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Abstract

Australasian Fire Authorities council members have recognised the need for their organisational staff to consider and act to conserve environmental values and resource use during emergency response and hazard modification operations. Simple checklists have been drafted to guide field officers to select options that will minimise flow-on effects to the natural environment and use resources economically, within the constraint of safety to staff, clients and the public. Many emergency services do not own land, and must obtain policies and priorities from the manager of the land hosting the incident or operation. The draft checklists are presented as tools for practising fire fighters. It is the overall intention to gain the acceptance of environmental regulators, that management decisions made within the framework will provide improved environmental outcomes, if not best practice in minimisation of adverse affects.

Introduction

This is about instilling the scientific practices of land management agencies into the bushfire management practices of emergency response agencies. It offers practical methods of meeting environmental care responsibilities of fire services, by the process of inserting a decision checklist into a typical time sequence of conducting a prescribed burn or responding to wildfire. The considerations in the checklist are based on over 30 years personal experience in a land management agency plus the benefit of working in an experienced project team, and the underlying science is assumed, not analysed.

Materials and Methods

Fire services in Australasian countries consist of both land management agencies and response agencies. Response agencies typically have a Government Act which outlines their responsibilities and head of power for management decisions. The Queensland example is the *Fire and Rescue Services Act 1990*, which is:-

An Act to establish the Queensland Fire and Rescue Service
and to provide for the prevention of and response to fires and
certain other incidents **endangering persons, property or the
environment** and for related purposes.

It is only in the last two years that we have had a definition of environment under this Act to guide us.

environment includes—

- (a) ecosystems and their constituent parts; and
- (b) all natural and physical resources; and
- (c) the qualities and characteristics of locations, places and areas, however large or small, that contribute to their biological diversity and integrity, intrinsic or attributed scientific value or interest, amenity, harmony and sense of community; and
- (d) the social, economic, aesthetic and cultural conditions that affect, or are affected by, things mentioned in paragraphs (a) to (c).

This is certainly wide scope, particularly (d) where it is very easy to offend an individual's sense of lifestyle value, whereby they are able to criticize or challenge to actions of other parties.

We need to narrow in on the concept of “endangering the environment” and the regulation of this in Queensland is contained in:-

Environmental protection Act 1994 Section 14 Environmental harm

(1) **Environmental harm** is any adverse effect, or potential adverse effect (whether temporary or permanent and of whatever magnitude, duration or frequency) on an environmental value, and includes environmental nuisance.

(2) **Environmental harm** may be caused by an activity—

(a) whether the harm is a direct or indirect result of the activity; or

(b) whether the harm results from the activity alone or from the combined effects of the activity and other activities or factors.

The degree of the harm can vary from Nuisance to Serious, and all degrees could apply to activities that fire services become involved in.

Bushfires, including wildfires and prescribed fires, cause some effects on vegetation, organic and mineral earth, water, some fauna, air quality, visual amenity, built and natural environments and lifestyle environments. All activities of fire services use resources, and may have effects on other resources.

I am not aware of any activity we undertake that has **no** effect on either environmental factors or resources. The management choices we have available are all about minimizing adverse environmental effects, rather than avoiding any effect.

For officials considering the issue of a fire permit to a third party, the comparison of the likely results of a fire lit under prevailing weather and fuel conditions, against any management plans and rural industry standards, is a valid consideration.

In prescribed burning, management choices are generally made at leisure before the fire is lit, but the responsibility is heavier because the outcomes are caused by the action to light the fire.

During wild fire events, there is usually some urgency for management decisions, and environmental considerations are generally behind operational effectiveness and safety. Opportunities do exist to reduce the effects of the event, and reduce the usage of resources and flow-on effects to other resources.

The concept of the checklists below is to provide guidance at likely decision points during each of the situations above, plus general considerations of resource use. The checklists are intended for the use of fire operatives who may not have a background of natural systems or resource management.

The second intended use is for the checklists to become a code of practice, which is recognised by environmental regulators as aiming at minimization of adverse effects.

The checklists have been prepared by the author to draft standard, for consideration by the Australasian Fire Authorities Council- Environmental Committee. They will become the intellectual property of AFAC, in whatever form is finally adopted.

CHECKLIST
FOR PERMIT ISSUE FOR PRIVATE FIRE LIGHTING.

ITEM	TASK	LINK TO OTHER TASK
1	Identify the land manager or role of the applicant, plus land parcel.	Ensure the area is within your jurisdiction. Ensure permittee has legal responsibility for the property and the job.
2	Consider the safety of the planned fire, for example notification of adjoining landholders, width and type of firebreaks, wind speed limits, people and fire control resources required, time of lighting, smoke hazard management including traffic control, mop-up and patrol requirements.	Most safety considerations are to confine the fire to the target area, and not endanger other people. Require inexperienced permittees to arrange the assistance of local fire brigades. Require the permit to be kept current until there is a secure edge around all burning material.
3	Consider the environmental effect on the area to be burnt. The applicant will state a purpose of the fire, and the weather and seasonal conditions should be suitable to achieve that aim without undue damage to the vegetation, soils and water on that area. Avoid issuing permits that might breach other legislation, such as vegetation management, environmental protection acts or local bylaws. For heaped clearing debris, are the stacks constructed for rapid combustion? Can creek buffers or sensitive vegetation types be protected, by reasonable and economic measures?	Condition the permit appropriately if you decide to issue it at all. For heaped vegetation, the smouldering stage produces smaller and more irritating the smoke particles.
4	Consider offsite environmental effects. Will the smoke cause nuisance to residential areas, or to known susceptible individuals or places such as schools? Is it practical to time the burn or wait for a suitable wind direction? Can overnight smouldering be avoided? Are pit burning techniques applicable?	Condition the permit appropriately and practically. Environmental effects cannot be avoided, but they may be minimised, without excessive expenditure.
5	If the "Fire Warden" is a volunteer, he may obtain advice on problem decisions from local fire authorities, but most decisions are based on community and industry standards applying in the area.	Some models of fire administration are based on experienced community members providing advice and regulation within their community.

FOR THE CONDUCT OF A **PLANNED FIRE**, BY AN EMERGENCY SERVICE AGENCY

ITEM	TASK	LINK TO OTHER TASK
1	Identify land manager	
2	Identify land manager environmental policy, priorities, resource mapping etc that relates to the target block.	Item 1 If Land Manager cannot be identified do not proceed
3	Identify any areas within the target area that need exclusion from the burn.	Item 2
4	Identify existing fire lines that will enclose the burn or save exclusion areas.	Item 2 Will save time and effort, and environmental disturbance.
5	Identify requirements for new fire lines which achieve aims, but do not traverse sensitive vegetation types, and minimise soil disturbance during construction. i.e. heavily side cut lines will cause maximum disturbance.	Item 2
6	Encourage land manager to minimise disturbance during construction and maintenance.	Item 14 will reduce rehabilitation time and costs.
7	Clarify aims of the burn, with the land manager.	
8	If the aims include vegetation stand destruction, or unacceptable results for any known "rare and threatened" species, then OIC needs to make a decision on whether to withdraw from the project.	Item 2
9	If aims are acceptable, plan a lighting pattern and weather conditions that will achieve the aims, but avoid excessive intensity of the burn. Examples would include downhill, ridge-top and backing-fire patterns, and provide escape routes for fauna. A mosaic of burn and unburnt patches avoids any species level threat to fauna and flora.	The landholder may increase preservation of individual habitat trees or sensitive areas by raking fuel or additional exclusion lines, but this is not an activity expected of fire control agencies.
10	Choose weather conditions that will minimise smoke nuisance to residential areas or sensitive crops.	Eg Pineapples may flower out of season.
11	Time the run of the burn to allow smoke dispersal prior to the onset of inversion layers or sea-breeze capture of smoke columns.	
12	Have the landowner start the fire, then conduct the operation to keep the fire within the target area, achieve the aims of the burn and maintain fire fighter and public safety. Ensure use of resources is appropriate to the results. Be aware that different functional areas of incident management teams have differing environmental responsibilities during operations.	Landholder to obtain the permit for the fire if required, and therefore own the fire and consequences. Any machinery brought onto the area, should be inspected for weed and soil lodgment, and cleaned if necessary, before and after use.
13	Mop-up edges to prevent escape.	In some areas, the habitat of hollow trees and logs may be preserved by water extinguishment rather than felling and burnout. This would depend on landholder and community attitudes, but would place a high demand on fire control agencies.
14	Survey results. Gain landholder agreement to conduct any rehabilitation required.	
15	Hand back the area to the land manager.	This should be a formal process, acknowledged by both parties.

CHECKLIST
FOR CONDUCT A WILDFIRE RESPONSE BY AN EMERGENCY SERVICE AGENCY

<i>ITEM</i>	TASK	<i>LINK TO OTHER TASK</i>
1	Identify the land manager, if time permits	
2	Identify the land managers environmental priorities, along with the priorities for saving property	
3	Land manager to identify existing constructed fire lines, which are suitably located and constructed to contain the fire safely. Use existing fire lines in preference to new construction.	Item 1 May save considerable time and effort in control line construction
4	Arrange reopening of safe, suitable lines. Destruction of erosion control devices should be avoided.	
5	If no existing control lines, obtain land manager advice on fallback to other lines or construction of new lines.	Items 1 and 2
6	Plan new lines to avoid traversing sensitive vegetation types or habitats, and to minimise soil erosion potential, but also to accord with landholder priorities for property protection, and safety of fire fighters and public. Property on adjacent lands may be threatened	If machinery is brought to the area, inspect and clean if necessary of weed and soil lodgment, before and after use. Place of cleaning to be identified to landholder to permit monitoring for weed germination.
7	Combat fire from control lines. Use of resources should be appropriate with the danger and the task.	
8	Conduct burnout of remaining areas. Grid light or backfiring in cooling conditions will minimise environmental effects. Continuous edge light of uphill fires will give the most severe result. Timing to avoid smoke nuisance to residential areas may be possible. Be aware that different functional areas of incident management teams have differing environmental responsibilities during operations.	
9	Mop up edges, to achieve control and minimise escapes. Machinery, equipment and appliances should not be sent to other areas without cleaning, but the cleaning should take place in a controllable area, which the land manager monitors for weed, germination.	In some areas, the habitat of hollow trees and logs may be preserved by water extinguishment rather than felling and burnout. This would depend on landholder and community attitudes, but is placing a high demand on firefighters.
10	Survey results. Gain landholder agreement to conduct any rehabilitation required, including erosion control structure re-establishment. Preservation of ignition area may be a priority for investigation.	
11	Hand back the area to the land manager.	
12	Debrief significant fires for any operational, care or environmental lessons.	

CHECKLIST

FOR RESOURCE USE IN BUSHFIRE OPERATIONS

ITEM	DISCUSSION
Water	Is a natural resource that is scarce in some areas. Water is often in domestic storage, and ongoing residence or stock supply may be affected by our operations. Natural water bodies may be affected by polluted runoff. This pollution may come from the materials being burnt or directly from operations.
Foam	Fire fighting foams are essentially wetting agents that change some of the character of water, eg Lower surface tension, and will affect water quality of receiving water bodies.
Gelling agents.	Reasonably inert powder chemicals that cause temporary gelling and stickiness of water, so surfaces stay "wet" for periods. Generally low effect on natural resources, but it is a manufactured product that took energy to produce, so use economically.
Fire retardant	Commercial fertilizer or various proportions of ammonium and phosphorus. Will change growth status of most plants, may damage sensitive ones, and expected to be persistent in water bodies. Land management agencies may not allow use in conservation areas. Corrosive to some equipment, and relatively high cost manufactured material.
Absorbent material.	Used for cleanup of spills, particularly petrochemicals. Inert clay material before use but contaminated after. Ensure sweep-up and proper disposal of used material. Use according to cost, but generally cheaper than a water body cleanup
Fuels and lubricants	Used in appliances, other vehicles, pumps, drip-torches. Polluting if spilled. Expensive if wasted. Use appropriately.
Other consumables	Variable pollution factor if spilled. The main environmental concern is to use them appropriately
Electricity and other energy supplies.	Natural resources are consumed to produce such products and some may produce pollutants during their consumption, hence economy of usage is the main environmental issue. The issue applies to facility and asset management and maintenance as well as field operations.

Conclusions

Simple checklists can be inserted into incident action plans to guide operational decisions at the fire front, where they can make a difference in environmental outcomes. To become codes of practice accepted by environmental regulators, the checklists would need to be supported by an organisational environmental policy and possibly by general environmental guidelines that cover the scientific background of the recommended actions.

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References

Fire and Rescue Service Act 1990, Queensland State Legislation.

Environmental Protection Act, 1994, Queensland State Legislation.