OVERALL FUEL HAZARD GUIDE FOR SOUTH AUSTRALIA

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Abstract

Fuel hazard assessments are an important input in to fire management plans and prescribed burn plans. For fuel hazard assessments to be useful, they need to use a consistent methodology.

An Overall Fuel Hazard Guide has been developed for South Australia, based on the Victorian Overall Fuel Hazard Guide. Outcomes from Project Vesta have been incorporated into the Guide and it has been tailored for use in South Australian conditions.

The significant changes to the Guide are related to the application of the Overall Fuel Hazard principles to discontinuous 'mallee' fuels and the incorporation of a new fuel layer – *near-surface fuel*.

Introduction

The purpose of the Guide is to assist firefighters and fire planners, to assess the hazard posed by Bark Fuel, Elevated Fuel, and Surface Fine Fuel in forest, woodland and shrubland fuels. It builds on the principles of fuel hazard assessment already established in the Victorian Overall Fuel Hazard Guide (McCarthy et al 1998) and includes several outcomes from Project Vesta research (Gould & Sullivan 2004). This guide specifically uses fuel hazard images and data from South Australian fuel types.

The Guide aims to assist with:

- defining and identifying the different components of fuel hazard,
- assessing fuel hazard levels for surface, near-surface, elevated and bark fuel, and
- integrating fuel hazards components to assess Overall Fuel Hazard.

The Guide should be used to:

- identifying fuel hazards during fire management planning,
- identifying fuel hazards before and after prescribed burning operations, and
- identifying fuel hazards during fire suppression operations,

Overall Fuel Hazard

Overall Fuel Hazard is defined as follows:

Overall Fuel Hazard = (the sum of the influences of) Bark Hazard + Elevated Fuel Hazard + Surface Fine Fuel Hazard

Surface Fine Fuel Hazard = Litter Fuel Hazard adjusted to account for the presence of Near-Surface Fuel

Each fuel layer contributes to different effects of fire behaviour: flame depth and height, surface fire combustion and rate of spread, spotting and crown fire

What's Different ?

The significant changes compared to the Victorian Overall Fuel Hazard Guide are related to the application of the Overall Fuel Hazard principles to discontinuous 'mallee' fuels and the incorporation of a new fuel layer – *near-surface fuel* based on the work of Gould & Sullivan (2004).

Discontinuous Fuels

Where fuels are discontinuous (that is have significant 'gaps' between 'clumps' or 'patches' of fuel), such as in Mallee or other semi-arid shrubland fuels, the fuel arrangement (overall ground coverage and size of 'gaps' in relation to 'patches') becomes a significant factor in fire spread (and hence fuel hazard). Outcomes from Project Vesta (Gould & Sullivan 2004) suggest that the use of fuel cover should be used in addition to a rating of fuel hazard.

In this guide, estimates of the thresholds of elevated fuel continuity required to sustain fire spread under the reference first attack conditions have been made and incorporated into the descriptions. These estimates still need to be further tested. This is planned to be done as part of the experimental burning conducted by DEH & CSIRO in Ngarkat Conservation Park under the Bushfire CRC's Project FuSE.

Near-surface Fuels

The incorporation of near-surface fuels into the assessment of Overall Fuel Hazard is the major change from the Victorian Guide. Near-surface fuels are live and dead fine fuels which lie just above the ground surface, but not on it. Typical near-surface fuels include grass tussocks, dead bracken, low shrubs or low wiregrass and are generally less than 30 cm above the ground, but may be up to 60 cm high. Near-surface fuels interact with the surface litter to increase fire behaviour, and therefore need to be considered when assessing Surface Fine Fuel Hazard (Gould & Sullivan 2004). Like elevated fuels, the moisture content of suspended dead material will vary in near-surface fuels depending on weather conditions, but near-surface fuels will always burn in any ground fire (regardless of intensity) – unlike elevated fuels. If there is little surface fine fuel (or it is wet), fire can spread in the near-surface fuel alone.

Near-surface fuels are assessed visually over an area of approximately 5 m in radius. Separate assessments should be made at different locations (suggested at 200 m to 1000 m apart) around a block so that the range of variation in a fuel type is sampled.

Low Near-Surface Fuel Hazard

Near-surface fuel absent or virtually absent (< 10% ground cover).
Near-surface fuel plays no role in fire behaviour.

Moderate Near-Surface Fuel Hazard

Tussock Grasses	***Low Sedges/Rushes***	***Hummock Grasses***	***Low Shrubs***
10 – 20% dead, or 10 – 20% cover little or no suspended bark & leaves	10 – 20% dead, or 10 – 20% cover	10 – 20 % cover	10 – 20 % cover little or no suspended bark, leaves or twigs

Enough near-surface fuel to give occasional boost to flame height.
In marginal burning conditions, may assist in keeping surface (ground) fire spreading.

High Near-Surface Fuel Hazard

Tussock Grasses	***Low Sedges/Rushes***	***Hummock Grasses***	***Low Shrubs***
20 to 40% cover with > 20% dead, or 30 to 50% cover with < 20% dead May have suspended bark and leaf material	20 to 40% cover with > 20% dead, or 30 to 50% cover with < 20% dead	20 – 35 % cover	20 – 40% cover may have suspended bark, leaves or twigs

Patches of near-surface fuel that boost flame height. Under marginal burning conditions, only these patches will burn, but they are not well enough connected to permit fire to spread continuously without stronger wind.

Very High Near-Surface Fuel Hazard

Tussock Grasses	*Low Sedges/Rushes*	*Hummock Grasses*	*Low Shrubs*
40 to 60% cover with > 20% dead, or 50 to 80% cover with < 20% dead grass or other leaf and bark litter	40 to 60% cover with > 20% dead, or 50 to 80% cover with < 20% dead grass or other leaf and bark litter	35 – 60% cover	40 to 60% cover

Near-surface fuel almost continuous and contributes significantly to fire spread and flame height. A fire burning under marginal conditions will still spread readily (given wind or slope).

Extreme Near-Surface Fuel Hazard

Tussock Grasses	*Low Sedges/Rushes*	*Hummock Grasses*	*Low Shrubs*
> 60% cover with > 30% dead grass or other leaf and bark litter, or > 80% cover < 30% dead	> 60% cover with > 30% dead grass or other leaf and bark litter, or > 80% cover < 30% dead	> 60% cover	> 60% cover

Near-surface fuel continuous and contributes significantly to fire spread. Burning under marginal conditions will spread readily in this layer without having to consume the surface layer.

Near-surface fuel levels are assessed and if significant are used to adjust the surface fuel hazard score (i.e. do not affect overall fuel hazard directly). The Surface Fine Fuel Hazard rating should be adjusted by the following values depending on the near-surface fuel score:

Near-surface Score	*Effect on Surface Fuel Score*
Low	none
Moderate	increase by ½ class
High	increase by 1 class
Very High	increase by 1 ½ classes
Extreme	increase by 2 ½ classes

Adjustment by half classes is done based on the where the litter-bed depth falls within the class.

Surface Fuel Hazard Adjusted for Near-surface Fuel

Surface Hazard		**Near-Surface Hazard Rating**				
Surface Hazard Rating	**Litter Depth (mm)**	**L**	**M**	**H**	**VH**	**E**
L	< 8	L	L	M	M	H
L	8 - <15		M	M	H	VH
M	15 - <20	M	M	H	H	VH
M	20 - < 25		H	H	VH	E
H	25 - < 30	H	H	VH	VH	E
H	30 - < 35		VH	VH	E	E
VH	35 - < 43	VH	VH	E	E	E
VH	43 - < 50		E	E	E	E
E	≥ 50	E	E	E	E	E

Discussion

When using this Guide, the characterising descriptions (in italics and quotation marks at the beginning of each category description) should not be used on their own, but read in conjunction with the rest of the category description. The images used are examples of the particular fuel hazard level – they do not represent all possible presentations of that fuel hazard level. Fuel hazard assessments should be based on the descriptions, using the images as examples only.

Fuel Hazard assessment using draft versions of the SA Guide have commenced in various parts of South Australia. The Guide is being used as an input to prescribed burn planning and Fuel Hazard data is being collected as part of the preparation of Fire Management Plans (maximum overall fuel hazard for vegetation/fuel types and overall fuel hazard change over time).

Field data sheets and self- calculating spreadsheets for data collection and entry have been prepared.
All data collected is being stored in a database and the data is being incorporated into spatial formats for use by staff and future analysis.

Work is commencing in co-operation with the SA Country Fire Service to incorporate the SA Overall Fuel Hazard Guide into risk assessment tools.

Conclusions

The SA Overall Fuel Hazard Guide has been developed for South Australia, based on the Victorian Overall Fuel Hazard Guide and outcomes from Project Vesta. The Guide has been tailored for use in South Australian conditions.

This new Guide is being used as an important input in to fire management plans and prescribed burn plans. A consistent methodology and support tools have been developed to make Overall Fuel Hazard assessments consistent and useful.

A database & mapping of fuel hazard assessments will be maintained.

Acknowledgements

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References

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