



Rural Fire Research

The Scion Rural Fire Research group's mission is to develop the science and technology needed to protect life and property and manage fire in the landscape.



The annual average direct impact of rural fire on New Zealand's economy is estimated at \$67 million p.a., with indirect costs estimated to be at least two to three times this.

Climate change has the potential to increase future fire risks and impacts beyond this. On top of this, extreme fire is here. With 2015 and 2016 globally the warmest years on record, New Zealand is not immune to the extreme fire behaviour normally associated with Australia, North America or the Mediterranean. The 2017 Port Hills fire is an example of this.

Research Programme: Preparing New Zealand for extreme fire

Extreme fires can occur in any fire, at any time and are highly dangerous. They can be fast moving, have very large flames, high fire intensities, or other characteristics such as fire whirls or ember spotting.

Current management strategies cannot suppress these fires, and New Zealand urgently needs new models, decision support tools and methods to better protect our natural environment, primary producers, vulnerable communities and tāonga species.

We have brought together an international team of fire science experts to undertake innovative research, aiming to enable New Zealand to identify, mitigate and adapt to the threat of extreme fires. This programme has five research areas:

- Creating a new fire spread model – testing a new theory around heat transfer at the fire front by turbulent convection processes

(rather than radiative processes), using highly instrumented experimental burns in a range of vegetation fuel types.

- Developing innovative decision support tools – automating and linking systems for satellite and ground-based fire detection (Fire Register), fire growth prediction (Prometheus) and smoke modelling (BlueSky Framework) to provide real-time predictions to improve current and future fire response.
- Investigating new extreme fire prevention methods – developing new response technologies to prevent and suppress extreme fires, potentially including smart thermal sensor networks, enhanced fire-fighting tools and equipment.
- Targeted protection against extreme fire – developing strategies and methods for protection of important ecosystems, assets (e.g. forestry) and historical sites from an extreme fire.
- Use of fire as a tool – developing and presenting a 'Prescribed Burn' training resource to support the use of fire as a land management tool in rural New Zealand.

This is a five-year (2016-2021) programme funded by MBIE (Co4X1602) and industry.





Research Programme: Resilience to wildfires

This programme is researching shared responsibility and development of community-led protection plans, and community engagement for wildfire resilience. Research components include:

- Community resilience and community-led planning across all natural hazards – based around a Kaikōura District case study.
- Māori engagement for wildfire resilience including Northland-based research on the Karikari Peninsula investigating wildfire risk awareness and prevention, and a case study in the Hokianga on wildfire resilience planning linked to First Nations wildfire research in Canada.
- Formal and informal volunteering during disasters.
- Port Hills fire community response and resilience.

This is a three-year (2016-2019) programme funded through the Resilience to Nature's Challenges National Science Challenge (RNC-NSC).

The RNC-NSC is also an important conduit for implementing research to improve community resilience to extreme fire resulting from the Preparing New Zealand for Extreme Fire programme (above) and other fire research projects.



Other projects

These major research programmes build on the past 25 plus years of rural fire research in New Zealand, including previous MBIE and end-user funded projects. Recently completed or current projects include:

- Assessment of seasonal grass curing – investigation of alternatives to visual and destructive measurements of seasonal die-off of grasses, including satellite monitoring, soil moisture measurements and grass growth model predictions. This is important for predicting fire spread.
- Mapping of wildfire prone areas – development of methods to identify and map high fire risk areas with the potential for wildfires to affect on people and property (i.e. the rural-urban interface).
- Improving safety at controlled burns – documentation of lessons learned from recent burn-over incidents for use in improving land manager knowledge and practices.
- Fire risk activity triggers – development of fire danger triggers for controlling high fire risk activities in forestry and grassland areas.



Team and skills

The team aims to provide New Zealand fire and land management organisations with greater capacity to:

- better understand fire behaviour
- enhance firefighter safety
- address smoke impacts
- deploy effective firefighting resources
- allow for safe and effective use of fire as a land management tool
- manage fire in different landscapes
- increase community resilience to wildfire

The Scion Rural Fire Research group has strong capabilities, knowledge and experience across a range of fire-related issues. Members have a diverse mix of skills, including:

- **Tara Strand (Research Leader):** smoke dispersion modeller, smoke emissions, turbulence, fire-atmosphere links, extreme fire behaviour
- **Grant Pearce (Senior Fire Scientist):** weather/climate, fire behaviour, extreme fire behaviour, fire danger rating
- **Veronica Clifford (Fire Scientist):** fuels and fire behaviour, fire as a land management tool, technology development for transfer of knowledge
- **Richard Parker (Human Factors Scientist):** firefighter health and productivity, suppression tools and technology development for use on the fire-ground
- **Lisa Langer (Social Scientist):** community resilience and recovery, community engagement, communication and warnings
- **Ilze Pretorius (Atmospheric Dispersion Modeller):** smoke plume modelling, real-time fire information tool development
- **Hugh Wallace (Fire Technician):** fuels and fire behaviour, fire suppression
- **Emma Percy (Project Manager):** project delivery, reporting, stakeholder liaison

Partners/collaborators

- Alberta Agriculture and Forestry
- CSIRO
- Heartland Software Solutions Ltd
- inFact
- Lincoln University
- The Nature Conservancy
- Resilience to Nature's Challenges NSC
- San Jose State University
- Te Tira Whakāmataki
- University of New South Wales
- University of Canterbury
- University of Alberta
- US Forest Service Missoula Fire Sciences Laboratory
- US Forest Service Pacific Northwest Laboratory

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Research programme governance and support is provided by the Rural Fire Research Advisory Committee, which comprises representatives from Fire and Emergency New Zealand, NZ Forest Owners Association/Forest Growers Levy Trust, Department of Conservation, NZ Defence Force, Local Government NZ and Federated Farmers of NZ Inc.



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Prosperity from trees *Mai i te ngahere oranga*