View of the Lake Taylor Valley from the top of the Slip Block.

Site

Lake Taylor - Located at the edge of the Northern Canterbury Plains, in the foothills of the Southern Alps.

•Manuka (*Leptospermum scoparium*) and Kanuka (*Kunzea ericoides*) shrubs 1-7m in height.

•5 Experimental plots on two sites:

-Wilding block: Mixture of scrub and Lodgepole Pine (*Pinus contorta*) wildings, slope 10-15°.

-Slip block: Dense shrubs, slope greater than 30°.

•Because of the steep slopes, helicopter-slung drip torches were used to ignite the experimental fires.

•The weather on-site was monitored to enable correlation with fuel moisture and fire behaviour.

Destructive fuel sampling of large Manuka shrubs, with Slip Block in background.

Introduction

A joint project between Australia and New Zealand as a part of the Bushfire CRC.

•Project FuSE; Fire Shrubland Experiments with attention to wind 'u', aims to continue the development of the heath/shrub fire behaviour model by conducting experiments in different heath/shrub/scrub fuel structures at different sites in Australia and New Zealand. These experiments examine how fire spread is affected by slope as well as other factors like ignition pattern.

•The Lake Taylor New Zealand burn experiments, the first stage of Project FuSE, were carried out in March 2005 in thick shrub vegetation on very steep slopes.

•These experiments add to the scientific understanding of fire behaviour in scrub fuels – enhancing fire fighter safety, public safety, prescribed burn planning and wildfire management.

Project Fuse

Lake Taylor – New Zealand

Manuka (*Leptospermum scoparium*).

Destructive 1x4 fuel sample on steep slope in the Slip Block.

Fuel

Examining fuel load, moisture and characteristics.

•Fuel Hazard: The Fuel Hazard Scoring System, as developed during Project Vesta, was used to continue its validation as a tool to predict fire behaviour and suppression difficulty.

•Spatial Extent: The Point intercept method was used – i.e. a 100m transect line was established and observations of fuel height and structure made at every metre along the line.

•Fuel Load and Composition: Destructive fuel samples were taken from 1x4m quadrats at three different positions on the slope in each experimental plot. The elevated fuel was sorted into size classes, oven dried and weighed.

•Fuel Consumption: Post-fire destructive sampling was carried out as above.

•Fuel moisture: measured daily to provide information for planning the experimental burns, and immediately before and after the experimental burns to be used in analysis of fire behaviour. Intensive fuel moisture sampling was also carried out to determine the timing of the diurnal moisture cycle.

Wind

A major driver of fire spread but, especially in steep country, highly variable in time and space.

•Sonic anemometers were used to measure variability across, up and down slope and with height on each block prior to burning.

•Reference stations at the top and base of each block measured wind during the burn.

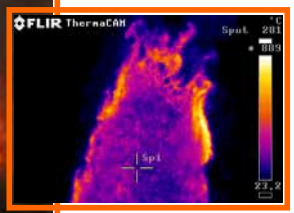
•Wind was measured within the canopy pre and post-burn in the same location as an in-fire video was taken. The opening-up of the canopy to wind as the fire progresses is emerging as an important regulatory component of fire spread. Interesting evidence is emerging that – unlike the open Australian forest types - fire spread is driven by canopy flammability rather than surface flammability.

Windsonic anemometers measuring wind profile within and above Manuka heath – Wilding Block.

A study of fire behaviour on steep slopes in heath and shrub fuels.

Authors: Juanita Myers[1], Ian Knight[1], Jim Gould[1], Grant Pearce[2]

Flames in Manuka scrub on the Slip Block.



Aerial infra-red photograph, courtesy of DoC NZ.

Fire Behaviour

Development, acceleration and head-fire shape under different ignition patterns.

•The development and acceleration of the fires were measured using buried rate of spread loggers. Preliminary analysis shows rates of spread of up to 2km/h.

•The fire was filmed with both aerial and ground-based Infra-red photography to enable interpretation of flame characteristics and the head-fire shape.

•Flame temperature and structure were measured with arrays of thermocouples in the flammable region of vegetation. Flame temperatures of up to 900°C were recorded, with a full flame immersion time of just over 10 seconds.

•Fire spread mechanisms were analysed using in-fire video photography in combination with the flame measurements to determine which fuel layer carried the fire front.

•Flame heights were approximately 3 times the vegetation height.

Summary

•Project FuSE will now continue, extending into other shrub vegetation types, including mallee/heath vegetation in South Australia, the heath of the Sydney Basin region, and more shrub fuels in New Zealand.

•The project will continue to validate the Fuel Hazard Scoring assessment system to be used in fire behaviour predictions, and to study the relationships between wind, slope and fire behaviour in shrub fuels.

•After battling gale force winds, thick scrub, steep slopes and even snow on the experimental sites, five successful experimental burns were completed. And the view from the top of the slip block (see photo top left) well and truly made up for any hardships!!

"Team Wind" – Ross "the Scot" Kennedy, Darrin Woods and Fraser Townsend (Scion), Ian "Benny the BOM" Knight (CSIRO).

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