

RURAL FIRE RESEARCH HIGHLIGHTS 2013



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These highlights are extracted from
Scion's Forest Protection Annual Science Report 2013.

ONE-STOP-SHOP FOR FIRE WEATHER INFORMATION

The new national Fire Weather System (FWSYS) recently developed by Scion and NIWA will enable fire managers to focus more on fire prevention rather than fire management. The FWSYS provides a one-stop-shop for fire managers, providing them with access to fire weather information, forecast data and danger conditions across the country. It is the main tool used by the New Zealand Fire Service and rural fire managers to monitor changing conditions and potential fire outbreaks.

The system is based on NIWA's Eco-Connect climate forecasting platform, and utilises the latest research from our rural fire research group to provide current, historic and forecasted fire weather information to fire managers and the general public. Information includes national maps and tables of daily weather and fire danger conditions, as well as graphs or tables of hourly and daily data from more than 200 weather stations across the country.

The new system replaces the existing model which was last upgraded over 10

years ago. Out-dated computer hardware along with lack of fire weather forecasting capability meant current, archived and forecasted fire weather data needed to be obtained from three different systems. Today, NIWA's supercomputer models fire weather more accurately than the old system and overlays the forecasted weather over actual weather observations to show how well the forecasts are doing.

"I found EcoConnect to be a very good package to use during the fires in Northland earlier this year," says David Hunt, National Integration Coordinator for DOC. "The two and six day forecasts were excellent for identifying the predicted trends in the daily weather. The direct access to graphed fire behaviour indices also resulted in easy analysis for the incident planning team and operations staff. "In regard to the roll out of the package and training, Scion in particular as well as NIWA and the NRFA, did an excellent job. Concurrent with the roll out there was refresher training on fire behaviour

carried out by the Scion team. This was welcomed by the DOC staff I have talked to."

Rural fires cost the country about \$100million per year (BERL, The Economic Cost of Wildfires, 2009). The FWSYS will enable fire managers to better target fire prevention activities such as permit requirements, forest closures and public education, as well as heighten fire response readiness. Improved fire weather information for landowners and the public will increase their awareness of, and response to fire danger conditions, and help reduce the number of fire starts and escapes, lowering firefighting costs and reducing the impact on our environment.

Research partners: NIWA, NZFSC

Investment: NZFSC via the NRFA

Contact: Grant Pearce

WILDFIRE COMMUNICATION FOR RURAL COMMUNITIES

Many rural communities are vulnerable to the risk of wildfires. Around 3,000 wildfires occurred each year between 1992 and 2007, and evidence suggests many communities are unaware of the risk these fires pose and ill prepared for their occurrence.

Lisa Langer, Rural Fire Research Group social scientist, and Mary Hart, Validatus

Research have embarked on a study to identify the most effective methods of communicating the risk of wildfires, preparedness for a wildfire event and mitigation to help minimise the number and impact of human-caused fires. They have conducted three case studies in the Queenstown, Nelson and Wairoa areas, documenting each community's knowledge of and preparedness for wildfires. The study found that the ability to effectively communicate with at-risk communities is not a simple 'one size fits all' approach. Effective communication needs to be intimately linked with the nature of the communities.

The project is part of an Australasian Bushfire CRC programme, Communicating Risk, led by the RMIT University, Melbourne. The programme aims to develop a suite of tailored,

multi-level communications strategies to help diverse communities in both countries respond to rural wildfire risk.

The team also worked with the Technical University of Lisbon to adapt this methodology to rural Portuguese communities. Results from similar case studies in Portugal will be analysed alongside the Scion study to produce learnings from different country perspectives.

Research partners: RMIT, Validatus Research, Technical University of Lisbon

Investment: Bushfire CRC, MBIE, NZ rural fire sector

Contact: Lisa Langer



SMALL DIFFERENCES CAN INFLUENCE FIRE BEHAVIOUR



Controlled back-to-back burns to clear land for forestry in the Waihopai Valley allowed our scientists to observe fire and smoke plume behaviour as well as the influence of local meteorology on fire development. The field studies also enabled the team to test our field protocols and equipment while being able to observe any problems and issues industry may face in the work environment that research can help to improve.

The burns also provided a good case study on the interaction between fuels, meteorology, smoke column development and fire behaviour. Cloud cover over the burn site caused a drop in temperature and increase in humidity, which noticeably suppressed the fire. Less solar radiation due to the cloud shade meant the fire environment could no longer provide enough energy to dry the fuel (in this case grass) and

propagate the fire, demonstrating how even the smallest differences in weather can influence fire behaviour. Using previously developed carbon prediction models, the team was also able to show that the newly planted forest would uptake all the carbon dioxide (CO₂) emitted during the burn in one year when the trees were between four and five years old.

Research partners: University of Canterbury, in particular Department of Geography, plus Ernslaw One Ltd, Timbergrow and Marlborough Kaikoura Rural Fire District. Fire crew from other organisations such as DOC also assisted on the day of the burns.

Investment: MBIE Rural Fire Research Programme

Contact: Tara Strand

WILDINGS POSE GROWING FIRE HAZARD

The increasing spread of wilding conifers presents a growing number of problems for landowners as well as fire fighters and fire managers. Wildfires in dense wilding areas are thought to exhibit more extreme fire behaviour, be more difficult to suppress and present greater threats to lives and property.

A recent analysis conducted by our Rural Fire Research Team identified nine fire hazard stages and 44 possible fire behaviour models associated with wilding spread and control. The analysis revealed that over time, fuel characteristics change and, in combination with weather conditions, so too does potential fire behaviour.

Fire weather conditions, as well as the stage of wilding invasion or treatment, have a strong effect on available fuel load and thus rate of spread and intensity of the fire. Lower density, medium height wilding stands and red standing trees (about two years

following herbicide control treatment when the amount of biomass is unchanged but the forest floor is dead) represent greater fire hazards than tall, dense, green wilding stands. Herbicide use to control wildings is therefore predicted to increase fire risk.

Results of the analysis were presented at the annual national fire managers' conference (FRFANZ) and are also available on our website (www.scionresearch.com/wilding-hazard). Further field research is proposed to validate the findings.

Research partners: Thomas Paul (Scion), Nick Ledgard

Investment: NZFSC

Contact: Veronica Clifford



FIRE DANGER INFORMATION AT THE FINGERTIPS

In March, members of the public will be able to check out the risk of fire for their current location at the click of a smartphone button. Fire researchers Veronica Clifford and Dr Richard Parker worked with University of Canterbury student Greg Signal to develop *Today's Fire Danger*, an Android smartphone 'app' that provides members of the public with free information about the prevailing fire risk for their location.

Tait Communications and the University sponsored Greg to develop the GPS-enabled prototype, which is being trialled by fire managers and fire fighters around the country. Scion's software engineering team is presently modifying the prototype to work with the new national Fire Weather System and to include any additional functionality recommended by industry.

As well as showing today's fire danger, the final product will display the fire danger forecast for the next two days



and information on actions that can be undertaken to minimise the risk of fires. The app will be a great addition to roadside fire danger boards, and it is hoped rural fire authorities will be able to use it to provide rural property owners with information on fire season status and relevant fire permit requirements for their property.

Scion is seeking feedback on the prototype. *Today's Fire Danger* can be downloaded from the Google Play app store on an Android smartphone or mobile device.

Research partners: Tait Communication, University of Canterbury Computer Science Department, NRFA

Investment: Tait Communications, University of Canterbury

Contact: Veronica Clifford

WILDFIRE SIMULATION FOR FIRE MANAGEMENT PLANNING

Fire researcher Veronica Clifford demonstrated the effectiveness of the fire growth simulation software, Prometheus, to rural fire managers as part of a 10-day secondment with the Department of Conservation. The Canadian software is a GISbased fire growth simulation model that has been adapted by our Rural Fire Research Team for New Zealand conditions. The software is designed to enhance fire managers' planning and response to wildfires, resulting in fewer and less damaging fires.

Prometheus can be used to carry out 'what if' scenarios under different fire danger conditions, enabling fire managers to develop suitable suppression strategies. It can estimate where a fire is likely to spread based on the combination of fuel type, weather conditions, topography and fire behaviour models. Canterbury rural fire

authorities have been able to use this information to identify resource requirements for different fire danger levels, and to justify appropriate fire prevention activities if early response is not possible.

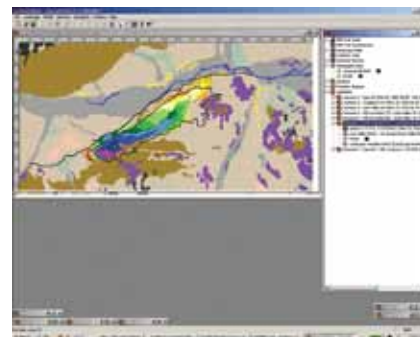
During her secondment, Veronica was also able to train DOC staff in the application and use of Prometheus, while testing the software for the developers and producing tutorials for its use. "Prometheus was used to significantly improve the strategic tactical fire management planning (STFMP) process. Predetermined response planning can be done using simple fire modelling equations, but better accuracy was achieved by using Prometheus to simulate fire growth across the landscape. It accounted for terrain and fuel type, enabling response to be targeted to a specific area or location on the ground." Heather

Wakelin, Technical Support Officer, Department of Conservation.

Research partners: DOC

Investment: Scion Core

Contact: Veronica Clifford



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