National Operational Guidance: [Incident command](#) for further information

Fire and rescue service vehicle drivers should:

- Use the identified access, egress and escape routes

- Report any obstructions or changes to conditions on access, egress and escape routes to the incident commander

- Avoid driving vehicles onto saddles and re-entrants

- Avoid crossing steep slopes if there is a risk of overturning

- Avoid driving on wet areas where the vehicle may become bogged down

- Ensure there is sufficient ground clearance at all times to prevent 'bottoming out'

- Consider the nature and condition of the driving surface; ensure the vehicle has sufficient traction at all times (for example, when crossing mud, gravel or scree)

- Consider the presence of:

    o Hidden obstructions, such as tree stumps and pot holes

- o Livestock and wild animals

- o Personnel and equipment

- o Members of the public

- Take extra caution when driving during limited visibility and/or darkness, using lights and lighting when required

- Consider sending personnel ahead of the vehicle to assess ground conditions and identify an appropriate route when driving off-road

Control measure – Park vehicles appropriately

Control measure knowledge

Refer to National Operational Guidance: [Incident command](#) for information relating to cordons and vehicle access at incidents. Also refer to National Operational Guidance: [Operations](#) for information about the generic use of fire and rescue service vehicles en route to, and at, incidents.

When attending a wildfire incident, predicted firespread and other hazards need to be carefully considered before a decision is made on how and where vehicles are to be parked. Personnel may need to operate some distance away from their vehicle, which means it will take longer to relocate parked vehicles.

Vehicles should be parked:

- Using any barriers that may provide protection

- Facing in the direction of the identified escape route

Vehicles should not be parked:

- In areas of flammable vegetation or fuel

- Up-slope and/or downwind of the fire

- On saddles or re-entrants

- Under power lines or tree canopies

- Where they may block an access, egress or escape route

Strategic actions

Fire and rescue services should consider:

- Developing wildfire fire plans

Tactical actions

Incident commanders should:

- Identify appropriate rendezvous points (RVPs) and holding areas, taking into account space available for parking vehicles

- Identify suitable parking areas for vehicles, that take into account predicted firespread

- Consider whether vegetation needs to be cleared or burned-out to reduce fuel-loading around parked vehicles

- Continually review the location of parked vehicles in relation to current and predicted fire behaviour and firespread

- Be prepared to relocate parked vehicles as conditions change and the incident progresses

Control measure – Use vehicles appropriately

Control measure knowledge

Vehicles may be moved around a wildfire incident for multiple uses including:

- Direct attack – driving along a fire line and applying water or retardant

- Indirect attack – creating control lines, such as a tractor towing a swipe or flail

- Transporting personnel and equipment

Any moving vehicle at a wildfire incident presents a number of hazards both to the driver/crew and to other personnel deployed at the incident. The likelihood and severity of some of these hazards may be increased when vehicles are moved off-road and/or over rough terrain.

The main hazards associated with moving vehicles at wildfire incidents are:

- Vehicle collisions with people, animals or other vehicles

- Vehicle contact with electrical hazards

- Overturning vehicles

- Entrapment of moving vehicles

Particular care needs to be taken to ensure that vehicle escape routes are continually identified, monitored and communicated to the drivers and crews of vehicles being used at wildfire incidents. Contingency plans should also be put in place in case a vehicle and/or its crew become trapped.

When using vehicles for direct attack, it is best practice to keep them within the black area (burned area). This helps to reduce the likelihood of vehicles and personnel being outflanked by the wildfire.

Strategic actions

Fire and rescue services should:

- Consider sharing policies and procedures with other organisations that may be present and/or provide vehicles for use at wildfire incidents

- Ensure fire and rescue service personnel have an appropriate level of awareness regarding the vehicles that may be used by other organisations at wildfire incidents

- Consider joint training and familiarisation exercises on vehicles belonging to the other organisations that may be present at wildfire incidents

- Provide appropriate training to personnel on how to drive and work around vehicles being used at wildfire incidents

Tactical actions

Incident commanders should:

- Consider deploying vehicles for direct and indirect attack, which are appropriate to the terrain and conditions

- Assign appropriate team and tactical lookouts (refer to [LACES safety protocol](#)) to continually identify, monitor and communicate escape routes to drivers of vehicles being used on the incident ground

- Establish effective communications between all of the following (refer to [LACES safety protocol](#)):

  o The driver and crew of a vehicle being used for direct attack

  o The team lookout(s) and tactical lookouts

  o The incident commander

- Consider assigning appropriate personnel to assist vehicles being used on the incident ground – for example, personnel could be sent to walk ahead of vehicles to identify any potential hazards or areas where the vehicle may become bogged down or trapped

- Develop contingency plans for the entrapment of a vehicle and/or its crew

- Initiate the withdrawal of vehicles involved in direct or indirect attack if the operation becomes too hazardous

Fire and rescue service vehicle drivers should:

- Avoid crossing steep slopes if there is a risk of overturning

- Avoid driving on wet areas where the vehicle may become bogged down

- Consider the nature and condition of the driving surface; ensure the vehicle has sufficient traction at all times (for example, when crossing mud, gravel or scree)

- Ensure there is sufficient ground clearance at all times to prevent 'bottoming out'

- Be aware of other personnel working in the vicinity and maintain appropriate distances

- Continually assess the feasibility of the escape route, taking into account other firefighting activities (refer to control measure 'Consider the impact of firefighting activities in vehicle access, egress and escape routes')

- Take extra caution when driving during limited visibility and/or darkness, using lights and lighting when required

Control measure – Consider the impact of firefighting activities on access, egress and escape routes of vehicles

Control measure knowledge

When vehicle pumps are being used they can result in a large quantity of firefighting run-off water or foam, which can cause the surrounding area to become very soft. This may cause a hazard for any vehicles parked in, or needing to drive through, the area.

Other firefighting activities may also restrict or block vehicle access, egress and escape routes. They should be considered when implementing the [LACES safety protocol](#) and when developing the tactical plan (refer

to control measure 'Consider appropriate fire suppression tactics and develop and implement a tactical plan'). Examples of things that may restrict or block vehicle access routes include:

- Firefighting hose on roads and tracks

- Hose from high volume pumps (HVPs)

- Cables from equipment being used at the incident

- Trailers and demountable units

- Stationary vehicles that were not appropriate for the terrain

Strategic actions

Fire and rescue services should:

- Make personnel aware of the potential impact that firefighting activities may have on vehicle access, egress and escape routes

Tactical actions

Incident commanders should:

- Ensure that hose is laid appropriately so as not to block access, egress and escape routes

- Request hose ramps if and when required

Fire and rescue service vehicle drivers should:

- Avoid driving on wet areas where the vehicle may become bogged down, particularly when vehicle pumps are being used

- Consider moving a vehicle if there is a risk the ground it is parked on could become unsafe and potentially lead to the vehicle being entrapped

Presence of people

Hazard	Control measures
Presence of people	Apply generic control measures [as detailed for the hazard of 'Wildfires']
	Minimise public access to the vicinity of the wildfire
	Consider evacuating members of the public
	Seek assistance to deal with the threat of deliberate fire setting

Hazard knowledge

People may behave unpredictably during incidents. For wildfires this may result in them:

- Wanting to stay and defend property and/or animals

- Self-evacuating in advance of the fire

- Self-evacuating on arrival of the fire

- Making their way to an incident to observe

This unpredictable behaviour may present hazards to personnel, other members of the public, property or the environment.

Additionally, some wildfires are set deliberately, with the fire setters sometimes remaining in the area to observe firefighting or set more fires.

Close collaboration with communities, land managers, other agencies and local emergency planning groups as part of the pre-planning process is important, to ensure the safety of members of the public and emergency responders.

Control measure – Minimise public access to the vicinity of the wildfire

Control measure knowledge

Unlike incidents in more urban environments, establishing a physical boundary of the wildfire incident ground is often extremely difficult. Therefore, members of the public may enter the vicinity of the wildfire either by mistake, on purpose, or with malicious intent.

Strategic actions

Fire and rescue services should:

- Establish methods for preventing unauthorised access to the vicinity of the wildfire, using, for example:
    - Traffic control
    - Media including television, radio or social media
    - 'Variable message' road signs

Tactical actions

Incident commanders should consider requesting:

- Traffic control

- Media involvement, to provide information

- The activation of 'variable message' road signs

- The presence of the police for assistance with members of the public

- Assistance from local authorities, national park rangers and other organisations in providing advice to the public

Control measure – Consider evacuating members of the public

Control measure knowledge

For generic information about evacuation, along with strategic actions and tactical actions, refer to National Operational Guidance: Operations. However, wildfires may require different tactics for evacuation from the rural environment. In particular, consideration should be given to:

- The wide geographic area that may be involved

- The potential for relocation to other towns or villages

- The transport and other logistics required for relocating evacuees

- The time it will take to evacuate those at risk

Control measure – Seek assistance to deal with the threat of deliberate fire setting

Control measure knowledge

There may be evidence that multiple seats of fire are due to deliberate fire setting. Consider seeking assistance from the police to deal with this threat, due to the impact this activity may have on dealing with the incident.

Strategic actions

Fire and rescue services should:

- Have a pre-determined plan that can be implemented if malicious threats and deliberate fire setting are encountered by their personnel at an incident

Tactical actions

Incident commanders should:

- Consider the advice of the police when determining the areas that are safe for resources to be deployed

- Consider awaiting confirmation that the fire setter has been removed or contained, especially if their activity is having a direct impact on dealing with the incident

- Seek advice about the potential recurrence of the threat, and request the ongoing attendance of the police if it is possible that the threat may recur

Presence of animals

Hazard	Control measures
Presence of animals	Apply generic control measures [as detailed for the hazard of 'Wildfires']
	Avoid or isolate animals
	Rescue or evacuate animals

Hazard knowledge

Animals are likely to be encountered in a wide variety of scenarios at wildfire incidents. They could include wild animals, exotic animals, pets or livestock. Situations could include some or all of the following:

- Animals at risk requiring evacuation

- Animals contained in buildings threatened by fire

- Animals trapped in fences, gates or grids

- Loose and straying animals, including animals emerging from concealed areas and fleeing across paths, roads or waterways

When approaching animals, or working where animals are present, personnel need to understand animal instinct and behaviour. When feeling threatened and fearful, animals resort to natural instinct and have natural defence mechanisms that may cause unwanted or unpredictable behaviour, such as panic and flight or aggression.

The reaction of an animal to a perceived threat will differ, depending on:

- The species of animal

- The nature of the entrapment or perceived threat

- Levels of stimulation

- Operational activity

- Environmental conditions

Failure to understand and anticipate the behaviour of animals may pose a risk to life, an immediate threat to safety and may have a negative impact on implementing the tactical plan. It may also restrict or block access, egress and escape routes for personnel and vehicles.

Consideration should also be given to members of the public endangering themselves in an attempt to rescue an animal, or how they may behave if they see an animal in distress.

Refer to National Operational Guidance: Operations for further information about health precautions that should be taken when working near animals.

Control measure – Avoid or isolate animals

Control measure knowledge

Fire and rescue personnel should always try to avoid any animals that may be present at a wildfire incident. If they cannot be avoided, animals should ideally be kept under control and/or separated from operational responders and members of the public. Personnel should be aware that loose animals, particularly in smoke, may present an immediate and unforeseen hazard.

Strategic actions

Fire and rescue services should consider:

- Providing personnel with access to specialist information on animals

- Ensuring personnel have a basic level of awareness of animal behaviour

Tactical actions

Incident commanders should:

- Consider requesting advice and support from animal specialists including:

    o Animal owners

    o Land owners

- o Farmers
- o Land managers
- o Responsible persons
- o Animal rescue/behaviour specialists
- o Fire and rescue service animal rescue specialists
- o Veterinary practices
- o Animal welfare charities
- o Defra
- o Local authority animal health inspectors

- Identify and communicate access, egress and escape routes and safety zones that are uncompromised by animals

- Consider alternative routes if access or egress is restricted or blocked by animals or insects

- Be aware of mechanisms of containment (e.g. corralling, herding etc.)

- Develop effective evacuation procedures and signals

- Identify resources that may be available to contain or corral animals if needed

- Ensure adequate cordon control and separation between members of the public, emergency responders and animals

- Consider the impact of equipment noise on animal behaviour

- Consider the impact of operational tactics on animal behaviour

- Consider whether warning signs are required to indicate the presence or potential presence of animals

- Consider liaising with the police as restrictions and/or 'variable message' road signs may be needed on surrounding roads, such as those through woodland or parkland areas that may be populated with deer

- Develop a tactical plan that considers loose, trapped or other at-risk animals in the vicinity of a wildfire incident

- Clearly brief fire and rescue personnel, and other organisations in attendance, on animal-related hazards, areas to avoid, animal isolation areas and safety control measures

Control measure – Rescue or evacuate animals

Control measure knowledge

The preferred option for fire and rescue services is to avoid or isolate animals during wildfire incidents. However, there will be incidents when the fire and rescue service has to consider helping to rescue or evacuate animals involved in the wildfire.

Techniques employed in evacuating animals from a place of danger to a place of safety may take many forms and be entirely dependent on the nature of the danger, the species involved and the number of animals. Specialist advice should be sought from animal rescue or behaviour specialists, either within the fire and rescue service or from other organisations.

The primary consideration needs to be the safety of the public and of personnel on the incident ground. When engaging other organisations and animal owners with rescuing or evacuating animals, it is essential to remember that the behavioural characteristics of animals are likely to be very different from those exhibited in non-emergency situations. This means that all personnel in the vicinity of the animals need to be clearly briefed and closely supervised.

Effective communication and liaison between the fire and rescue service and animal owners or responsible persons is important for ensuring that a wildfire incident involving animals is dealt with safely and effectively.

Strategic actions

Fire and rescues services should consider:

- Providing personnel with access to specialist information on animals

- Providing specialist equipment for animal rescue

- Pre-planning with land owners, land managers and other animal owners to consider how they would deal with their animals in a wildfire situation

- Making arrangements for mutual aid for animal rescue or evacuation – refer to the control measure 'Have mutual aid or memoranda of understanding arrangements in place'

Tactical actions

The incident commander should:

- Consider requesting advice and support from animal specialists including:
    - Animal owners
    - Land owners
    - Farmers
    - Land managers
    - Responsible persons
    - Animal rescue/behaviour specialists
    - Fire and rescue service animal rescue specialists
    - Veterinary practices
    - Animal welfare charities
    - Defra
    - Local authority animal health inspectors

- Attempt to identify and liaise with the owner of the animals involved or the responsible person

- Be aware of the capabilities and limitations of the organisations in attendance, for carrying out animal rescues or evacuations

- Brief personnel involved on the animal-related hazards and/or the animal rescue or evacuation techniques to be used

Inappropriate or uncontrolled use of aircraft

Hazard	Control measures
Inappropriate or uncontrolled use of aircraft	Apply generic control measures [as detailed for the hazard of 'Wildfires']
	Notify the appropriate authorities about potential hazards to aircraft
	Consider deploying fixed-wing aircraft or helicopters
	Consider deploying unmanned aircraft
	Establish communications with aircraft
	Manage the safety and security of take-off and landing areas for aircraft

Hazard knowledge

At many wildfire incidents aircraft can provide important tactical support to ground teams and the incident commander. However, the inappropriate or uncontrolled use of aircraft at a wildfire incident can present significant hazards to firefighters, personnel from other agencies, members of the public, the environment and any other leisure, commercial or military aircraft that may be flying nearby. For example:

- Aircraft and unmanned aircraft flown by members of the public who are not involved in suppressing the fire may inadvertently or deliberately fly over or near to the wildfire, presenting a hazard to both aerial and ground operations

- Aircraft deployed at the incident may drop water or retardant onto or near to people on the ground, which may represent a significant life and health risk

- Aircraft deployed at the incident may drop water or retardant onto or near to sensitive areas, potentially causing environmental damage (for further information refer to hazard 'Environmental impact')

- Helicopters deployed at the incident may create downwash, which can cause flying debris and increase the rate of firespread

For the purpose of this guidance, aircraft include:

- Fixed-wing aircraft – refer to National Operational Guidance: Transport for further information

- Helicopters – refer to National Operational Guidance: Transport for further information

- Unmanned aircraft

Aircraft may be used beneficially for a number of different purposes, including:

- Aerial reconnaissance of the incident

- Dropping water or retardant onto, or in front of, the fire

- Moving personnel and equipment to, or around, the incident ground

Aircraft can also be used effectively to provide access to remote and otherwise inaccessible areas. At some wildfire incidents, the early deployment of aircraft may prevent a small wildfire from developing into a much larger, more costly, and more destructive fire.

While deploying aircraft may bring many benefits, fire and rescue services should also be aware that a number of factors will limit the effectiveness of aircraft at wildfire incidents and/or can present significant hazards to the aircraft, and to personnel on the ground, such as:

- The terrain – steep slopes and mountainous areas make low-flying operations more complex and hazardous

- Man-made structures – such as power lines and communication masts, can make flying conditions and water/retardant dropping hazardous

- Weather conditions – high winds may make flying conditions dangerous and/or may influence the accuracy of water and retardant drops

- Smoke and darkness – may have an impact on or restrict aerial operations

- Vegetation – vegetation may prevent water or retardant drops from reaching the intended location on the ground or fire

- Turnaround times for refilling aircraft with water/retardant and fuel may be lengthy

- Delayed attendance times of requested aircraft may lead to an escalation of the incident, or other changes in the situation before their arrival at the incident

- Animal behaviour – the presence of aircraft may affect animal behaviour

Control measure – Notify the appropriate authorities about potential hazards to aircraft

Control measure knowledge

Wildfires can produce significant smoke plumes, which can reduce visibility for pilots. Wildfires can also produce strong thermal updrafts that may be hazardous to flight. This means wildfires may present a significant hazard to a variety of aircraft, including aircraft deployed at the incident, and aircraft that may be present in the area for other reasons (for example, commercial aircraft or Ministry of Defence aircraft).

In addition, aircraft flown by other agencies, or by members of the public who are not involved in suppressing the fire, may inadvertently or deliberately fly over or near to the wildfire. This presents a hazard to personnel involved in both aerial and ground operations.

Fire and rescue services need to consider that commercial aircraft and unmanned aircraft that are not involved in suppression operations may be flown at, or near, a wildfire incident. They may, for example, be used to record media footage of the incident or to inspect national infrastructure such as power lines or pipelines. These aircraft may fly near to aerial or ground resources, increasing the likelihood of an air-to-air or air-to-ground collision.

It is important that fire and rescue services notify air traffic control as soon as possible if there is a possibility that the wildfire may represent a hazard to aircraft in the area. Air traffic control can then issue warnings and instructions to aircraft in the vicinity of the fire. If required, the police can request that air traffic control create an air exclusion zone around a fire, to prevent unauthorised aircraft or unmanned aircraft from flying over, or near, the incident.

Strategic actions

Fire and rescue services should consider:

- Identifying and compiling contact details for all National Air Traffic Control and all air traffic control units within their area

- Identifying the areas covered by individual air traffic controls within their area

Tactical actions

Incident commanders should consider:

- Requesting that the fire control room notifies air traffic control if a wildfire incident is likely to present a hazard to aircraft

- Contacting the police to request an air exclusion zone around the wildfire to assist in maintaining the safety of the aerial and ground resources deployed

- Suspending or cancelling aerial operations if unauthorised aircraft are present at the incident and pose a risk to aerial operations

Control measure – Consider deploying fixed-wing aircraft or helicopters

Control measure knowledge

Fixed-wing aircraft and helicopters can be deployed to perform a number of tactical support roles at a wildfire incident, including:

- Direct aerial attack by dropping water or fire retardants onto the burning area

- Indirect aerial attack by dropping water or fire retardants in front of the burning area to form control lines or to strengthen existing control lines

- Airlifting water to, and around, the incident ground

- Airlifting personnel and equipment to, and around, the incident ground

- Aerial reconnaissance and information gathering

It is crucial that fire and rescue services request aircraft that have the correct capability for the tasks that they need to perform. Large commercial and military helicopters, and those used by the new Search and Rescue Service, can often create too much downdraft for effective direct aerial attack.

However, if available, large helicopters can be used very effectively to move personnel and equipment around the incident ground and to and from more remote locations. Smaller helicopters operated by experienced pilots can be used very effectively for dropping water and retardant.

Strategic actions

Fire and rescue services should:

- Complete local pre-planning to obtain an awareness of potential aircraft providers, and the capabilities and limitations of individual aircraft and providers

- Complete local pre-planning to identify how communications between aircraft and ground resources will be established and maintained at wildfire incidents, including identifying radio channels that can be used by available aircraft

- Complete local pre-planning to identify potential areas that may be communication 'blackspots' and may affect communication between ground resources and aircraft at wildfire incidents

- Consider establishing memoranda of understanding (MoUs) with local or regional providers of fixed-wing aircraft or helicopters

- Consider improving and maintaining interoperability between aircraft providers or pilots, and fire and rescue personnel by organising co-operative training and joint multi-agency exercises

- Consider appointing personnel to perform the role of aerial observer

Refer to the [National Operational Guidance: Transport](#) for information on working with and near aircraft, including guidance on how to safely board and disembark helicopters and fixed-wing aircraft.

When requesting aerial resources the incident commander should accurately describe their requirements. The aerial resource provider has a responsibility to provide an appropriate aircraft and pilot.

Tactical actions

Incident commanders should liaise with the aerial resource provider to:

- Consider the challenges of establishing and maintaining communications between personnel on the ground and aircraft

- Consider the challenges of managing the safety of multiple fixed-wing aircraft, helicopters and unmanned aircraft at the incident

- Consider deploying an appropriate member of personnel to accompany pilots as an aerial observer

- Provide briefings and/or inform ground personnel and other aircraft and unmanned aircraft of the presence of fixed-wing aircraft and/or helicopters, and provide details concerning the area in which they will be operating, the tasks they will perform, and the likely duration of those tasks

- Provide briefings and/or inform the pilots of fixed-wing aircraft and helicopters, of any known hazards present at the incident and the locations of personnel on the ground

- Consider the potential impact that the fire, weather conditions and topography may have on the flight and performance of fixed-wing aircraft and helicopters

- Consider the medium and long-term weather forecasts to assess the potential impact of the weather on the safety and effectiveness of fixed-wing aircraft and helicopters deployed at the incident

- Consider the support required for fixed-wing aircraft and helicopters, including:
  - Suitably located water supplies
  - Take-off and landing areas
  - Refuelling areas

Control measure – Consider deploying unmanned aircraft

Control measure knowledge

Unmanned aircraft can be used at wildfires to provide an overhead view of the incident. They can be used for a variety of purposes, such as:

- Information gathering

- Monitoring fire behaviour and firespread

- Monitoring the location of personnel on the incident ground

- Spotting potential water sources that may not be visible or apparent from the ground

- Inspection of access, egress and escape routes

- Spotting hotspots from above, particularly if equipped with a thermal imaging camera (refer to control measure 'Consider using thermal imaging cameras')

Unmanned aircraft can be used to assist in developing tactical plans for wildfires and in implementing a safe system of work. Unlike fixed-wing aircraft and helicopters, unmanned aircraft may be able to work well during the hours of darkness if they are equipped with thermal imaging cameras.

The Civil Aviation Authority has produced specific guidance for unmanned aircraft ([CAP 722 – Unmanned Aircraft System Operations in UK Airspace – Guidance](#)). The guidance is intended to assist those who are involved in all aspects of developing unmanned aircraft systems, to identify the route to certification, outline the methods by which permission for aerial work may be obtained, and ensure that all requirements are met by the unmanned aircraft system industry. The document highlights the safety requirements that have to be met before an unmanned aircraft system is allowed to operate in the UK.

Strategic actions

Fire and rescue services should:

- Consider pre-planning activity to obtain an awareness of potential unmanned aircraft providers, and the capabilities and limitations of individual unmanned aircraft and providers

- Consider improving and maintaining interoperability between unmanned aircraft providers/operators and fire and rescue personnel by organising co-operative training and joint multi-agency exercises

Tactical actions

Incident commanders should liaise with the aerial resource provider to:

- Consider the challenges of establishing and maintaining communications between personnel on the ground, unmanned aircraft operator(s) and any other aircraft that may be deployed at the incident

- Provide briefings and/or inform ground personnel and other aircraft (i.e. fixed-wing aircraft and helicopters) of the presence of an unmanned aircraft, and provide details about the area the unmanned aircraft will be operating in

- Provide briefings and/or inform unmanned aircraft operators of any known hazards present at the incident and the locations of personnel on the ground

- Consider the support required for the unmanned aircraft, including identifying suitable take-off and landing areas

- Consider the limitations of the unmanned aircraft and its operator

- Consider the potential impact that the fire, weather conditions and topography may have on the flight and performance of an unmanned aircraft

- Consider the medium and long-term weather forecasts to assess the potential impact of the weather on the safety and effectiveness of unmanned aircraft deployed at the incident

- Consider if there is a need to suspend unmanned aircraft operations at the incident while other aerial or ground operations are taking place

Control measure – Establish communications with aircraft

Control measure knowledge

Monitoring ground vehicles and aircraft at the incident ground is an essential part of the safe system of work used by the fire and rescue service. When deploying aircraft at a wildfire incident, fire and rescue services must establish effective air-to-ground and air-to-air communications to maintain the safety of all personnel and resources deployed. The success and safety of deploying aircraft at wildfire incidents will largely depend on the support provided by ground resources.

Strategic actions

Fire and rescue services should:

- Establish the tactical limitations of any aircraft available

- Complete pre-planning activities to establish air-to-ground and air-to-air communications

- Undertake local pre-planning activity to identify radio channels that can be used for ground-to-air communications at wildfire incidents

- Consider pre-planning activity to identify suitable water sources for use with fixed-wing aircraft and helicopters

Tactical actions

Incident commanders should consider:

- Creating an aerial sector

- Appointing an aerial sector commander

- Providing ground support to the aerial sector

Aerial sector commanders should:

- Liaise with the aerial resource provider to confirm the fire and rescue service requirements

- Brief pilots and aircraft operators of their task or mission, objectives, and any hazards identified at the incident location

- Provide regular briefings and relay appropriate information to or from:

    o The incident commander

    o All pilots and operators of aircraft and unmanned aircraft

    o All ground resources providing support to aircraft and unmanned aircraft

    o All ground resources from the fire and rescue service and other agencies/organisations present at the incident

- Liaise with the police to ensure that any unauthorised aircraft or unmanned aircraft are removed from the incident, and request an air exclusion zone at the incident if required

- Liaise with pilots of fixed-wing aircraft and helicopters, and operators of unmanned aircraft, in identifying suitable take-off and landing areas (refer to the control measure 'Establish and manage a suitable landing area for aerial resource')

- Ensure all ground resources and personnel are aware of the intended locations of any water, retardant or equipment drops before they take place, providing enough time for ground resources to relocate if necessary

- Brief pilots on where and when to complete their drops of water and/or retardant – water or retardant is normally dropped into the wind if possible, and drops should start from a strong anchor point

- Ensure ground resources and personnel are deployed to support the direct attack by aircraft – ground resources should be outside the drop zone before the drop takes place, but they may need to enter the drop zone after the drop, to extinguish any remaining hot spots and/or to prevent any firespread that may have been inadvertently caused by the drop (such as by downwash from a helicopter)

- Appoint observers on the ground to observe all water and retardant drops and to communicate these observations to the aerial sector commander. Tactical lookouts could be tasked with this role – refer to LACES safety protocol

- Consider deploying aircraft to observe water or retardant drops from the air, to assess and communicate the relative effectiveness of water and retardant drops to pilots

- Relay any observations of water and retardant drops to pilots in a timely manner, so that they can adjust the positioning of their aircraft for subsequent drops as necessary

If military aircraft are requested and deployed at a wildfire incident, the incident commander or aerial sector commander should establish and maintain effective communications with military liaison personnel.

For further information about the effective organisation of the incident ground, refer to National Operational Guidance: Incident command. For further information about pre-planning for using aircraft at wildfire incidents, refer to the Scottish Government's Wildfire Operational Guidance.

Control measure – Manage the safety and security of take-off and landing areas for aircraft

Control measure knowledge

Suitable landing areas provide aircraft and unmanned aircraft with a safe and convenient base from which aerial operations can be provided and supported. If aerial assets are requested, it is useful if the incident commander and/or aerial sector commander can assist pilots of aircraft and unmanned aircraft in identifying potentially suitable take-off and landing areas. While the ultimate responsibility for selecting a suitable take-off and landing area will be with the pilot, the responsibility for managing the safety and security of take-off and landing areas will be with the incident commander and/or aerial sector commander.

Helicopters and other aircraft often attract onlookers who may inadvertently put themselves and/or the aircraft in danger. It is essential that the incident commander or aerial sector commander considers how members of the public and other personnel will be controlled and prevented from entering the landing area. Cones and tape are not appropriate for creating a cordon, so the safest and most effective means of control may be deploying personnel to prevent unauthorised people accessing the landing area.

If military aircraft are being deployed, the task of identifying an appropriate landing area will be the responsibility of the military liaison officer. The incident commander and/or aerial sector commander should ensure there is close co-operation and information sharing between the fire and rescue service and the military liaison officer.

Ideally take-off and landing areas should:

- Be large enough to accommodate all aircraft that may need to use it

- Be on level ground that is dry and firm

- Have a compact surface – sandy and gritty soil types should be avoided

- Wherever possible, have an approach that is free of flight hazards such as high vegetation, overhead pylons and/or other man-made structures

- Consider that helicopter pilots prefer to land into the wind

- Be located near to a road or track as this will assist in the provision of fuel and other supplies

- Be close to a water supply that can be used to replenish the aircraft's firefighting systems

- Have their location provided in the form of a grid reference to pilots and other personnel

Tactical actions

When assisting pilots in identifying a suitable take-off and landing area, the incident commander and/or aerial sector commander should:

- Clear all debris from the surrounding area, to reduce the likelihood of flying debris that may cause injury or damage

- Ensure vehicles are parked a sufficient distance away from the take-off and landing area

- Ensure that firefighting equipment is made ready but kept outside of the take-off and landing area

- Ensure that cones and tape are not used to mark or cordon off the take-off and landing area, as these can represent a significant hazard to aircraft

Environmental impact

Hazard	Control measures
Environmental impact	Apply generic control measures [as detailed for the hazard of 'Wildfires']
	Consider the protection of public health
	Consider the protection of ecological and heritage assets
	Consider the environmental impact of firefighting

Hazard knowledge

Guidance on environmental impacts can be found in the Environment Agency and DCLG environmental handbook and National Operational Guidance: Environmental protection.

Wildfires can have positive and/or negative impacts on the environment. The potential environmental impact is an important factor when planning how to deal with wildfires.

Fire has had a significant role in creating landscapes, particularly heathlands. Some flora (plants) and fauna (animals) depend on wildfires to sustain specific species and habitats. Positive impacts of wildfire are usually limited but can include the removal of unwanted species from sites, changes in the structure of vegetation that will restrict future incidents and an increase in knowledge of effective firefighting tactics.

However, wildfires have the potential to pollute air, water and land. They can also contribute to climate change by releasing carbon stored in vegetation and peat soils. There may be other impacts on ecological assets, air quality, public health, heritage assets, flora and fauna, tourism and recreation, and the production of food.

The environmental impact of wildfires can be direct and/or indirect. An example of a direct impact could include the loss of flora and fauna of high ecological value during a wildfire. An indirect impact may occur some hours, days or weeks after the fire. For example, soil exposed by surface vegetation being removed by the fire could be eroded by later heavy rainfall.

Environmental impacts may only affect the immediate area that is burnt by the wildfire, or may affect a much larger area, such as the surrounding landscape and communities. Wildfires burning in peat and soil in remote upland areas may contaminate water supplies for urban areas. Defining the boundaries of the environmental impact may require the advice of specialists and/or statutory bodies.

Wildfires can have an impact on a range of ecological assets. Some of the semi-natural habitats and species that can be affected by wildfire include:

- Bracken and scrub

- Dwarf shrub heath

- Grasslands

- Arable land

- Fen and bog

- Broadleaved, mixed and coniferous woodland

Some habitats that could be impacted by wildfires require a greater level of understanding. They may contain a variety of species of wild plants, birds and animals, some of which may be protected or of priority species status. Further information can be found on the website of the Joint Nature Conservation Committee.

Heritage assets may also be affected by wildfires. This covers a broad range of buildings, structures and sites. Further information can be found at websites such as:

- Historic England

- Historic Scotland

- Historic Wales

- Northern Ireland Environment Agency

- UNESCO World Heritage Convention

Important ecological and heritage assets may have designations such as:

- Sites of Special Scientific Interest (SSSI)

- Areas of Special Scientific Interest (ASSI) (Northern Ireland)

- Special Areas of Conservation (SAC)

- Special Protection Areas (SPA)

- Scheduled Ancient Monuments (SAM)

- Areas of Outstanding Natural Beauty (England, Wales, Northern Ireland)

- National Scenic Areas (Scotland)

- Ramsar sites

The potential negative impact on these assets should be taken into account when fire and rescue services make decisions on selecting, using, limiting and modifying firefighting tactics.

This should also be considered when responding to landscapes that have been affected by past uses, such as heavy industry, mining or quarrying, or current uses such as oil and gas extraction or production of agricultural fertilisers.

Control measure – Consider the protection of public health

Control measure knowledge

Mitigating the impacts of wildfire to protect public health is a key requirement for fire and rescue services in partnership with the relevant agencies. Early identification and communication may limit the possible impact on public health; therefore, prompt liaison with the relevant environmental agency and public health agency is recommended.

Pre-planning for wildfires also has a significant role in enabling the effective protection of public health.

Pre-planning with land owners and land managers should help to identify any hazards to public health in the event that their landholdings are involved in a wildfire. This provides an opportunity to develop an agreement about the appropriate control measures that may be used in the event of a wildfire.

Guidance on the potential environmental impact on public health can be found in the Environment Agency and DCLG environmental handbook and National Operational Guidance: Environmental protection.

Strategic actions

Fire and rescue services should:

- Carry out pre-planning for incidents that may impact on public health – refer to National Operational Guidance: Operations, in the section relating to Site-Specific Risk Information (SSRI)

- Use multi-agency groups that address wildfires to help determine the most effective strategies and tactics to reduce the impact of wildfire on public health

Tactical actions

Incident commanders should:

- Monitor and review the potential impact on public health with the assistance of the public health agency – for further information refer to National Operational Guidance: [Environmental protection](#) and the [Environment Agency and DCLG environmental handbook](#)

Control measure – Consider the protection of ecological and heritage assets

Control measure knowledge

Pre-planning has a significant role in enabling the effective protection of ecological and heritage assets in the event of a wildfire.

Pre-planning with land owners and land managers should help to identify any potential hazards to ecological and heritage assets in the event that their landholdings are involved in a wildfire. This provides an opportunity to develop an agreement about the appropriate control measures that may be used in the event of a wildfire.

Pre-planning with forestry, natural environment, environmental and heritage agencies and departments should help to determine what impacts wildfires may have on air, water, soil, nature conservation, natural resources (renewable and non-renewable), tourism and recreation.

If protected heritage assets are disturbed, damaged or destroyed as a result of firefighting actions, fire and rescue services should notify the relevant heritage agency at the earliest opportunity.

If tree felling has been carried out as part of the firefighting strategy for a wildfire, fire and rescue services should notify their local forestry agency at the earliest opportunity.

Strategic actions

Fire and rescue services should:

- Consider using multi-agency groups that address wildfires to help determine the most effective strategy and tactics to reduce the impact of wildfire on ecological and heritage assets

Tactical actions

Incident commanders should:

- Identify key stakeholders and agencies that may be able to provide advice and guidance if a wildfire could have an impact on ecological or heritage assets, and request their attendance if appropriate

- Communicate any risk to the environment, either known or suspected, to those attending the incident and where appropriate, the relevant agencies

- Monitor the impact of environmental pollution – [for further information](#) refer to National Operational Guidance: [Environmental protection](#) and the [Environment Agency and DCLG environmental handbook](#)

- Consider the advice and information provided by other agencies such as:

  o Exclusion areas in the inner cordon where environmental assets would adversely affect firefighter safety

  o Sacrificial areas of land that can be burnt with minimal impact to ecological assets

  o Fire excluded areas where ecological assets could be severely affected by wildfire

- o Downstream and upwind environmental impacts of wildfires at the site or within the wider landscape

- o The benefits and risks of firefighting operations and products on ecological and heritage assets

- Consider using controlled burns to protect ecological and heritage assets

- Consider the tactic of tree felling, which can be undertaken without a licence where it is clearly justifiable to prevent danger to life, property or the environment

Control measure – Consider the environmental impact of firefighting

Control measure knowledge

The environmental impacts of firefighting operations, including the impact of fire water or firefighting foam run-off, are included in National Operational Guidance: [Environmental protection](#) and the [Environment Agency and DCLG environmental handbook.](#)

Consideration must also be given to indirect impacts such as control line construction that may cause erosion during later high rainfall.

Pre-planning with neighbouring fire and rescue services, land owners and land managers should help to identify any potential hazards and to develop an agreement on the best fire suppression strategy, tactics, operations and appropriate control measures that may be used in the event of a wildfire.

Strategic actions

Fire and rescue services should:

- Ensure they have a good understanding of their responsibilities as detailed in National Operational Guidance: [Environmental protection](#) and the [Environment Agency and DCLG environmental handbook.](#)

- Consider using multi-agency groups that address wildfires to help determine the most effective firefighting strategy and tactics to reduce the impact of firefighting operations on the environment

Tactical actions

Incident commanders should:

- Carry out an environmental risk assessment – refer to National Operational Guidance: [Environmental protection](#) for further information

- Consider using high volume pumps (HVPs) at protracted incidents to reduce erosion damage of water pump relays and impacts on soil and water quality (refer to the control measure 'Understand how to request and mobilise National Resilience assets')

- Consider the location of HVPs to reduce the impacts on soil and water quality and flow rates

- Consider using temporary dams, pumps and refilling areas – if used they should be positioned correctly with appropriate control measures in place to minimise the impact on soil, water quality and ecological assets

- Consider using less or non-invasive tactics, such as hand tools or high-pressure water fogging units as alternatives at particularly sensitive sites, which could be affected by water or firefighting foam

- Carefully plan the location of control lines, as well as tree and vegetation removal, to reduce the risk of erosion

- Plan indirect attacks in partnership with land owners and land managers to ensure efficient and effective operations and to reduce the impact on recovery operations

- Consider the transmission of plant or animal pests or diseases – further information on bio-security can be found in National Operational Guidance: Environmental protection and the Environment Agency and DCLG environmental handbook, or through contact with the appropriate agency, such as Defra

- Establish 'exclusion areas' inside the inner cordon to protect sensitive assets that would be adversely affected by firefighting

Glossary

Term	Acronym	Description
Aerial fuels		Any fuel found at a height of more than 3.5 metres above the ground surface
All-terrain vehicle	ATV	Any motorised vehicle designed to travel on four low pressure tyres on unpaved surfaces, having a seat designed to be straddled by the operator and handlebars for steering control
Anaphylaxis		A severe generalised allergic reaction
Animal welfare charities		These include: • RSPCA (England and Wales) • SSPCA (Scotland) • USPCA (Northern Ireland) • British Equine Veterinary Association (BEVA)
Area of containment		An area of a wildfire where control has been established and no breakout is anticipated
Areas of Outstanding Natural Beauty	AONB	In England, Wales and Northern Ireland, these are areas of land that have been identified for special protection to preserve their character and qualities because of their identified national importance. Refer to http://www.landscapesforlife.org.uk/
Areas of Special Scientific Interest	ASSI	In Northern Ireland, these are areas of land that have been identified by scientific survey as being of the highest degree of conservation value. Refer to http://www.doeni.gov.uk/niea/protected_areas_home/area_interest.htm
Bog		A permanently saturated area of spongy ground with poor drainage. Bogs are usually found in upland areas experiencing cool temperatures and high rainfall. Slow decomposition of the plants found in bogs sometimes leads to the formation of peat
Breakout		The escape of a wildfire from an area of containment
Civil Aviation	CAA	The UK's specialist aviation regulator

Authority		
Control line		Control lines are constructed or natural barriers, including treated fire edges, which are used to control a fire. They can be constructed manually, mechanically or by applying water or retardants
Convection column		A rising column of pre-heated smoke, ash, particles and other debris produced by a fire
Critical point		A point in time or place, when or where there will be a significant change in firespread, rate of spread and/or fire intensity
Dead fuels		Fuels with no living tissue. The moisture content of dead fuels is mostly controlled by external weather conditions, such as relative humidity, precipitation, temperature, and solar radiation
Downslope		At or towards a lower point on a slope
Environmental agency		An agency specifically established to protect, manage and improve the environment. Examples of environmental agencies include: • English Heritage • Environment Agency (England) • Natural Resources Wales • Northern Ireland Environment Agency • Scottish Environment Protection Agency • Scottish Natural Heritage
Fen		A wetland environment consisting of low lying land covered fully or partially by water
Fine fuels		Fast-drying dead fuels that are less than 6mm in diameter. Fine fuels ignite readily and are rapidly consumed by fire when dry. Examples of fine fuels include grass, leaves, ferns, mosses, pine needles and small twigs. When dried, fine fuels are referred to as 'flash fuels'
Firebreak		Areas where there is a change or discontinuity in fuel that will reduce the likelihood of combustion or reduce the likely rate of firespread. Firebreaks may be suitable control lines.
Fire intensity		The rate at which a fire releases energy in the form of heat, expressed as kilowatts per metre (kW/m) or kilojoules per meter per second (kJ). Fire intensity should not be confused with fire severity
Fire severity		Fire severity can be defined in two ways: • The degree to which a site has been altered or disrupted by fire • The capacity of a fire to cause damage Fire intensity and the amount of time a fire burns within a particular area, among other possible factors, will influence fire severity. Fire severity should not be confused with fire intensity

Flame height		Measurement of flame height is calculated perpendicular from ground level to the tip of the flame. Flame height will be less than flame length if flames are tilted due to wind or slope
Flame length		The total length of a flame measured from its base at ground level to the flame tip. Flame length will be greater than flame height if flames are tilted due to wind or slope
Fuel break		Areas where vegetation and all other combustible materials have been removed to expose the mineral soil. Fuel breaks may be constructed and may be suitable control lines. They are commonly used to contain and suppress ground fires.
Ground fire		A fire burning below the surface of the ground
Ground fuels		Any fuel below the surface fuel layer, normally within the soil. Examples of ground fuels include organic matter, tree roots, shrub roots, rotting wood and peat
High volume pump	HVP	National asset used for pumping large volumes of water over large distances
High volume pump tactical adviser	HVP Tac Ad	The role of the HVP Tactical Adviser is: • To provide planning advice at Silver and Bronze level for the appropriate HVP response • To provide tactical advice to the incident commander, operations commander or sector commander as to the safest and most effective use of HVP resources • To provide information to the incident commander, operations commander or sector commander regarding the nature of the incident and further HVP resources that may be required for the resolution of the incident. Note: A HVP Tactical Adviser will not monitor performance or take any operational command responsibilities at an incident other than providing advice as stated above
Horizontal fuel arrangement		A description of the distribution of fuels on the horizontal plane. The horizontal arrangement of fuels will influence the relative ease with which fire can spread horizontally across an area of land
Ladder fuel		Fuels that provide vertical continuity that allow fire to move through the vertical fuel arrangement
Local emergency planning groups		Known as: • Local resilience forums (England and Wales) • Regional or local resilience partnerships (Scotland) • Emergency preparedness groups (Northern Ireland)
National		National frameworks includes:

frameworks		• National Co-ordination Advisory Framework for England • Fire and Rescue National Framework for Wales • Fire and Rescue Framework for Scotland • Northern Ireland use an amalgamation of the three frameworks for England, Scotland and Wales to produce their Corporate Plan and Annual Business Plan
National Scenic Areas	NSA	In Scotland, sites identified with outstanding scenery that require special protection from inappropriate development. Refer to http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/national-designations/nsa/
Parallel attack		A type of indirect attack involving creating control lines along the flanks of the fire, towards and around the head of the fire
Peat		An organic fuel layer consisting of a light, spongy material formed in temperate humid environments through the accumulation and partial decomposition of vegetation debris
Pulaski		A hand tool that includes a double-sided head that combines a mattock (cutting blade) for digging or grubbing on one side, and an axe for chopping on the other
Rake hoe		A hand tool that includes a double-sided head that combines a rake on one side and a hoe on the other
Re-entrants		These are normally drainage features with slopes on either side
Responsible person		The person responsible for a site, building, or similar. Used in a legislative context they are known as: • Responsible Person (England, Northern Ireland and Wales) • Duty Holder (Scotland)
Rural-urban interface	RUI	A zone of transition between rural land and urban settlements
Saddles		Identified as a curvature in the landscape formed between two areas of higher ground
Scheduled Ancient Monument	SAM	As defined in the Ancient Monuments and Archaeological Areas Act 1979, that makes provision for the investigation, preservation and recording of matters of archaeological or historical interest
Site of Special Scientific Interest	SSSI	Areas protected by law to conserve their wildlife or geology. Refer to https://www.gov.uk/protected-areas-sites-of-special-scientific-interest
Smouldering fires		A fire burning without flame and barely spreading
Snag		A standing, dead or dying tree, often missing a top or most of the smaller branches

Special Area of Conservation	SAC	Strictly protected sites designated under the EC Habitats Directive. Refer to http://jncc.defra.gov.uk/page-23
Special Protection Area	SPA	Strictly protected sites classified in accordance with Article 4 of the EC Birds Directive. Refer to http://jncc.defra.gov.uk/page-162
Stump		After a tree has been cut and felled, the stump or tree stump is usually a small remaining portion of the trunk with the roots still in the ground
Surface fuels		Any fuels found at a height of up to 0.5 metres above the ground surface
Torching		A fire that burns from the ground through the surface and aerial fuels and into the crown of a single tree, or small group of trees
Trigger point		A pre-designated point in time, or place, or a change in conditions, when or where tactics will be changed. For example, if a wildfire reaches a particular trigger point on the landscape, the incident commander may decide it is necessary to adopt alternative tactics to maintain safety and effectiveness. To provide another example, if extreme fire behaviour is observed on an area of the incident ground then this may trigger a withdrawal of personnel from this area to a safety zone
Unmanned aircraft		An aircraft piloted by remote control or on-board computers. Unmanned aircraft are also referred to as unmanned aerial vehicles, remotely piloted aircraft or drones
Unmetalled road		A road that does not have a hard surface
Vertical fuel arrangement		A description of the distribution of fuels on the vertical plane, from the ground up to the canopy levels of vegetation. The vertical arrangement of fuels will influence the relative ease with which fire can spread vertically through the fuel layers
Wet line		A line of water, or water mixed with firefighting chemicals, which is sprayed along the ground to serve as a control line from which to ignite an operational burn or to stop a low-intensity fire
Window of opportunity		A period of time, or location on the landscape, when or where it will be particularly beneficial to adopt particular suppression tactics or actions
Zoonoses		Diseases that can be transmitted from animals to humans

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