

Report to the Emergency Services Foundation

Emergency services and the environment

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Background

The community expects all services provided by government and other organisations to be delivered in an economically, socially and environmentally responsible way.

Many fire service activities can benefit or negatively affect the environment.

Key environmental issues for fire services in Australia include:

- effects of incidents on air, land, water, flora and fauna,
- minimising environmental damage from fire service activities,
- community concerns on issues such as fuel reduction burning, and
- management of urban fringe development.

Other emergency services can also affect the environment, and risk community concern regarding environmental issues.

While a number of fire services have formal environment programs, managing environmental risk is relatively new to emergency services.

The Australasian Fire Authorities Council (AFAC) is establishing a working group to assist fire services to start building environmental care into their business.

The challenge for emergency services

A key challenge for CFA and other emergency service organisations in Australia is how to improve environmental practice while maintaining efficient and effective delivery of their services.

These two objectives are not always compatible, or are not always seen as compatible.

This project aims to research how emergency services in other locations are responding to this challenge and to share their experiences with CFA, other Australian emergency services, local government and the wider community.

Project objectives

- To collect examples of methods used by fire and emergency services around the world to manage environmental issues.
- To develop on-going partnerships in environmental risk management.
- To share information gained with CFA, other Australian emergency services and the community.

Case studies

Environmental management was clearly seen as relevant to the emergency services researched.

The following case studies highlight some of the key themes of interest arising from my research to date in the following categories:

[Business support](#)

[Global change](#)

[Pollution prevention](#)

[Cultural heritage protection](#)

[Matters of environmental significance](#)

[Wildfire and the environment](#)

[Managing environmental issues](#)

Business support

London Fire Brigade (LFB), the London Metropolitan Police, West Yorkshire Fire Authority and Cheshire Fire Service provide examples of how consideration of the environment has been built into business support.

Many of these initiatives have been driven by the European Union (EU) regulations, affecting:

- greenhouse gas reduction,
- packaging, and
- battery recycling.

Regulation of environmental impacts by community, business and government activities is increasing significantly in Europe. While Australia shares many of these issues, such as greenhouse gas emissions, regulation is less advanced, although similar initiatives are encouraged by government.

Fire and emergency services in Australia should consider how to position themselves with regard to these issues before regulation increases further.

Recycling

Some initiatives include:

- toner cartridge and paper recycling at main offices and stations,
- recycling of batteries, and
- the LFB store, which supplies 112 stations, reuses packaging.

Both LFB and the London Metropolitan Police Service recycle uniforms and equipment. The recycling company supplies collection bags and shreds fabric for use in car seat padding and other applications. Badges are reused.

Police body armour, firearms, offensive weapons, as well as ammunition casings and spent rounds collected from the Metropolitan Police firearm ranges are recycled.

LFB purchases furniture which is sustainably produced, including second-hand furniture which is reconditioned.

Purchasing

The procurement team at LFB have successfully reshaped their approaches to purchasing to achieve good environmental outcomes as follows.

- Environmental requirements are built into all purchase contracts as they are renewed.
- Meetings are held with existing and prospective suppliers to communicate where LFB is headed with environmental care as well as other issues.
- Rather than being prescriptive in tender specifications, LFB ask suppliers to show how they will deal with environmental issues such as packaging, recycling, and sustainable materials and practices. LFB have done this recently with batteries.
- Recycling of used products by the supplier is specified, where appropriate
- Cost savings offsets are identified for more expensive initiatives. For example, LFB negotiated down the cost of collection of waste paper down by 50% to offset the increased cost of using recycled office paper.
- Whole of life costing is considered. For example, in London while the cost of alkaline batteries is 33% higher, the batteries last longer.
- Basic research on product options is carried out to support business cases and negotiation with suppliers where needed.
- LFB has been working on quick wins.
- LFB participates in joint purchasing with the Local Government Authority to give cost savings as well as potential to negotiate environmental savings.

Sustainable items purchased by LFB include furniture. Bulk purchasing of firefighting foam to minimise containers is also under consideration.

Travel

Vehicles

The use of smaller and alternative fuel vehicles is common in the United Kingdom (UK). This is driven by EU policy regarding greenhouse gas emissions.

Initiatives undertaken by UK fire services interviewed include:

- use of smaller vehicles for administration and command functions,
- replacement of fire units to meet EU emission requirements,
- use of long life engine oil,
- recycling of used engine oil for heating, and
- recycling of lead/acid batteries.

Biodiesel

Biodiesel is used by the London Metropolitan Police Service and is being trialled by the London and West Yorkshire Fire Authority (WYFA). This fuel contains 5% rapeseed oil, reducing greenhouse emissions.

Access to supplies is limiting it's use in London (as in Australia). However, supplies are expected to expand.

Reducing travel

A videoconferencing business case developed by LFB demonstrated cost as well as environmental savings.

Carbon 'sinks'

LFB supports the UK's Carbon Trust and is planning to purchase forest trees to compensate for greenhouse gas emissions

The Chief Officer of LFB drives a hybrid (electric assisted) vehicle (Honda Civic), demonstrating environmental leadership, as well as reducing greenhouse emissions



Energy conservation

Some WYFA initiatives include:

- heating efficiency improvements to existing buildings including installation of double glazing and upgrading of insulation,
- low energy lighting facilities introduced at offices and fire stations,
- solid fuel boilers replaced with gas and oil fired types at fire stations, and
- all new building work utilises energy efficient materials and resources.

LFB purchases 'green' electricity. This is electricity which is produced using more sustainable methods such as wind power.

Water

The London Metropolitan Police Service has reduced water consumption by 25% in the 5 years to 2001-2.

Plumbing in of drinking water in LFB buildings has saved 250,000 water bottles and £50,000 each year.

LFB is trialling the use of personal drinking water bottles with operational staff. Feedback received so far indicates good support.

Noise

LFB has developed an ambient noise strategy. The use of station bells is being discontinued.

Selected references

Metropolitan Police Authority (2003) The Metropolitan Police Authority's Environmental Progress Report.

Global change

Climate change and flooding

England experienced widespread and prolonged flooding in Autumn 2000 (and again in 2004). In 2000, 10,000 properties were flooded in 700 locations. There was severe disruption to road and rail facilities and repeat flooding in some places. The total cost of the 2000 floods was estimated to be in the order of £1 billion.

Response and recovery operations stretched all emergency services. Wide-ranging recommendations to improve flood defences, prediction systems, community information, land use planning and emergency response roles and arrangements were made following the floods.

Evidence suggests that the UK climate is growing warmer, with wetter winters and drier summers. By 2080, daily winter rainfall may increase by between 5 and 20%. Sea levels may increase by between 26 and 86 cm above current levels in south east England and extreme sea levels could occur between 10 and 20 times more frequently. As a result, flooding is expected to be more severe and more frequent. Most of the climate change over the last 50 years is attributed to increasing greenhouse gas emissions due to human activities.

The Office of Science and Technology analysed risks and options for managing floods. They used sustainability analysis to determine that a mix of treatments including greenhouse gas reduction, catchment-wide storage, land use planning and realignment of coastal defences would be most effective in reducing risks. Their report will assist with the development of 20 year flood strategy.

The Environment Agency's current strategy for flood risk management focuses on:

- improving flood defences,
- improving flood forecasting,
- local planning for floods,
- helping residents to protect themselves,
- preventing inappropriate development in flood plains, and
- assisting flood recovery.

There appears to be a significant awareness in the UK of the potential for climate change impacts on the emergency services. However, how this will be managed does not appear clear to some of the services visited.

Considerations for Australian emergency services

There is potential to further raise awareness of the risks of environmental change, including flooding and fire, in Australia.

There is also potential to learn from approaches used in the UK to analyse and manage the changing flood risks.

Selected references

Department for Environment, Food and Rural Affairs (2002) Climate change scenarios for the United Kingdom. The UKCIPO2 Briefing Report.

Environment Agency (2001) Lessons learned. Autumn 2000 floods.

Office of Science and Technology (2004) Foresight. Future Flooding. Executive summary. www.foresight.gov.uk

Environmental regulation

There is extensive regulation for environmental protection in the UK. New regulation encourages the end of life recycling of goods by manufacturers, and there are stringent emissions standards for transport.

This regulation is having an unwanted effect on the environment and emergency services. Illegal dumping and ignition of cars, refrigerators and other goods is increasing.

This situation is also thought to be exacerbated by moves to rationalise the hundreds of hazardous materials disposal sites across the UK.

This issue is being dealt with by enforcement though local government and the Environment Agency.

Pollution prevention

A range of measures are in place in the UK to deal with pollution arising from fires or hazardous materials incidents. These place responsibility on landowners and polluters to deal with their pollution. They also clearly define responsibilities and working arrangements between UK fire services and the Environment Agency. The strong partnerships between the Environment Agency and the fire services was evident from interviews conducted.

Industry

Owners of industrial sites not covered by mandatory requirements are encouraged by the Environment Agency to develop pollution prevention plans which identify:

- risks of pollution to air and water,
- drainage features,
- waterways at risk of pollution,
- means of containing and disposing of pollution including firewater runoff, and
- firefighting strategies to minimise pollution.

Mass decontamination

Procedures have been developed to manage the risk of infection and water pollution from mass decontamination units. Water pollution is one of the risks considered in siting these facilities.

Incident management

The UK's Water Resources Act 1991 (s85) gives protection to fire services against legal liability for pollution where they can demonstrate:

- every reasonable step was taken to prevent the pollution,
- they were taking action to protect health and property, and
- the Environment Agency is notified as soon as practicable.

Agreements between fire services and the Environment Agency (see following section 'Partnerships') establish the responsibility of the fire services for first response to hazardous materials incidents and handover to the polluter or landowner for cleanup.

Fire services interviewed:

- liaise with Environment Agency staff at incidents regarding protection of surface and ground water,
- liaise with local government regarding human health and air issues
- have electronic mapping showing location of waterways,
- routinely contain firewater runoff and other waste for treatment and disposal by the owner of the site or pollution,
- divert firewater to sewers with approval of water authorities,
- appoint Hazmat officers to support incidents involving foam, and
- use water saving tactics.



Fire service facilities

Pollution protection measures carried out by some of the fire services interviewed include the following :

- recycling of water used in training,
- foam training only in specialised areas and on a reduced basis,
- use of 'training' foam in preference to 'real' foam for training, and
- use of gas fires for training.

Manchester Airport Fire Service maintains a training facility which is used for foam and other training by surrounding fire services. This fire service is concerned about its ability to continue to provide realistic training scenarios using carbon-based fires and 'real' foam.

Environmental skills

A large number of fire service staff I met in the UK have environmental qualifications and a good understanding of environmental protection issues including waterway protection and biodiversity.

The five week hazardous materials and environmental protection course provided at the Fire Service College at Moreton-on-Marsh includes one week on environmental protection. This is resourced by the Environment Agency.

Selected references

Environment Agency. The Environment Agency grab pack (video)

Environment Agency, Scottish Environment Protection Agency and Environment and Heritage Service pollution prevention guidelines. www.environment-agency.gov.uk

PPG 3 The use and design of oil separators in surface water drainage systems

PPG 18 Managing firewater and major spillages

PPG 21 Pollution incident response planning

PPG 22 Dealing with spillages on highways

Harman (2003) Focus on foam. Fire prevention and fire engineers journal June 2003.



Air versus water pollution

A draft report on management of air and water pollution hazards from structural fires was commissioned by the National Fire Service Liaison Working Group in the UK (see 'Partnerships').

The findings of this report are being used to:

- develop UK policy on the application of 'controlled burns', and
- provide guidance to site owners and fire services in preparing pollution incident response plans.

Stakeholders consulted during the preparation of the report included regulators, fire services, insurers, industry and operators, and local authorities. Most stakeholders agreed with the concept of controlled burning provided safeguards were in place to protect firefighter and public health and safety and provided financial factors were taken into account. Legal issues were also examined.

This report examines the environmental costs and benefits of allowing a structure to burn (and risking short-term air pollution and deposition of airborne contaminants) compared with application of water and foam (and risking ground and water pollution from contaminated firewater runoff).

Because of the lack of financial data, a semi-quantitative risk-ranking approach was taken to assessing impacts of six case study fires. Impacts considered include human health, water quality, air pollution and the terrestrial environment.

The report proposes the adoption of least-impact tactics by the incident controller, based on a two-tiered risk assessment process and pre-planning.

Guidelines include methodologies for:

- a preliminary risk screening of all sites or activities which may cause environmental harm (activity of concern, record of incidents, firewater containment capacity, quantities of substances relative to a threshold, proximity to sensitive locations eg watercourses), and
- a more detailed risk assessment where there is significant risk of environmental damage from a fire to rate the relative threats to air, water and land.

Considerations for Australian emergency services

This report supports decision-making based on best available information and a risk assessment approach and, where available, preplanning.

Implementation of preplanning as outlined in this report will require a significant commitment from fire services, environment agencies and site owners. Access to data, workload and costs will be significant issues.

This report should be considered by Australian fire services in review of this issue.

Selected references

- Environment Agency (2000) Environmental impact of controlled burns. R&D Technical Report P388.
- Environment Agency, Scottish Environment Protection Agency and Environment and Heritage Service pollution prevention guidelines. www.environment-agency.gov.uk

PPG 21 Pollution incident response planning

Pollution partnership

A strong partnership has been established between UK fire services and the Environment Agency (EA). The National Fire Service Liaison Working Group was established in 1998 to help determine how local government service objectives relating to the environment could be implemented by fire services.

Kevin Arbuthnot, Chief Officer, West Yorkshire Fire Authority, who represents the Local Government Association on this group, believes that the partnership has been successful in achieving practical working arrangements, funding for fire service delivery and improved understanding of the way that fire services benefit the environment. Environment Agency and fire service staff interviewed have commented enthusiastically on the cultural changes the partnership has brought.

Achievements from this partnership to date include the following.

- Establishment of a memorandum of understanding and local working arrangements for first response to hazardous materials incidents. This clarifies the roles of both EA and the fire services. Fire services act as an agent of EA and take initial steps to contain the pollution. The polluter, or the landowner is responsible for cleanup, unless they are unable to be located. Costs to fire services are recouped through charging polluters, where they can be located.
- Provision of an effective first response capability for hazardous materials incidents.
- Provision of 'grab packs' to fire service units by EA. These include booms, mats and chemicals for first response to pollution incidents. Equipment specifications include training by suppliers. The cost of maintaining the bags is borne by the fire service, unless costs can be recovered from polluters.
- Research and development on issues including management of air and water pollution hazards from structural fires and environmental impacts of firefighting foams.
- Development of 'pollution prevention guidelines'.
- Development of environmental protection training as part of the Hazardous Materials and Environmental Protection course.
- Training of over 45,000 fire service personnel in environmental protection.
- Each Environment Agency region has a contact person for fire service issues.

The working group is currently under review. The final model for the partnership and the fire service role in response to pollution incidents will depend upon the current review of the fire services.

Considerations for Australian emergency services

The UK partnership could provide a model for facilitating improved:

- understanding of EPA and fire service issues,
- input into environmental regulation, and
- refinement of pollution management guidelines and training.

Consideration should also be given to:

- whether the EA/fire service memorandum of understanding could assist Australian fire services to clarify respective roles for first response and help access additional funding for this service,
- contents and popularity of the grab bags, and
- review of the UK training materials and guidelines.

Selected references

Environment Agency (2000) Environmental impact of controlled burns. R&D Technical Report P388.

Environment Agency. The Environment Agency grab pack (video).

Environment Agency, Scottish Environment Protection Agency and Environment and Heritage Service pollution prevention guidelines. www.environment-agency.gov.uk

PPG 18	Managing firewater and major spillages
PPG 21	Pollution incident response planning
PPG 22	Dealing with spillages on highways

Local Government Association and the Environment Agency (2000) Protocol between the Local Government Association and the Environment Agency on fire service issues.

West Yorkshire Fire Authority and Environment Agency (undated) Local working arrangements.



Cultural heritage protection

The UK National Trust (NT) and US National Parks Service (NPS) have both recently introduced structural fire management programs to assist in the protection of cultural heritage from the effects of fire and fire suppression.

Both organisations manage buildings and collections of national and international significance. For example, the Statue of Liberty and the Smithsonian Institute are located in parks. The UK National Trust, which is the second largest landowner in the UK, manages 20,000 buildings worth £130m. 7,500 of these buildings are of heritage importance.

Fire monitoring

The National Trust maintains detailed records for structure fires. In the 833 fires since 1991, most (240) have been caused by electrical problems.

In the previous 10 years, the NPS has had approximately 5000 reported incidents. There has been no major structural fire since the 1970s.

Prevention and preparedness

The National Trust prefer a human presence wherever possible and supplement this with detection systems. Systems are designed to exceed the British Standard for smoke, to minimise smoke damage to assets. Structural aids such as fire doors and roof compartmentalisation are installed, where required, however, non-engineering solutions are preferred. Sprinkler systems will be installed if buildings are not staffed, but are not preferred because of the risk of causing damage to buildings and collections.

In contrast, the NPS structural fire unit recommends that sprinklers be installed in all new NPS buildings. Every park and museum has a structural fire management plan. The National Fire Protection Association (NFPA) standard has been adopted as a baseline.

Both organisations strongly emphasise fire awareness. National Trust property staff train with brigades annually.

Suppression

National Trust buildings are supplied with extinguishers but not hose reels, because of the risk of water damage. Suppression is carried out by fire services. The senior NT person is made available to assist the fire service with advice.

The NPS are about to conduct a analysis process to determine the appropriate mix of risk treatments, and whether provision of engine resources is the best way to protect cultural heritage.

Recovery

The National Trust have developed procedures and established recovery teams for evacuating collections affected by fires or other emergencies. Decision-making regarding evacuation is based on the site inventory and asset priorities as well as operational considerations.

Risk transfer

Many NPS sites are managed through commercial concessions. Fire prevention requirements are being placed into contracts, allowing these costs to be built into the commercial arrangements. Two parks maintain 'concession brigades'.

The majority of NT buildings are managed by the Trust and not by tenants.

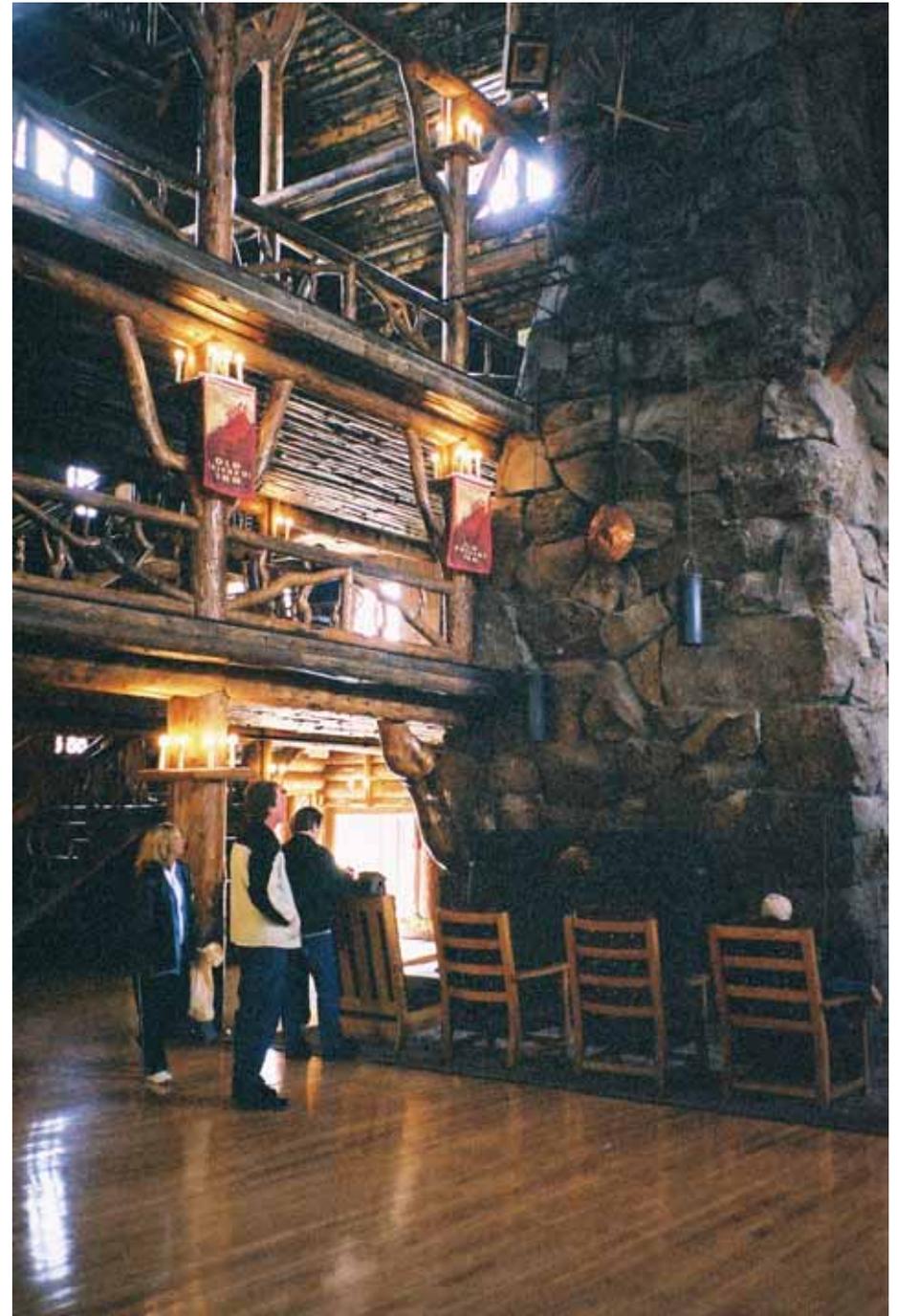


Fire protection systems in the historic Old Faithful Inn at Yellowstone National Park, illustrate the tension between fire safety and cultural/aesthetic considerations.

Selected references

Packer (2002) Fire protection at historic properties. The National Trust approach. Paper no 1

Packer (2002) Fire protection at historic properties. The National Trust approach. Paper no 2



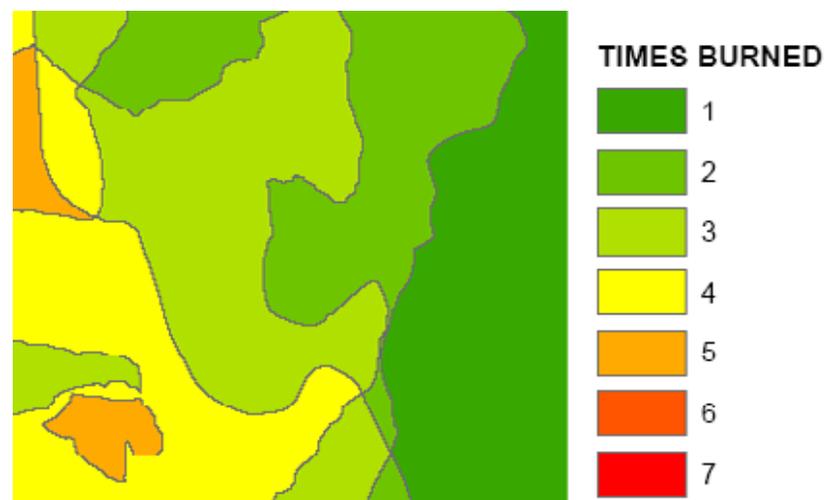
Matters of environmental significance

Here are some examples of how some fire services obtain information on matters of environmental significance.

Orange County Fire Authority (OCFA)

OCFA, assisted by surveys from the Nature Conservancy, maps sites of biological and archaeological significance. These are used with guidelines for fire prevention, incident management and incident recovery programs.

OCFA is conducting a research project to correlate the number of times vegetation has burnt since the early 1900's with vegetation condition. This information will be used to assist the determination of appropriate fire regimes, to assist restoration of fire-dependent vegetation communities and plan fuel management.



United States Forest Service (USFS) Fire Effects Information System (FEIS)

FEIS summarises research about living organisms found in the United States (US). It contains information on their biology, ecology and relationship to fire.

For example, for the grizzly bear (*Ursus arctos*)

'Fire can be used to ...maintain ..shrub communities by rejuvenating shrubs, releasing nutrients and discouraging conifer dominance...A fire-induced increase of berry-producing shrubs may only be beneficial if spread over large areas...'

(www.fs.fed.us/database/feis)

US NPS incident management teams (IMTs)

IMTs in the Yellowstone/Grant Teton areas rely upon Resource Advisors rather than databases to provide information on matters of environmental significance which need to be taken into account in incident management.



Firefighter access to data

Cheshire Fire Service has environmental information including watercourses and stone walls as well as other operational information available to firefighters on on-board computer-based maps



Wildfire and the environment

Wildfire is regarded globally as a significant hazard to environmental values, as well as health and safety.

The importance of environmental issues is highlighted by the work being carried out through the United Nations and several recent conferences including the 2003 Third International Wildland Fire Conference held in Sydney, which had the theme of fire management and sustainable development.

Environmental issues of concern at the international level include the degradation of natural resources, soils and air and water quality from inappropriate fire. A significant example is the widespread smoke haze experienced as a result of the El Niño of 1997-98. There are significant concerns about damage to forest resources and soils from fire in the Mediterranean area.

The historical exclusion of fire from fire-adapted plant communities is believed to be a major contributor to this situation, resulting in a build-up of fuel levels and a greater incidence of severe fire.

Lack of fire or significant changes to fire regimes in fire-adapted vegetation communities is also increasingly recognised as a threat to the ecological health of these communities.

Both of these issues are relevant to Australia.

There are significant examples at the international, national and local levels on work to address these issues.



International approaches to wildfire and environment issues

International approaches to reduce the negative impacts of wildfire on the environment and the global community are being developed:

- in accordance with the United Nations (UN) International Strategy for Disaster Reduction (UN-ISDR), and UN conventions on biodiversity, desertification, and climate change, and
- in cooperation with a range of international organisations including FAO, UNESCO, WHO and the newly created UN University for Human Security and the Environment.

Work on wildfire issues is in the process of being transferred from the Working Group on Wildland Fire (WG 4) to the Global Wildland Fire Network, which is administered by the Global Fire Monitoring Center (GFMC), and the UN-ISDR Wildland Fire Advisory Group.

Advice is given to the UN through the Inter-Agency Task Force for Disaster Reduction.

Approaches

Reduction of unwanted fire is being assisted by mechanisms including:

- cooperative arrangements for combatting fires and sharing resources, and
- monitoring of fire risks and fire incidence.

Guiding principles to reduce the negative impacts of fires and encourage appropriate fire regimes were discussed at the International Wildland Fire Summit held in October 2003. The theme of the summit was 'Fire Management and Sustainable Development'.

While Summit participants only agreed to the use of the guiding principles in international projects, this agreement gives credibility to these principles for all fire management, and provides a further step towards developing a global wildland fire strategy.

Environmental principles discussed include the following.

- The occurrence, frequency and intensity of fire, or its exclusion are determining factors for maintaining, enhancing, or reducing the health and sustainability of ecosystems.
- There is a need to integrate management of ecosystems and sustainable development, as well as social objectives, into fire management planning and practices.
- Community-based fire management will usually form the basis of effective fire management. Some communities may benefit from a better understanding of the role of fire in the environment and the deliberate use of fire.
- Fire management activities should be planned and conducted in an environmentally sensitive manner taking into account:
 - fire regimes and fire management activities appropriate to maintain the vigour and diversity in populations of species and communities of indigenous flora and fauna,
 - protection of water quality and quantity, soil, landscape values, geomorphological features, cultural and historical, indigenous flora and fauna,
 - avoiding the possible introduction and spread of pest plants and animals, plant diseases, and insect pests, and
 - air quality being addressed by measures which balance the impacts of smoke generated by prescribed burning.

Considerations for Australian emergency services

These approaches and principles provide guidance for (and validate the current approaches of) Australian wildfire managers in dealing with environmental issues.

Selected references

Goldammer (2004) Towards developing a global wildland fire strategy. Proceedings of the second symposium on fire economics, planning and policy: A global view.

Goldammer (2004) Transition from Working Group 4 Wildland Fire to the Global Wildland Fire Network and the Wildland Fire Advisory Group: Towards an International Wildland Fire Accord. Presentation to International Strategy for Disaster Reduction 9th Inter-Agency Task Force Meeting, Geneva, 4-5 May 2004. <http://www.unisdr.org/eng/task%20force/tf-working-groups4-eng.htm>

Hamilton, Morgan and Williams (2003) Guiding Principles for Wildland Fire Management. Annexure 1 to the International Wildland Fire Summit 2003 Communiqué. www.fire.uni-freiburg.de/summit-2003/International-Wildland-Fire-Summit-Communique-original.pdf

Fire management planning

Fire is recognised by the United States government as a critical natural process which has been excluded from the environment. Fire exclusion has resulted in a buildup of forest fuel and changes in vegetation composition. It has been linked to more severe wildland fires, and increasing ecosystem health problems.

Concerns from a number of influential stakeholders over many years has recently culminated in the development of a national policy and planning framework and extensive programs on both public and private land to protect the community and environment from the unwanted effects of fire.

Policy framework

A number of documents provide a framework for federal agencies, states, tribes, local governments, and communities to manage fire. Specific fire management policy documents include:

- Federal Wildland Fire Management Review (1995),
- Federal Wildland Fire Management Policy (2001),
- National Fire Plan (2001),
- 10-year strategy and implementation plan (2002), and
- Healthy Forests Restoration Act (2003).

Relevant environmental regulation includes the National Environmental Policy Act (NEPA) which requires government approval of environmental issues affected by federal proposals.

Performance monitoring and accountability is driven by the Government Performance and Results Act 1993 which requires program activities and measurement to be linked to desired outcomes, including effectiveness.

Federal fire policy aims to achieve the following:

- improvement in fire prevention and suppression,
- reduction of hazardous fuels,
- restoration of fire-adapted ecosystems,
- fostering of community stewardship,
- integrated management of safety and environmental issues, and
- accountability.

Implementation is planned at the national, state/regional/tribal and local levels, with performance indicators and tasks for each goal contained in the strategy.

Goal 3 of the federal strategy aims to achieve the following outcome: 'Fire-adapted ecosystems are restored, rehabilitated and maintained....(to) provide sustainable environmental, social and economic benefits.'

Performance measures specified in the implementation plan include movement towards desired fire regimes. (These are based on fire history (condition class), rather than species and age class diversity, as used on public land in Victoria). Other measures include percentage rehabilitation of areas degraded by wildland fire, and cost effectiveness of condition class improvement.

Planning and performance management on Federal lands

Federal land managers (Bureau of Land Management, US Forest Service, National Parks Service, Bureau of Indian Affairs, Fish and Wildlife Service) are required to develop integrated interagency fire management plans that:

- implement the new policy directions,
- address hazard reduction and ecological health, and
- document strategies for prevention, suppression and recovery that support community, land and resource objectives.

The Fire Program Analysis (FPA) system is being developed to support planning, monitoring and budgeting. It will:

- assist the development of measurable fire management objectives and performance measures across all fire management activities (preparedness, suppression, wildland fire use, fuel management, rehabilitation and restoration and prevention),
- enable the evaluation of the effectiveness of alternative fire management strategies in meeting land management objectives, at landscape and management unit levels, and
- assist reporting on outcomes.

'The greatest challenge in implementing FPA will be the identification of meaningful measurable objectives and indicators.' (Robertson and Roose, 2003).

The planning process is also being supported by the development of information systems and provision of training and support.

Environmental issues are built into federal fire management planning as shown in the following table.

<p>Federal policy</p> <ul style="list-style-type: none"> • Healthy Forests Restoration Act 2003 • National Fire Plan 2001 • 10 year 'Fire and Restoration' strategy and plan 2002 	<ul style="list-style-type: none"> • Land and resource management plans set the objectives for the use and desired future condition of the land. • The role of wildland fire as an essential ecological process and natural change agent will be incorporated into the fire management planning process. • Fire management programs and activities will be based on economic analyses that incorporate commodity, non-commodity, and social values. <p>(Department of Agriculture (1995) Federal Wildland Fire Management Policy and Program Review Final Report)</p>
<p>Planning</p>	<p>For each fire management unit (eg back country or wildland-urban interface), the plans contain:</p> <ul style="list-style-type: none"> • Objectives and performance indicators which define the current and desired condition of the land or resource • Fire management strategies which will assist in achieving the desired condition. • Weighting to indicate priority. <p>Example of objectives and performance indicators</p> <p>Land management plan objective:</p> <ul style="list-style-type: none"> • suppress all unwanted fires <p>Resource management plan objective:</p> <ul style="list-style-type: none"> • protect critical habitat from unwanted (severe) fire <p>Fire management plan objective:</p> <ul style="list-style-type: none"> • control 95% of unwanted fires <p>Performance measures (FPA inputs):</p> <ul style="list-style-type: none"> • unplanned ignitions greater than a specified intensity threshold during specified months to be kept to specified size <p>(Adapted from Robertson and Roose (2003) Fire Management Planning – Developing strategies and setting measurable objectives for adaptive management)</p>
<p>Environmental data</p>	<p>Landfire (environmental data system) includes vegetation conditions, fire fuels, risks, and ecosystem status at the national, regional, and local scales to assist planning and monitoring.</p> <p>(www.landfire.gov)</p>

Community fire planning

The Healthy Forests Restoration Act 2003 requires federal land managers to give consideration to the priorities of local communities in the:

- development of forest management and hazard reduction programs on federal lands, and
- distribution of funding for projects on other land.

Priority is placed on treatment of areas identified by communities in an Community Wildfire Protection Plan (CWPP). The plans focus on the wildland-urban interface.

These plans must, at a minimum:

- be developed collaboratively,
- prioritise location and methods of fuel reduction, and
- recommend measures by residents to reduce structure ignition.

The recommended process for developing a CWPP does identify environmental risks as one risk that the community could consider and suggest consultation with environmental experts in developing its plan. However, given community concerns about fire safety and both landscape and environmental issues, it appears that more guidance on how to achieve sustainable outcomes may be needed.

Considerations for Australian emergency services

- The national fire program is driven by the US federal government, with the open support of the President. Further consideration could be given to how fire and ecological health can be added to the political agenda in Australia.
- This program provides one model for addressing the key environmental issue of biodiversity loss due to changed fire regimes. Land and biodiversity managers in Australia should consider the US approach in their work to gain support for the development of effective landscape-scale and tenure-blind strategies for ecological health and fire management in Australia.
- As it develops, this program could provide Australian land and fire managers with ideas on integrating environmental objectives into fire management planning and the development of meaningful environmental indicators based on desired outcomes.

Selected references

Carty (2003) Fire Program Analysis (FPA) System preparedness module. conceptual architecture. http://fpa.nifc.gov/Modules/Task3/conceptual_architecture_final_1.2.pdf

Department of Agriculture (1995) Federal Wildland Fire Management Policy and Program Review Final Report.

Healthy Forests Restoration Act 2003.

Robertson and Roose 2003). Fire Management Planning – Developing strategies and setting measurable objectives for adaptive management

The Healthy Forests Initiative and Healthy Forests Restoration Act Interim Field Guide. <http://www.fs.fed.us/projects/hfi/field-guide/>

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Protection of fire-sensitive areas

Dense settlement and fire risks in the Mediterranean area has contributed to a policy of rapid detection and suppression of wildfires.

Over the last decade, nearly 3 million hectares of forest have been burnt in Spain. A major cause of fires in Spain and other parts of the Mediterranean is either deliberate burning or escapes from burning by private landholders.

In Andalucia, in southern Spain, wildfire is regarded as a significant threat to the environment, as well as health and safety. Over half of the land area of Andalucia supports forest, shrub or grasslands. While many species regenerate after fire, land management agencies are concerned about the immediate loss of tree cover, habitat, and park and timber resources from fire. As the slopes in many of the forested areas are steep and erodible, removal of ground cover by fires can cause significant erosion, land instability and water pollution.

These concerns are addressed through preventing fires, keeping ignitions as small as possible, and restoration of fire damage.

Fire awareness programs for the community such as ‘Look out for your woods’ focus on protection of the natural environment. Fire regulation requires the issue of a permit for burning by landholders. Landholders in Andalucia are encouraged to have a fire protection plan, as fire suppression costs are waived if the landholder has a plan. These plans are required by law for forest properties.

Fuel reduction burning is currently not supported on public land in Andalucia. Fuel is reduced in forested areas by manual cutting of firebreaks, thinning and other silvicultural work. There is a concern that burning by agencies would send contradictory messages to landholders who have been encouraged over the last 20 years not to burn. Fuel reduction burning is carried out in France and Portugal.

Minimum impact suppression techniques are not built into fire service programs in Andalucia. Foam is used to suppress fires, although seawater is often used by air fleets where it is accessible and timely. Burnt public land is regenerated if no natural regeneration occurs within two years.

Fire is not used by land management agencies in Andalucia for ecological management.

Selected references

Junta de Andalucia (2003) Plan INFOCA (Plan for prevention and fight against forest fires in Andalucia)

Partnership approaches to restoring fire-adapted ecosystems

The US Nature Conservancy (TNC) and Federal agencies (the Departments of Agriculture and Interior) have created a partnership to help address the threat of altered fire regimes and implement the National Fire Plan.

The partnership aims to restore millions of acres of fire-adapted ecosystems at risk across the US through fuel management by agencies and the community. The initial 5 year program commenced in 2002.

Program components

Fire learning network

- Community-based, multi-stakeholder restoration of landscapes using fuel treatments.
- 250 tribes, agencies and other organisations working to advance restoration on over 60 million acres (25 sites).
- Site teams work towards developing, implementing and monitoring science-based fire management strategies.
- Staff offer network and workshop design guidance, facilitate collaboration, review project work, help projects apply for funding to implement fire regime restoration.
- Workshops
 - Ecological models and collaborative goal setting
 - Desired future conditions
 - Strategies for achieving goals
 - Monitoring and adaptive management.
- Annual conferences to showcase regional projects, linkages and transfer lessons learned.
- Evaluation report: The Nature Conservancy's Fire Learning Network - Assessment interviews.
- Projects have raised \$US3.5 million since 2002.

Wildland fire education

- Community programs on fire ecology, living in fire-prone environments and incorporating community fire education in the landscape planning process.
- Information exchange between TNC, agency programs, and the community.
- Targeted education and training: net, workshops, regional meetings.

- Increased partnerships with non-agency interests including local government, private and forestry interests.

Wildland fire training

- 500 people trained in 18 courses to Dec 2003.
- Education of non-fire decision makers regarding fire prone landscapes, community preparedness and the ecological role of fire.
- Introduction to fire effects.
- Ecological burning - training for field staff on ecologically-appropriate fire use and management decisions.

Considerations for Australian emergency services

- Consider TNC's approach to working with a diversity of stakeholders.
- This approach is systematic and science-based (fire, environmental and social science) and appears to provide a practical model for community involvement and sustainable land management.

Selected references

www.tncfire.org



Yellowstone National Park. As expected for this vegetation type, altitude and terrain, recovery from the 1988 fires is slow.

Fire use

'Wildland fire use' is one of the options available to US fire agencies for managing fires ignited by natural causes, such as lightning or lava. Instead of suppressing them, incident management teams allow these fires to burn to achieve management objectives, such as fuel reduction or biodiversity improvement.

All 'fire use' fires are closely monitored and suppressed if needed.

'Fire use' is promoted by US fire policy. As a result of the 1995 review of federal wildland fire management fire policy, federal agencies have been directed to achieve a balance between suppression to protect life, property, and resources and fire use to regulate fuels and maintain healthy ecosystems. 'Use of fire will be based on approved fire management plans, and will follow specific prescriptions contained in operational plans.' Fire management plans are subject to public comment. Smoke management and other environmental regulation also applies.

'Fire use' can increase the opportunities for burning, and can require less resourcing to manage than fuel reduction burning.

Treatments reported to the National Incident Coordination Centre are summarised in the following table:

	Number	Acres (000's)
2003 fire use	342	331
6 year average	304	111
2003 fuel reduction burning	11,846	2600
6 year average	13,837	2100

Based on this data, fire use extended the area receiving fire treatment in the US by around 10-15% compared to fuel reduction burning alone.

Many 'fire use' fires are allowed to burn over several months, requiring patience and commitment to manage them. Fire use is most likely to be a feasible option where the risks to life and non-target assets are low, such as in remote country, under low fire danger conditions, or where boundary fuel reduction has taken place.

Incident management teams engaged in fire use incidents are supported by specialised fire use management teams which carry out monitoring, fire growth prediction and risk assessment.

Before any fire use is permitted, a 3-stage wildland fire implementation plan, containing specific prescriptions for its management must be completed. Each fire must meet all the conditions identified in a checklist for it to be allowed to burn. Fire behaviour and spread, weather and fuels are monitored and predictions and tactics are reviewed as specified in the implementation plan.

Considerations for Australian emergency services

Meeting of fuel reduction targets and ecological fire needs on public land in Australia may be assisted by consideration of 'fire use' as an option for managing wildfire.

Selected references

Department of Agriculture (1995) Federal Wildland Fire Management Policy and Program Review Final Report.

Department of the Interior and Department of Agriculture (2003) Interagency standards for fire and fire aviation operations 2003.

National Incident Coordination Centre (2004) 2003 Statistics and Summary report. www.nifc.gov/news/2003_statsum

www.fireuse.org



'Fire use' has been used in the valley located to the right of the photograph (northern Yellowstone National Park). Its use is supported in the park as it 'fits' with the park philosophy of allowing natural processes to occur.

Minimum impact suppression

Minimum impact suppression technique (MIST) guidelines are built into operating guidelines for US fire managers. They aim to achieve the least amount damage to land and natural resources, while the incident is safely and responsibly managed.

MIST requires that both fire management and land management objectives be considered in determining the appropriate response to an incident.

Some features of MIST include:

- appointment of a resource advisor to Incident Management Teams to communicate resource concerns and management expectations,
- consideration of MIST and land and resource objectives in developing wildfire strategies and tactics for inclusion in the incident action plan,
- communication of environmental issues and tactics during briefings,
- monitoring operations to determine if land management objectives are being met, and
- tactics which aim for minimal impact on soil, air, water and habitat quality, including guidelines on:
 - tree removal,
 - trail and helipad construction,
 - managing human wastes and other impacts,
 - use of chemicals near watercourses, and
 - restoration and rehabilitation.

Federal fire guidelines require the building of MIST into existing training. This may assist in addressing an issue identified early in the introduction of MIST, where MIST was considered as an 'extra' thing to do, rather than part of the decision-making process.

Considerations for Australian emergency services

MIST considerations are now being incorporated into policy and guidelines by fire agencies throughout Australia. Further consideration could be given to how we can support the implementation of MIST in the planning and implementation phases of fire control.

Selected references

Department of the Interior and Department of Agriculture (2003) Interagency standards for fire and fire aviation operations 2003.

National Wildfire Coordinating Group (2003) NWCG guidance on minimum impact suppression tactics in response to the 10 year plan for reducing wildland fire risks to communities and the environment.



Land use planning and building controls

The 1993 Laguna fire has shaped design of buildings and subdivisions in areas of high fire hazard in Orange County, USA.

New buildings contain fire safety features. New subdivisions contain low-fuel zones, including irrigated vegetation and water bodies, at the urban interface. The lake shown in the lower photograph contains reclaimed water.

Selected references

California Fire Code (2001).

Orange County Fire Authority Guideline C-05 (2001) Fuel modification plans and maintenance.

Orange County Fire Authority Guideline A-01 (2003) Guideline for alternate materials and methods requests.

Orange County Fire Authority Guideline B-09 (undated) Width of fire access roads.



Managing environmental issues

Emergency services visited or reviewed shared some similar approaches to introduce environmental care into service delivery and manage environmental issues. Some highlights are listed below.

Leadership

Strong leadership was seen as a key factor influencing successful introduction of environmental care.

Some examples include:

- The Chief Officer of London Fire Brigade drives a petrol/electric hybrid car, promoting a responsible attitude to minimising environmental effects.
- The US National Fire Plan, which aims to integrate planning for fire safety and restoration of fire-adapted landscapes, is promoted by the US President.

Partnerships

The partnership with the Environment Agency was seen as critical by UK fire services and the Environment Agency in managing environmental issues. The partnership has helped fire services to gain the support of the regulators, understanding of fire service issues, resourcing (kits), improved access to environmental expertise and training.

Community partnerships were identified as a key element in:

- implementing the US National Fire Plan
- protecting Spanish forests and protected areas from adverse fire effects generated by traditional fire management practices.

Use of specialists as resource advisors at major incidents was seen in the US as a logical way of gaining specialist expertise that may not already be within the fire service. It was noted by several interviewees however, that there was not always a good understanding of fire service needs from external resource advisors.

Building on existing skills and attitudes

Environmental care in all emergency service activity was seen by many interviewees as a natural extension of the work of fire services in protecting the environment from damaging incidents such as hazardous materials incidents.

Many staff, particularly those involved in hazardous materials management, had diverse skills in environmental management such as wildlife, fisheries, park and waterway management and archaeology.

USFS training staff emphasised the value of building on people's 'natural affinity for the woods' and desire to leave 'their' land in good condition, using credible operators to sell the messages.

'Normalising' environmental care

Many interviewees emphasised the need to build environmental care into existing operational or business arrangements, rather than viewing it as an 'add-on'. Some examples include:

- 'Pollution prevention guidelines' maintained by the UK Environment Agency for a range of fire service activities are built into fire service training and operational guidance.
- The Fire Service Training College at Moreton-on-Marsh provides a one-week session on environmental management (delivered by Environment Agency staff) as part of a five week hazardous materials and environmental protection course.
- Environmental awareness training is built into the induction package for all LFB staff.
- Environmental criteria for purchasing is built into purchasing policy the LFB and London Metropolitan Police

USFS training staff commented that the introduction of minimum impact suppression techniques (MIST) was initially hampered by a failure to embed them into training early on. Many firefighters in the US regarded them as an alternative method, rather than a collection of tools.

Environmental management systems

Environmental management systems assist in the identification of environmental issues, organisational policy, plans and procedures for addressing these, monitoring of outcomes and management of improvement.

Several fire services interviewed either have or are building environmental management systems, including London Fire Brigade and Cheshire Fire Service. The fire service in Andalucia, Spain, has an environmental management system for office-related issues including waste and water-saving. This does not cover operational issues.

Some interviewees felt that while environmental management systems can assist focus on outcomes, they are also time and resource intensive, and the advantages of these systems can be gained without seeking formal accreditation.

Performance measures most commonly used in services visited related to waste, energy and resource use issues.

Recommendations

Environmental management is a key international issue. Its importance is reflected in United Nations conventions, national legislation and community interest.

Emergency services around the world are working to deal with the effects of the environment, such as wildfires and floods on the community, and the effects of global climate change. Many are also working to minimise the effects of their activity on the environment.

This study trip revealed many good examples of environmental practice which could assist Australian emergency services. There are also many good examples that Australian services could share.

Key recommendations

Support and information-sharing

Communication on environmental issues is relatively limited, and many emergency service people working in this new and growing area are working in isolation.

It is recommended that Australian emergency services facilitate greater sharing of environmental management approaches, on an international basis, through mechanisms such as:

- publishing papers and case studies
- conference presentations,
- incorporating environmental issues in existing training,
- encouraging international networks to highlight environmental issues, and
- supporting exchanges of personnel.

It is recommended that the environmental training delivered at Moreton-on-Marsh, UK be reviewed and considered for incorporation in Australian courses.

Partnerships with environmental regulators

The partnership between the UK Environment Agency and the fire services provides an excellent model for facilitating understanding of and cooperation on environmental protection and fire service issues. It is recommended that the UK approach be considered further for adoption in Australia.

Building environment into our business

Many of the environmental protection measures viewed during this project were driven by regulation. Regulation in Australia is not yet as stringent as in the UK or the US. However, this situation is changing. It is timely that Australian emergency services continue work to identify environmental risks, develop solutions for them and build management approaches into business systems.

Integrated planning for fire-adapted ecosystems

Australian ecosystems have been substantially modified by centuries of fire management which has focused on fire exclusion, coupled with intensive fuel management in some areas, such as around settlements. This has affected not only biodiversity, but in some cases, fire risks.

Much Australian research supports the appropriate use of fire to restore biodiversity and to reduce fire risks. However, further work is needed to gain support for the use of fire for biodiversity (and fire safety) and to develop approaches which will successfully integrate the two and deliver on-ground outcomes.

The US national fire program aims to solve similar problems. It aims to both restore fire-adapted ecosystems and improve fire safety across the US. This program is driven nationally, with political support and funding. Its projects are landscape-scale and are based on science and community engagement.

The US program has several features that may assist consideration of these issues in Australia. It is recommended that this program be reviewed to help develop a strategy for integration of biodiversity and fire safety management in Australia.



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Disclaimer

This report has been prepared to highlight selected issues of interest on this topic. It is not intended as a comprehensive review of issues. It represents the views of the author and any errors are the responsibility of the author.