

## Scion Rural Fire Research Programme

### Annual Summary of Activities 2010/11

#### Research Programme Background

Every year, significant areas of New Zealand either experience or are threatened by wildfire, and the reality is that the risks from rural fire are growing. This research programme aims to protect life, property, and economic and conservation resources from wildfire in New Zealand's rural environments by providing land managers and policy makers with information and tools that will help to reduce the number and consequences of wildfires. The programme comprises four objectives aligned to the 4Rs of risk management:

- (1) enhanced description of the social/economic and physical/environmental factors making up the fire hazardscape, leading to improved wildfire risk assessments and risk 'reduction';
- (2) improved communication of wildfire risks and mitigation strategies to the public and fire management authorities through an upgraded NZ fire danger rating system, resulting in enhanced 'readiness';
- (3) development of effective practices and decision tools to support wildfire 'response', particularly relating to firefighter and community safety; and
- (4) quantifying the effectiveness of existing 'recovery' processes following wildfire and investigating methods for enhancing overall community resilience to this hazard.

#### 2010/11 Research

Research to identify **mitigation options for human-caused fires** was completed with publication of a detailed report and public summary (Fire Technology Transfer Note, FTTN#42) highlighting means of reducing deliberately lit fires. Results from focus groups and interviews with fire managers and farmers, as well as international literature review, identified a range of options for mitigating against fires caused through malicious intent or carelessness, and accidents by recreationists and landowners. Ground-breaking research on the effectiveness of fire danger warnings was also further progressed, with publication of a report and FTTN#41 summary on findings from the public survey of fire danger communications. Together with the previous fire manager surveys, this has shown that the fire danger ratings are not clearly understood and the community lacks an understanding of necessary behaviour change associated with increasing fire risk. These results are highly significant to the ongoing use of fire danger signs and other fire prevention activities, and are being used as the basis for recommending potential solutions as well as further research needs in this area.

Documentation of lessons learned from NZ wildfires has contributed to increased understanding of the factors affecting **community resilience and recovery following wildfire events**. Findings from the 2003 Mt Somers wildfire and other NZ case studies were presented to a range of rural fire and natural hazards audiences, and in several papers submitted to or published in international journals. Linkages also continue to be developed with natural hazards and Bushfire Cooperative Research Centre (CRC) researchers investigating community resilience and recovery, with several potential collaborative projects being considered. A proposal was also developed with DOC's Canterbury Conservancy regarding before and after case studies of the effectiveness of community consultation as part of the Strategic and Tactical Fire Management Planning (STFMP) project, with such case studies being considered essential ahead of possible national roll-out of this fire management planning process.



New **fire behaviour models** were developed for NZ scrub and grassland fuel types using the data collected in recent years from experimental burns and wildfires. These include improved models for predicting rate of spread in tussock grasslands using data from the Tussock Fire Ecology experiments in Otago and other historic data, and for native scrub (manuka/kanuka) using the additional data collected from the Project FuSE experiments in Canterbury supported by the Bushfire CRC and Canterbury rural fire authorities. These rate of spread models, along with improved fuel loads models produced previously, are currently being incorporated into fire behaviour prediction tools, including the Field Manual, Fire Behaviour Toolkit calculator and Prometheus fire growth simulation software.

Research to develop a method for **assessing and predicting the seasonal die-off of grasslands**, which has been conducted in conjunction with the Bushfire CRC, was continued during 2010/11. The final report on the Bushfire CRC satellite assessment research was completed, and several papers on aspects of the work submitted to international journals. A full season NZ pilot trial was conducted over the fire season to compare the accuracy of the two best satellite products from the previous trial. However, results from this were inconclusive and further work is required before recommendations can be made regarding operational implementation.

Development of the **User Guide to the NZ Fire Danger Rating System** is well advanced, with production of a series of worked examples outlining applications of the fire danger rating system to various fire management activities. These include several existing best-practice examples, including offshore island access guidelines, and grassland activity and 4WD vehicle access restrictions (based on grass ignition thresholds). Together with the background and introduction sections of the guide, these worked examples have been reviewed by project team members, and are currently being compiled and formatted for publication. It is also planned that new worked examples be added to the User Guide over time to create a substantive resource to support fire management planning.

Ongoing collection of data on **firefighter productivity and workload** during fire suppression activities continued over the 2010/11 fire season. Firefighter instrumentation kits were located with fire crews across the country. Findings from the research to date, including data on carbon monoxide exposure during firefighting operations, were described in a report and popular summary (Research Update #7) as well as several workshop and seminar presentations. Results from the data collection will be combined with published data and expert opinion into guidelines on firefighter workload and productivity. Scoping of research on aerial suppression productivity and effectiveness is also underway, via identification of data requirements and collection methods, and initial consultation with fire managers and aircraft operators.

Two major **fire climatology analyses** were also undertaken to provide an improved description of fire climate severity across NZ, and updated estimates of the effects of climate change on future fire danger. In addition to providing an up-to-date assessment of NZ's current fire climate severity, the former will be used to support definition of boundaries for proposed Enlarged Rural Fire Districts, whereas the latter was conducted as part of a MAF-funded Sustainable Land Management Mitigation and Adaptation to Climate Change project. This re-emphasised the potential for fire climate severity to increase in many parts of the country with climate change. Final reports have been produced on both projects and added to the fire research website, and summaries (Fire Research Updates) are also being produced.

A major highlight for the year was the hosting of the **3rd NZ Rural Fire Workshop**, which was based around the theme of "Promoting Research Adoption". This included presentations from end-users, including several DOC examples, of current and planned research implementation, as well as presentations by Scion and Bushfire CRC researchers on specific research activities. A group discussion was also held on promoting research uptake and implementation. The Proceedings from the workshop are available through the rural fire research website ([www.scionresearch.com/fire](http://www.scionresearch.com/fire)).

Fire research staff also presented on research activities at the annual Forest & Rural Fire Association of NZ (FRFANZ) and Regional Rural Fire Committee Chairpersons conferences, and DOC National

Fire Management Workshop. Results from the research were also disseminated via technical reports, newsletters and research updates available through the website. Researchers contributed to the development and presentation of a national Intermediate Fire Behaviour (US4648) training course, run for the first time in 2010 in conjunction with Telford Rural Polytechnic. Research staff also presented two Fire Behaviour Refresher & Assessment workshops for participants of previous IFB courses, to assist them to achieve this Unit Standard. Regular meetings of the Rural Fire Research Advisory Committee, which has a governance role to the research programme, were also held at which updates were provided on research projects and activities.

Research staff also continued to provide advice to national working groups on fire weather forecasting (MetConnect discontinuation & replacement), and reviews of the NRFA's Fire Weather Monitoring System (FWSYS) and remote automatic weather station (RAWS) standards, and NZ Wildfire Threat Analysis System. The research team also participated in a NRFA/Bushfire CRC workshop to develop a NZ seasonal fire weather assessment describing the likely severity of the 2010/11 fire season in different regions of the country. This is likely to become an annual event.

## Conclusions

Very good progress was made during 2010/11 across all areas of the research programme. Highlights include the development of improved fire behaviour models, data on carbon monoxide risks to firefighters, mitigation options for human-caused fires and identification of issues around fire danger signage and communications, as well as the provision of technical advice to support a number of national initiatives. There was again considerable focus on transferring the results from the research to end-users, including DOC personnel, through the 3rd NZ Rural Fire Research Workshop, as well as training courses, newsletters and reports, and presentations. Continuing efforts were also made to ensure peer review of research findings, through end-user review of reports and publishing on a number of aspects of the programme in international journals.

Re-bidding for the core FRST component of the programme's funding has been postponed for a further 12 months (i.e. now from Oct. 2012) due to FRST/MSI restructuring. Despite this, work continued on transitioning the research into the new strategic theme areas identified by stakeholders at the strategic workshop held in 2009. These include increased focus on firefighter safety and community resilience, as well as the development of knowledge and tools to support the safe and effective use of fire as a management tool (particularly in tussock grasslands). Additional feedback was also obtained from stakeholders, including DOC, during several forums on the priorities of the proposed research activities over the immediate and longer term. This information has been used to put together the research workplan for 2011/12, and will also be used during the re-bidding process to structure the new programme, thereby ensuring the research continues to address the Department's and other rural fire end-users' needs.

## Other Highlights

- The Bushfire CRC funded social scientist Lisa Langer to attend a two day Bushfire CRC Community Projects research workshop at the University of South Australia, Adelaide. Directors of the proposed research and researchers met to discuss research plans and methodology for three projects on community engagement, effective communication and human behaviour under stress. A commitment was made to extend research proposals to include case studies in NZ.
- Grant Pearce provided expert evidence in support of legal proceedings by the Southern Rural Fire Authority and DOC against a landowner responsible for starting a significant wildfire. This evidence, which countered an opinion by the defendant's expert witness, was instrumental in the defendant pleading guilty to the charges prior to the court hearing.
- Lisa Langer was invited to participate in the 4th Australasian Natural Hazards Management conference at Te Papa, Wellington, 10-13 August 2101. She made a presentation to a conference workshop on "Enhancing capacity in rural and remote communities" on lessons learned from fire affected communities in NZ.

- Lisa Langer participated in social science working group meetings with researchers from universities, other CRIs, Ministry of Social Development and Opus to discuss research efforts and share information following the Canterbury earthquakes. Potential research collaboration includes the investigation of recovery of communities from wildfires compared with other natural hazards.
- Heather Wakelin, whose Masters was supervised by Stuart Anderson, attended and presented a paper and poster on her MSc work (on grass ignition thresholds) at the 3rd Fire Behaviour and Fuels Conference at Spokane, Washington, USA, 25-29 October 2010.
- Scion was asked to provide input into two Australian bushfire research initiatives, including bidding to the Australasian Fire and Emergency Service Authorities Council (AFAC) to undertake scoping of a national fuel classification system, and provision of advice to the Bushfire CRC on NZ's experience and lessons learned with research adoption, especially uptake of fire behaviour models.
- The programme was also successful in attracting an experienced fire and atmospheric scientist, Dr Tara Strand, from the USDA Forest Service to replace key researcher Stuart Anderson who left the programme in May 2010. Tara is due to join the fire research team in Sep/Oct 2011.

## Outputs

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