Rural fire research workshop Proceedings

Celebrating 20 years of rural fire research in NZ

Scion campus, Rotorua. 14-15 June 2012

bushfire CRC

NATIONAL RURAL FIRE AUTHORITY

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WWW.SCIONRESEARCH.COM/FIRE

Rural fire research workshop

Scion campus, Rotorua. 14-15 June 2012

Celebrating 20 years of rural fire research in NZ

Scion, in conjunction with the Rural Fire Research Advisory Committee, hosted the fourth Rural Fire Research Workshop in June 2012. As well as continuing the theme of research adoption, it also celebrated 20 years of NZ rural fire research. The programme included presentations and discussions on where we have come from, where we have got to and where we are heading.

We were fortunate to acquire Dr Marty Alexander, formerly of the Canadian Forest Service, as a keynote speaker for the workshop. Several other international speakers were also confirmed, including a number from the Bushfire CRC. Further programme details are found in this booklet.

The aims of the workshop were to:

- Recognise the achievements of the research programme,
- Present the latest New Zealand and overseas findings in rural fire research,
- Provide examples of research implemented by fire agencies,
- Ensure that research outcomes are embraced by fire managers,
- Ensure that the needs and priorities of fire managers are being satisfied,
- Encourage fire mangers to actively participate in the direction and scope of the research.

Many thanks to the kind sponsorship from the following:

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Contents page:

Time table: day one

Thursday, 14 June 2012

Speaker	Topic	Time	Length
MORNING TEA (1000 - 1030)		1000	30
Opening Session (1030 - 1100)			
Chair: Richard Parker			
Brian Richardson (Scion)	Scion welcome & introduction	1030	10
Murray Dudfield (NRFA)		1040	10
Bob Francis (NZFS Commission)		1050	10
Keynote presentation (1100 - 1200)			
Dr Marty Alexander (University of Alberta)	Wildland Fire Research's raison d'etre	1100	60
LUNCH (1200 - 1250)		1200	50
Managing emerging risks to New Zealand's fire hazardscape (1250 - 1400)			
Chair: Stuart Anderson			
Tara Strand (Scion, ex US Forest Service)	Ongoing research in the US to observe, model and develop tools to assist with understanding smoke	1250	20
Fabienne Reisen (CSIRO & BFCRC)	Bushfire smoke impacts: assessing exposure to firefighters and rural communities	1310	20
Colin Simpson (BFCRC PhD student, UoC Geog)	Research highlights from a PhD investigating fire weather indices and fire atmosphere interactions	1330	20
DISCUSSION panel questions / Break		1350	10
Operational perspectives & uptake of tools (1400 - 1510)			
Chair: Mark Boere			
Liam Fogarty (DSE, Victoria)	The role of science in reducing uncertainty and achieving better bushfire risk management	1400	30
Tony Teeling (DOC Canterbury)	Research into operational practises	1430	30
DISCUSSION panel questions / Break		1500	10
AFTERNOON TEA (1510 - 1540)		1510	30
Improving Safety and Capacity in the Rural Fire Workforce (1540 - 1700)			
Chair: Grant Dodson			
Sally Ferguson (Central Queensland Uni & BFCRC)	The fighting without the fire: simulating campaign bushfire suppression activities for research and training.	1540	20
Richard Parker (Scion)	Improving safety and productivity in the rural fire workforce.	1600	20
Kerry Hilliard (Songbird gardens, ex DOC)	A historic perspective: how fire management has changed through research	1620	30
DISCUSSION panel questions / Break		1650	10
HAPPY HOUR (1700 - 1800)		1700	60
DINNER (1800 - 1900)		1800	60

Time table: day two
Friday, 15 June 2012

Speaker	Topic	Time	Length
Use of fire as a land management tool (0830 - 1000)			
Chair: Dave Hunt			
Veronica Clifford (Scion)	New research theme: Fire as a land management tool	8:30	20
Graeme Doole (UWA & BFCRC)	New Zealand case study results on tussock burning in central otago	8:50	30
Neil Cooper (ACT Parks and Conservation Service)	Fire in the landscape - Bushfire CRC research	9:20	30
DISCUSSION panel questions / Break		9:50	10
	MORNING TEA (1000 - 1030)	1000	30
Enhanced community resilience (1030 - 1200)			
Chair: Douglas Marshall			
Dr Susan Chaplin (RMIT & BFCRC)	Effective bushfire communication for communities on the urban fringe	1030	20
Lisa Langer (Scion)	Social fire research to date and the new research direction towards enhanced community resilience	1050	20
Maria Colaço (Lisbon Uni, Portugal)	Wildfire social vulnerability: a contribution to the European project MATRIX	1110	20
Julie Warren (Warren & Associates)	Encouraging fire safety ownership. Southland community engagement research project	1130	20
DISCUSSION panel questions / Break		1150	10
	LUNCH (1200 - 1300)	1200	60
Closing Session (1300 - 1500)			
Chair: Grant Pearce			
Richard Thornton (BFCRC)	The Bushfire CRC: past present and future	1300	20
Noreen Krusel (BFCRC)	Research adoption - or making the most of your research	1320	20
Murray Dudfield (NRFA)	Fire management	1340	20
Grant Pearce (Scion)	Protecting New Zealand from emerging rural fire risks and workshop summary	1400	20
DISCUSSION panel questions / Break		1420	10
Murray Dudfield (NRFA)	WORKSHOP CLOSING	1430	5
	AFTERNOON TEA (1505 - 1530)	1435	30

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Abstract

Click here to return back to the contents page

Key Note Presentation

Dr. Marty Alexander (University of Alberta)

Presentation title: Wildland Fire Research's "Raison d'être"

Taking the time to celebrate the last 20 years of rural fire research in New Zealand is a very honourable activity.

Marty had the good fortune to be placed in charge of reinitiating the rural fire research program in New Zealand back in 1992 following a 15-year hiatus.

This included the initial training of Grant Pearce and the hiring of Liam Fogarty. Marty considers the year spent in New Zealand one of the highlights of his career in fire research.

In this keynote presentation Marty will outline what he considers essential in order for the program to maintain itself as a permanent fixture in the country.

This will be done from the standpoint of the fire researchers themselves and the fire management community that they serve.

His suggestions are based on having worked not only in Canada but the United States as well Australia and of course New Zealand, dating back over 40 years now.

Want to know more?
CONTACT: mea2@telus.net

Wildland Fire Research's *Raison d'être*

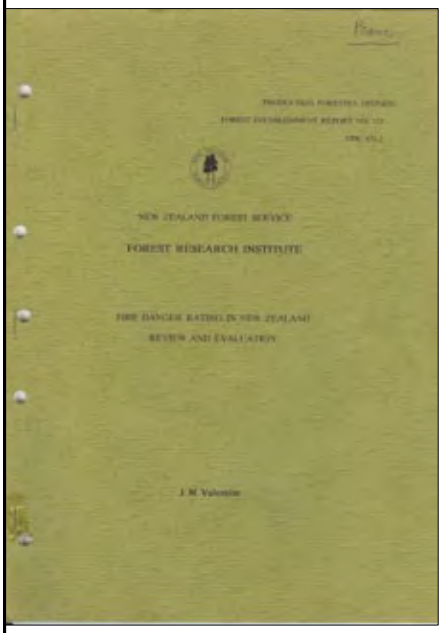
Martin E. Alexander, PhD, RPF
University of Alberta, Edmonton, AB Canada

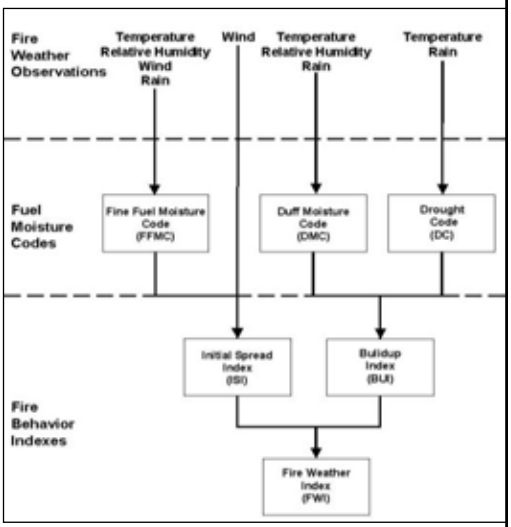
Invited Keynote Address:
New Zealand Rural Fire Research Workshop 2012 – Rotorua, 14-15 June 2012
"Celebrating 20 Years of Research"


The origins of rural fire research in New Zealand


Early fire research in New Zealand was carried out by the Forest Service
FOREST SERVICE
FIRE DANGER METER
EXTREME DANGER
VERY HIGH DANGER
HIGH DANGER
CONSIDERABLE DANGER
DANGER
MODERATE
SLIGHT
LOW
VERY LOW
NIL
SEASONAL SCALE
TEMPERATURE
HUMIDITY
NEW ZEALAND FOREST SERVICE

John Valentine served as New Zealand's first full-time forest fire researcher for the period 1969 to 1978



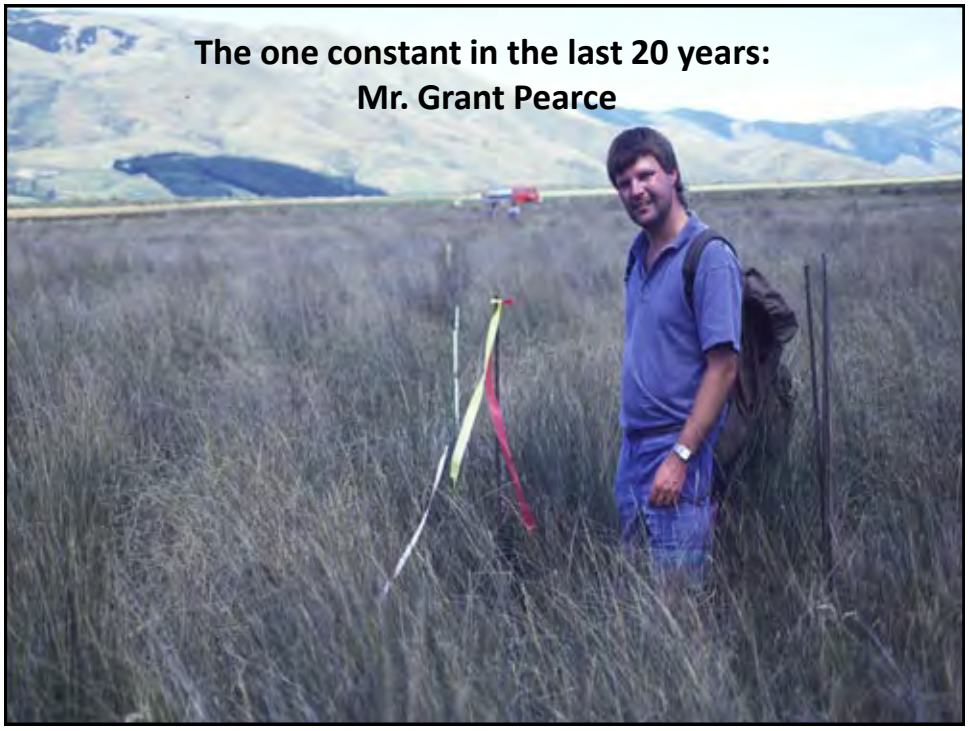


Some Personal Timelines

- **1981-1989:** Correspondence with Neill Cooper (NZ Chief Fire Control Officer) regarding New Zealand's adoption and application of the Canadian FWI System.
- **October-November 1990:** Seminar presentations on the "Canadian Forest Fire Danger Rating System" sponsored by the NRFA in Auckland, Rotorua, Palmerston North, Dunedin, Christchurch, Nelson and Wellington. Made 10 recommendations, including the need to reinitiate a fire research programme at FRI.
- **April 1992:** Started a one-year secondment from the Canadian Forest Service at NZFRI in Rotorua.
- **May 1992:** Interviews for resident fire researcher. Grant Pearce hired.
- **April 1993:** Interviews for a technology transfer specialist. Liam Fogarty offered the position. Sojourn in NZ ends. Return to Canada.

Activities in 1992-93

- Technology and information activities pertaining to fire danger rating and fire behavior prediction (e.g., Advanced Fire Behavior Courses complete with fire case studies and test fire exercise
- A revision of fire danger classification criteria currently used in NZ
- Demonstration of the experimental fire technique designed to furnish fire behaviour data in selected fuel types, including the live fire training exercise concept.
- A problem analysis on fire research needs



The year in New Zealand was one of the top 3 highlights of my career so far

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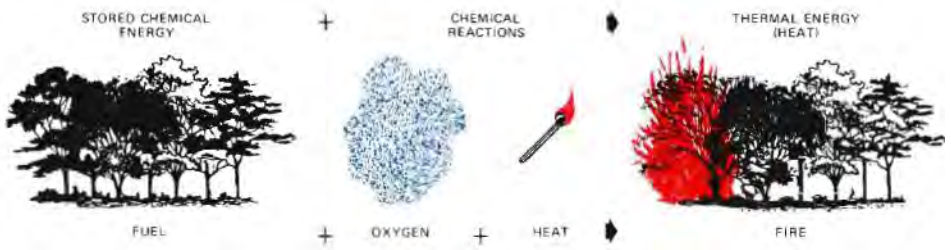
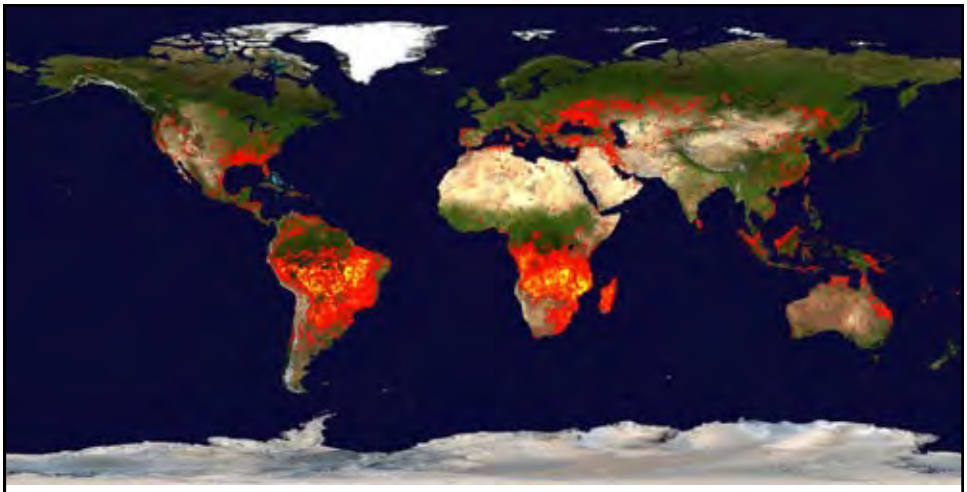
Thank you Murray Dudfield !

Raison d'être

A French phrase meaning
"reason or justification for existence".

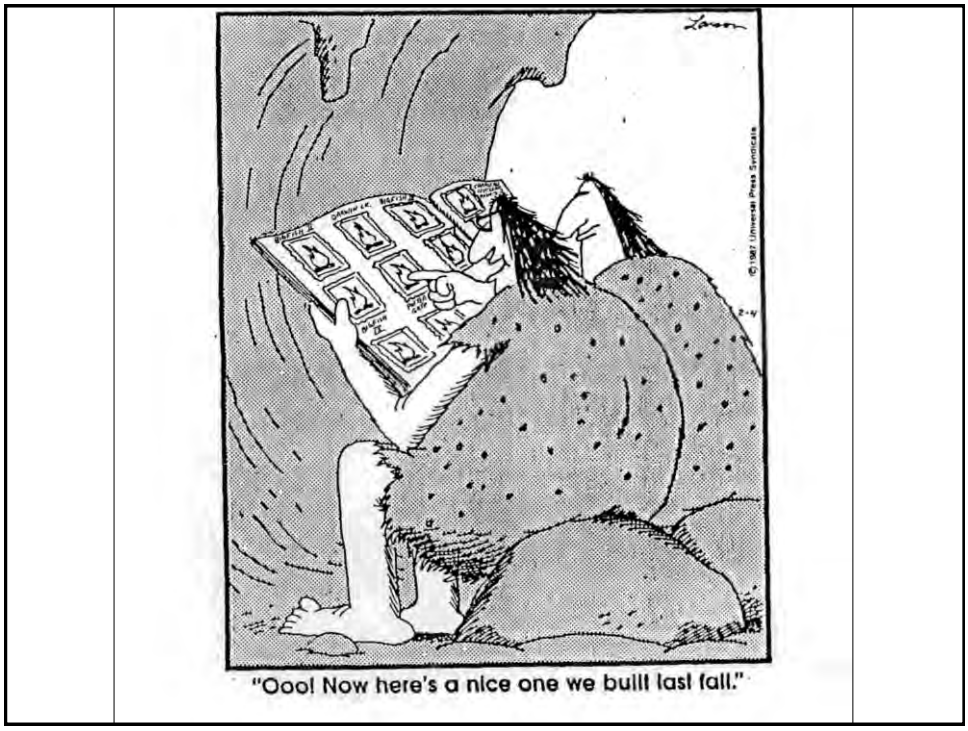
The Fire Triangle as an Equation





"We are a uniquely fire creature on a uniquely fire planet".

Stephen J. Pyne


"Oooo! Now here's a nice one we built last fall."

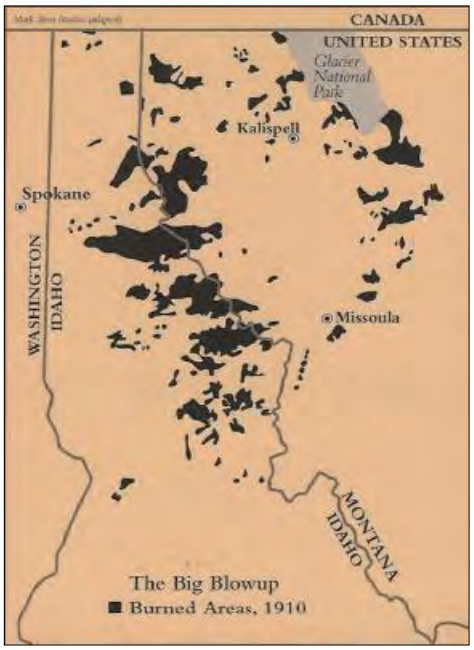

Fire is a good servant but a bad master

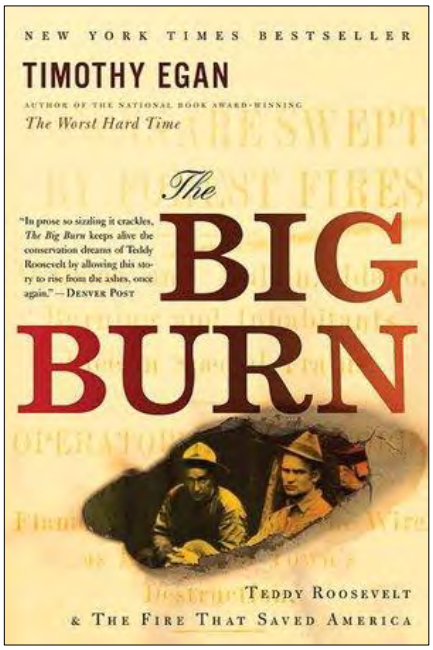
Peshtigo Fire, Wisconsin, USA – October 1871: 1500 fatalities

"The Bucket Brigade"

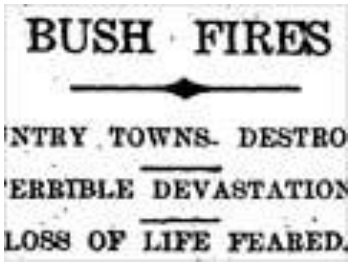
Developing a System of Forest Fire Suppression

The "Big Blowup", Northern Rocky Mountains, USA – August 1910


CANADA
UNITED STATES
Glacier National Park
Kalispell
Spokane
WASHINGTON
IDAHO
Missoula
MONTANA
IDAHO
The Big Blowup
Burned Areas, 1910


NEW YORK TIMES BESTSELLER
TIMOTHY EGAN
AUTHOR OF THE NATIONAL BOOK AWARD-WINNING
The Worst Hard Time
The
BIG
BURN
"In prose so sizzling it crackles, The Big Burn keeps alive the conservation dreams of Teddy Roosevelt by allowing this story to rise from the ashes, once again." — DENVER POST
TEDDY ROOSEVELT
& THE FIRE THAT SAVED AMERICA


NEW ZEALAND TRAGEDIES
FIRES
& Firefighting
Gavin McLean


BUSH FIRES
NTRY TOWNS DESTRO
ERRIBLE DEVASTATION
LOSS OF LIFE FEARED.


FRIANZ
Rural Fire History of New Zealand

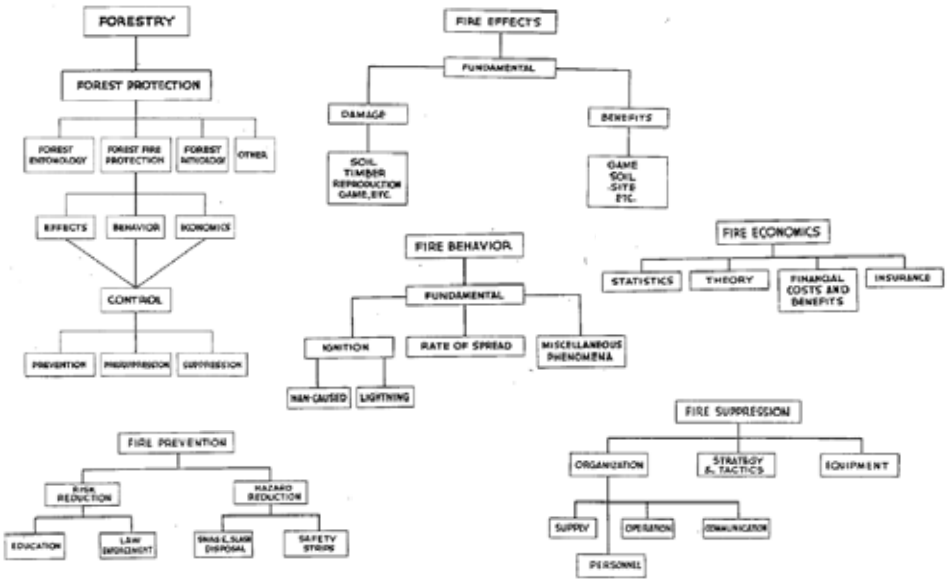
The World's First Full-time Forest Fire Researcher:
HARRY T. GISBORNE (1893-1949)

"We are not doing research for research's sake. We have a definite, decidedly practical goal, and it is still the basic, over-all goal as stated in 1910: Fire research is intended to serve as directly as possible the fire-control men who must first be successful before any of the others arts or artists of forestry can function with safety."

H.T. Gisborne (1942)

Review of Problems and Accomplishments in Fire Control and Fire Research. Fire Control Notes 6(2): 47-63.

The Scope of Forest Fire Protection – late 1930s

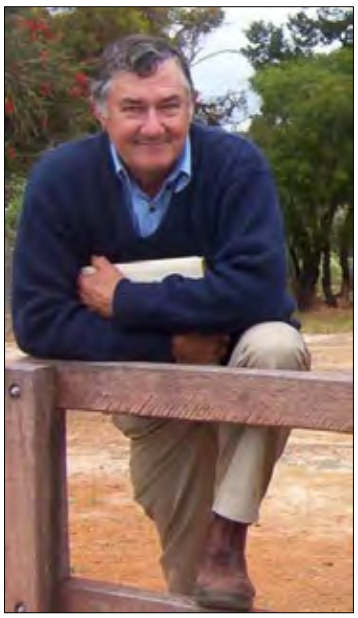


From: J.R. Curry. 1938. *The field of forest-fire protection. Fire Control Notes* 2(1):1-6.

Roy Headley
Director of Fire Control
U.S. Forest Service, 1919-1941

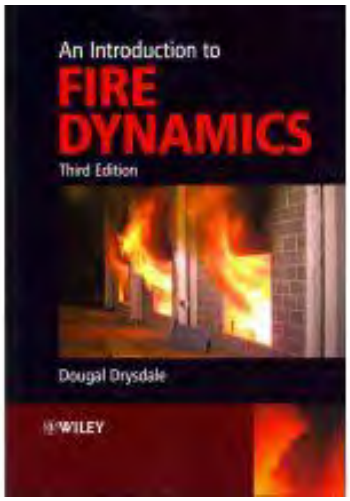
One of the major needs is for a system that will allow a man in charge of a going fire to be less of a gambler and more of a manager.

Headley (1943)
Re-thinking Forest Fire Control



The management or control of forest fires in Australia will never become a reality until their behaviour can be predicted over the many conditions under which they occur.

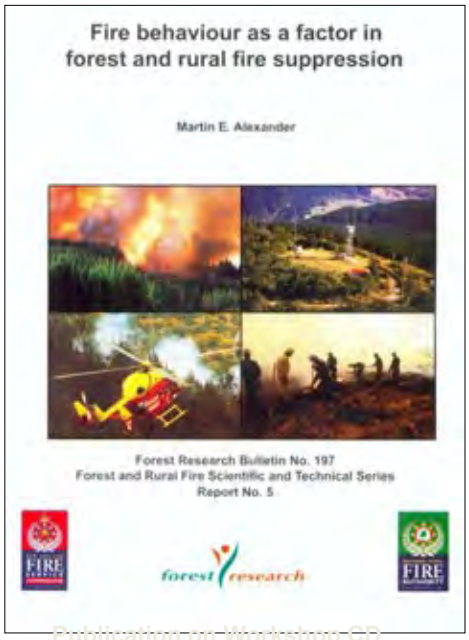
Roger Underwood (1985)



... further major advances in combating wildfire are unlikely to be achieved simply by continued application of the traditional methods. ***What is required is a more fundamental approach which can be applied at the design stage …***

Such an approach requires a detailed understanding of fire behaviour ...

Drysdale (2011)



Keynote Address at FRFANZ Annual Conference, Christchurch, August 1992

The ultimate goal of fire behavior research is to provide simple, timely answers to the following types of questions:

- **What will be the head fire rate of spread? What will be the area, perimeter length, and forward spread distance after 1 hour, 2 hours, 3 hours, and so on?**
- **Will it be a high-intensity or low-intensity fire? Will it be a crown fire or a surface fire? How difficult will it be to control and extinguish? Will mechanical equipment and/or air tankers be required, or can it be handled safely by a suppression crew? Will the mop-up efforts require more time than normal?**
- **Is there a possibility of it "blowing up"? Is so, will it produce a towering convection column or have a wind-driven smoke plume? What will be the spotting potential – short- or long-range? Are fire whirls and/or other types of wildland fire vortexes likely to develop? If so, when and where?**

Richard Parker

SCION

Rural Fire Research Group

Grant Pearce

Veronica Clifford

Lisa Langer

Tara Strand

A mission statement is a statement of the purpose of a company or organization. The mission statement should guide the actions of the organization, spell out its overall goal, provide a path, and guide decision-making.

A mission statement is a statement of the purpose of a company or organization. The mission statement should guide the actions of the organization, spell out its overall goal, provide a path, and guide decision-making.

Effective mission statements commonly clarify the organization's purpose and also ultimately seeks to justify the organization's reason for existing.

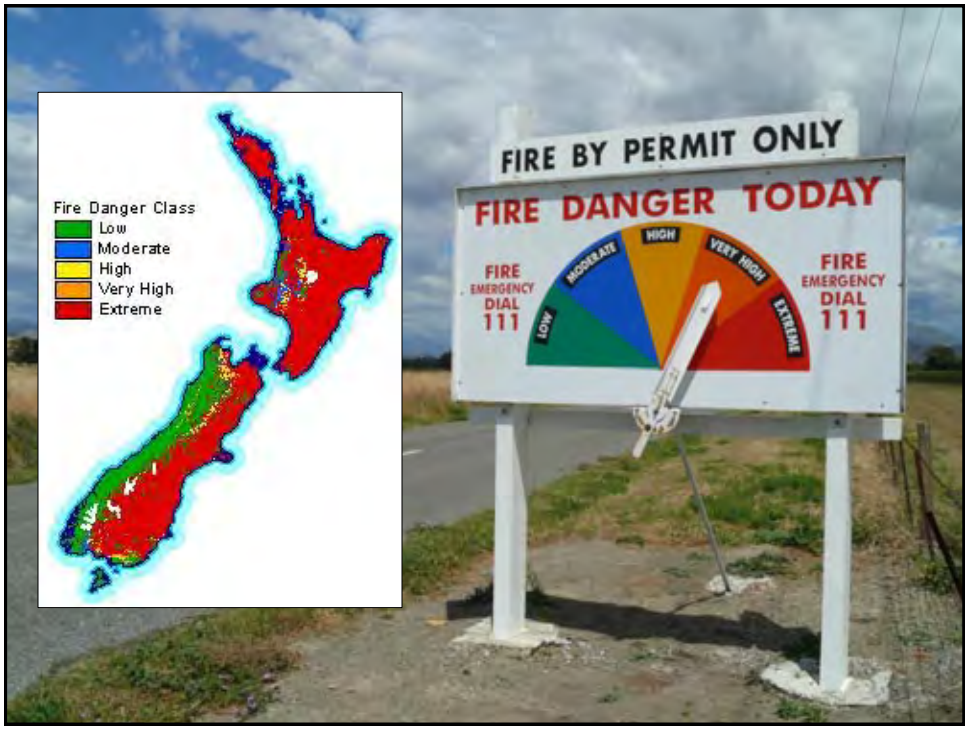
SCION Rural Fire Research Group Mission

Scion's Rural Fire Research Group is New Zealand's only provider of specialist fire research expertise in rural and forest landscapes. We develop the science and technology needed to protect life and property, and to manage fire in the landscape.

Understanding how fires are likely to behave in different weather conditions, terrain and fuel types, and the factors affecting public and firefighter safety is essential to fire management and prevention.

Scion's Rural Fire Research programme comprises four major themes aligned to the '4 Rs' of fire risk management in New Zealand:

Reduction – fire mitigation and prevention, wildfire threat analysis, risk assessment and planning, and fuels management.
Readiness – setting fire suppression preparedness levels, adequate resourcing of Rural Fire Authorities, and managing fire season status and activities.
Response – responding to fires with adequate resources, safe and effective fire suppression, accurate predictions of fire behaviour, and decisions around evacuation or asset protection.
Recovery – understanding and learning from fire events to reduce the impacts, prevent reoccurrence and increase community resilience.


Fire Danger Class
Low
Moderate
High
Very High
Extreme
FIRE BY PERMIT ONLY
FIRE DANGER TODAY
FIRE EMERGENCY DIAL 111
LOW
MODERATE
HIGH
VERY HIGH
EXTREME
FIRE EMERGENCY DIAL 111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Student information
If you are a student with an interest in rural fire research or management, Scion offers opportunities for projects from Honours to PhD level.

Some Cautions or Pitfalls to Avoid

Resting on one's laurels.

Translation:

To be satisfied with one's past success and to consider further effort unnecessary.

Rural fire research requires a dedication in time, money, and staff .

Can Fire Research Exist Without Fire Management?

Can Fire Research Exist Without Fire Management?

No (not likely).

Can Fire Management Exist Without Fire Research?

Can Fire Management Exist Without Fire Research?

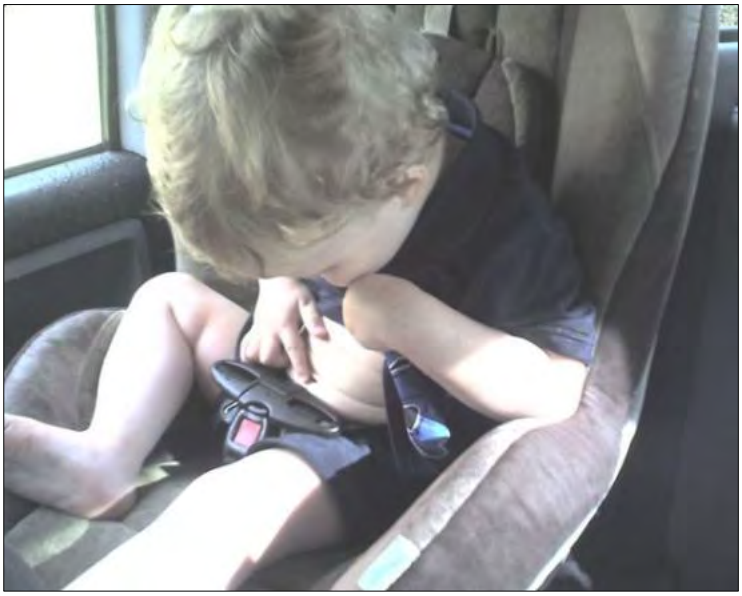
Unfortunately, Yes.

Can Fire Research Contribute to Safe and Effective Fire Management?

Can Fire Research Contribute to Safe and Effective Fire Management?

YES !!!

There's little time for navel gazing



And fire researchers can't very well act like Nero

TECHNOLOGY TRANSFER AND WILDLAND FIRE MANAGEMENT/RESEARCH

Martin E. Alexander

Wealth of information

Useful Reference

References

TECHNOLOGY TRANSFER IN FORESTRY: RECOMMENDATIONS*

Jack D. Cohen:

Wildland-Urban Interface
Fire Researcher
USDA Forest Service,
Missoula, Montana

"To effectively meet management needs, fire research must be directed toward providing both operational products and the fundamental understanding that makes the operational products possible."

Cohen (1990)
Research Has Part of the Answer

"Social Responsibility"

Dr. Chris Trevitt
Australian National University

"promote studies that critically analyze and comprehensively synthesize our existing knowledge". Trevitt (1989)

SWOT Analysis of Rural Fire Research in New Zealand

Strengths

- Strong technology and information technology component to programme
- Very applied nature to research and development activities

Weaknesses

- Few peer-reviewed articles in scientific journals
- Lack of recognition outside of Australasia

Opportunities

- Recount your "story" in words (in other words, periodically document your legacy)
- Undertake benefit-cost-ratio (BCR) analysis

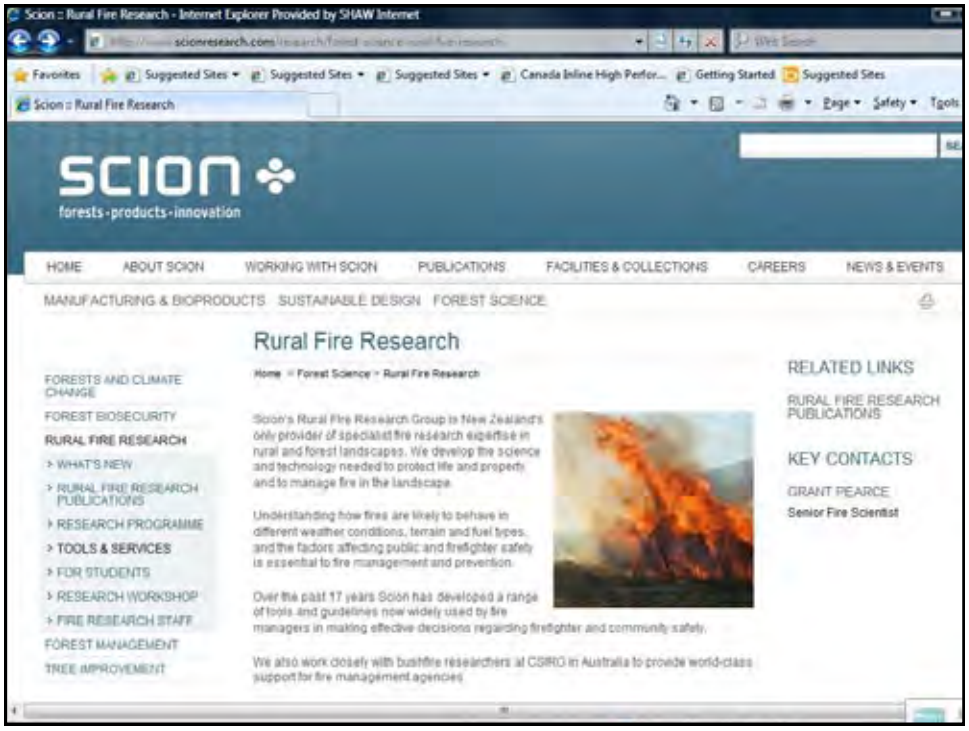
Threats

- Subject to the whims of politics and in turn government funding and policies
- Fire management can exist without fire research

SWOT Analysis of Rural Fire Research in New Zealand

Strengths

- Strong technology and information technology component to programme
- Very applied nature to research and development activities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Scion's Rural Fire Research Group is New Zealand's only provider of specialist fire research expertise in rural and forest landscapes. We develop fire science and technology needed to protect life and property and to manage fire in the landscape.
Understanding how fires are likely to behave in different weather conditions, terrain and fuel types, and the factors affecting public and firefighter safety is essential to fire management and prevention.
Over the past 17 years Scion has developed a range of tools and guidelines now widely used by fire managers in making effective decisions regarding firefighter and community safety.
We also work closely with bushfire researchers at CSIRO in Australia to provide world-class support for fire management agencies.
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A flammability guide for some common New Zealand native tree and shrub species
Liam O. Fogarty
Fire Technology Transfer Note
Forest Research Bulletin No. 197
Forest and Rural Fire Scientific and Technical Series
Report No. 6
forest research


htc
Sprint
10 08
Fire Behaviour Toolkit for the Android Smartphone.

SWOT Analysis of Rural Fire Research in New Zealand

Weaknesses

- ❑ Few peer-reviewed articles in scientific journals
- ❑ Lack of recognition outside of Australasia

Ignition and fire spread thresholds in gorse (*Ulex europaeus*)

Predicting the elevated dead fine fuel moisture content in gorse (*Ulex europaeus* L.) shrub fuels

Consider more involvement Globally.

NZ has much to contribute.

Fire research and the global village[1]

by M. G. Weber[2]

International fire research activities, priorities, constraints and opportunities are examined from a late 20th century vantage point. Recent accomplishments in computer technology are identified as the single most important phenomenon responsible for the advancement of the science and "shrinking" of the globe. Computer technology and the global research cooperation it has engendered are put within the context of societal demands and research funding limitations impacting on fire research activities in the various research organizations. Society's insistence on fiscal responsibility in the conduct of science is symptomatic of a greater need to balance increased demand for resources by a growing world population with the sustainability imperative. Fire research and its practitioners are well positioned to contribute meaningfully to the debate on ecosystem management, restoration and sustainability currently underway in the global village.

Key words: fire research, computer applications, international fire research activities, fire research and science policy, ecosystem management, sustainability

La recherche internationale sur les feux, ses priorités, ses contraintes, et ses possibilités sont examinées avec le point de vue d'une perspective de fin du 20ème siècle. Les récentes percés en technologie informatique sont identifiées comme la principale raison de l'avancement de cette science et la globalisation des enjeux. La technologie informatique et la coopération qu'elle a engendré sont mises dans le contexte des demandes de la société et des restrictions budgétaires ayant un impact sur les activités de différents organismes de recherche. L'insistence de la société sur la responsabilité fiscale dans la conduite de cette science est symptomatique du besoin d'équilibrer la demande croissante en ressource pour la population mondiale en constante augmentation et les impératifs du développement durable. La recherche sur les feux et ses participants sont bien positionnés pour contribuer de façon appréciable au débat sur la gestion des écosystèmes, la restauration des écosystèmes perturbés et le développement durable qui est actuellement en cours dans le village globale.

Introduction

The theme of this paper was originally assigned to me for a keynote address which was to deal with forest fire research activities underway around the world. The approach was left up to the speaker and I decided early on that the talk would encompass more than a simple enumeration of fire research activities currently undertaken planet-wide. The title chosen was to draw attention to the fact that, as in all other endeavours, scientific or otherwise, the results of our actions as well as our inertia, reverberate through the global village.

The physical fire research structures of the global village are visually identifiable as the buildings, laboratories and field sites where we spend our working days and nights. The administrative and financial support beams may be perceived as inconspicuous or obtrusive, as the case may be, but they are there. What is not so readily discernible or what cannot be described as easily, is the nature of the fabric that holds the edifice together. It is made up of many strands, each one crucial in its own right and contributing to the overall strength of the structure. The most important components, of course, are the people labouring within those walls. We, in turn, are tied together, if not by similar scientific training, then by the collective aspiration to do research on fire-related matters, whether physical, biological, economical, or social. The other elements which bind us together are the technological tools at our disposal, combined with the universal demand that our research be germane to contemporary societal constraints or priorities dictated by a diminishing resource base.

This paper will examine the significance of these two unifying agents, technological advances and societal demands, to international fire research, how they affect the way we practice the art and science of fire research and what difference, if any, we might make to the manner in which business is done in the global village.

Late 20th Century Technology and International Fire Research

The single most important phenomenon responsible for "shrinking" the planet into a global village has been the development of computer technology and its incorporation into the areas of communication, scientific computing and transportation. The impacts of late 20th century advances in computer technology and computing have been particularly profound on the conduct of science. These impacts now extend far beyond simple numerical computations and the speed with which they are done, but extend into such domains as complex simulations and knowledge and information retrieval (Brauman *et al.* 1994).

Computer technology allowed for great strides to be made in such complex fields as decision support, fire modelling, fire

[1]Modified from a keynote address given at the 2nd International Conference on Forest Fire Research, 21–25 November 1994, Coimbra, Portugal.

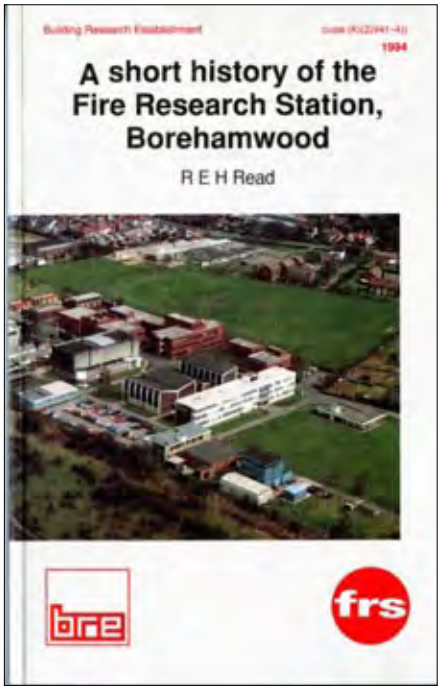
[2]Canadian Forest Service, St. John's, Newfoundland, Canada A1C 5X8.

584 SEPTEMBRE/OCTOBRE 1995, VOL. 71, NO. 5, THE FORESTRY CHRONICLE

SWOT Analysis of Rural Fire Research in New Zealand

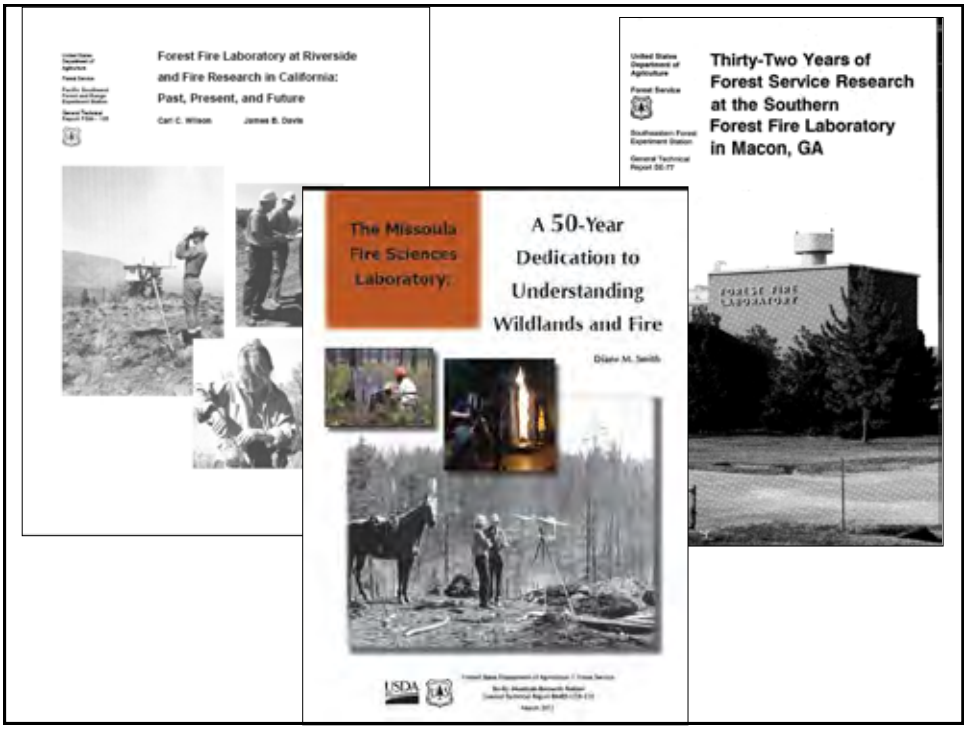
Opportunities

- ❑ Recount your "story" in words (in other words, periodically document your legacy)
- ❑ Undertake benefit-cost-ratio (BCR) analysis



"Recognizing our history while building our tomorrow"

"... the book not only sets out the background to our current knowledge and its application to fire safety, but also the culture behind it. The book will do much to help those coming into fire research in the future to build on these roots for the future". **-- Dr. D. Woolley, Director - Fire Research Station**



The "Wall of Flame"

Is Rural Fire Research Paying its Way?

Benefit cost ratio (BCR) takes into account the amount of monetary gain realized by performing a project versus the amount it costs to execute the project.

The higher the BCR the better the investment. General rule of thumb is that if the benefit is higher than the cost the project is a good investment.

SWOT Analysis of Rural Fire Research in New Zealand

Threats

- Subject to the whims of politics and in turn government funding and policies
- Fire management can exist without fire research

Closing Comments

Dr. Gordon Baskerville
Professor of Forestry
University of New Brunswick

"Making research match real problems requires substantive interaction between the scientist and the person who must solve the problem in its real form".

Baskerville (1994)

Pride is the fuel of human accomplishment.

Bill Creech, United States Air Force

Abstract

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Smoke & atmosphere

Tara Strand (Scion, ex US Forest Service)

Presentation title: Ongoing research in the United States to observe, model and develop management tools to assist with understanding fire and smoke behaviour and their interaction.

Understanding and quantifying emissions and downwind smoke impacts from both controlled fires and wildfires has become necessary for many land managers and air quality regulators within the United States. Assessment of potential smoke impacts, such as visibility reduction, transportation corridor closure, and human exposure, is often necessary during large wildfire events and controlled burn planning.

Fire size, location, growth-rate, and intensity play a role in the quantity and type of emissions released during the flaming and smouldering phases of combustion. Understanding the interaction between fire and smoke is important for understanding potential fire behaviour and predicting smoke production.

Tara will present ongoing fire and smoke behaviour research, current web-based tools developed to assist with management decisions in the United States, their application around the world and the future outlook of science-based tools. She will conclude with a discussion of the important role New Zealand holds in forwarding fire behaviour science and management tool development.

Want to know more?
CONTACT: tara.strand@scionresearch.com

Smoke and fire behaviour research and management tools

Tara Strand
14-June-2012
Rural Fire Research Workshop

Smoke

- Must be managed
  - Health
  - Visibility
  - Tourism
  - Fire-crew safety

Smoke modelling

Real-Time	Retrospective	Future
•Managing a burn – what is happening? •Lighting a burn – what will happen? •Managing an airshed – what is/will happen?	•Diagnosing an event – What caused the exeedance? – What caused the visual degradation?	•Planning a burn – What if?

BlueSky Smoke Modeling Framework

developed by US Forest Service

Fire Info — What burned?
SMARTFIRE
ICS-209
Manual

Fuels — How much burned?
FCCS
NFDRS
Hardy
Manual
LANDFIRE
LANDFIRE-FCCS

Total Consumption — What time of day was it released?
CONSUME 3
FEPS
EPM
Manual
FOFEM

Time Rate — How much was released?
FEPS
EPM
WRAP
Manual
FOFEM

Emissions — What was the transport layer?
FEPS
Literature+
EPM
Manual
FOFEM
Other

Plume Rise — Where will the smoke go & what is in it?
Briggs
FEPS
Manual
Daysmoke

Dispersion / Trajectories
CALPUFF
HYSPLIT
S.M.O.K.E-ready files

SCION
forests · products · innovation

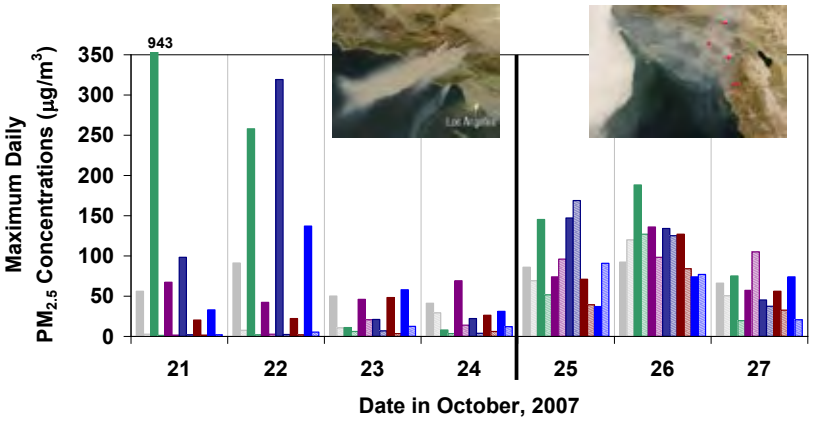
Fire

- Behaviour
  - Prescription
  - Wildfire
  - Deep organic

Fire and smoke modelling

- Fire Behaviour
  - Day 1 = 43,000 acres (17,401 ha)
  - 1 acre per second
- After: Equilibrium growth rate as estimate OK
- Smoke Behaviour
  - Pyrocumulous
  - Virga
- Using terrain induced meteorology put smoke in the narrow canyons

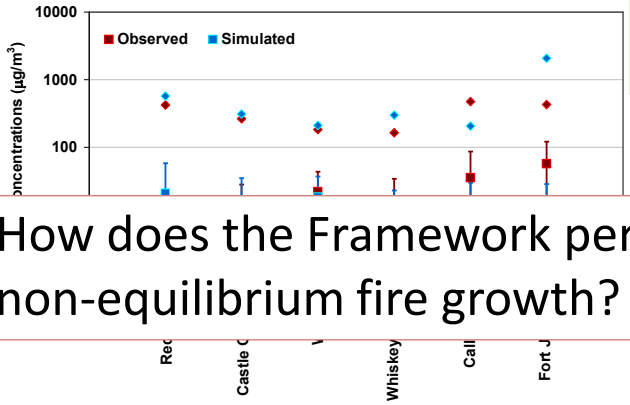
Wildfire prediction evaluation (2007 California wildfires)



Observed (solid bars) and predicted (striped bars) maximum daily $PM_{2.5}$ concentrations –a tracer for smoke.

[Strand et al., in review]

Wildfire prediction evaluation (2008 California wildfires)



How does the Framework perform for non-equilibrium fire growth?

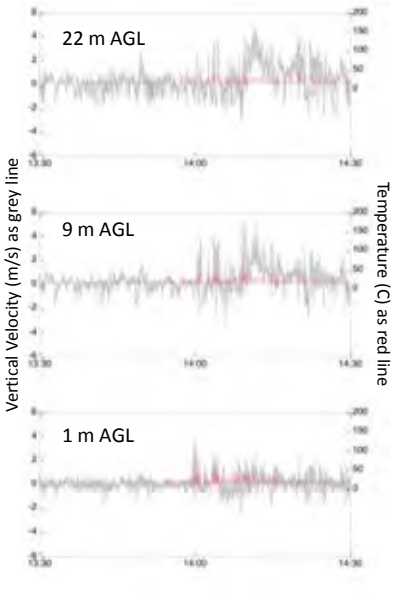
Observed (red) and predicted (blue) Median (squares) and 1st and 3rd Quartiles (whiskers) and maximum (diamonds) $PM_{2.5}$ concentrations.

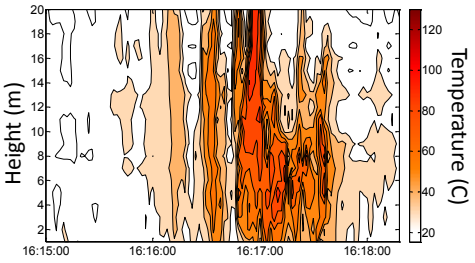
[Strand et al., in review]

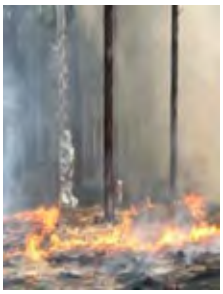
Research Objectives

- Collect a unified fire and smoke dataset
  - Fire characteristics
  - Flame front properties
  - Turbulence (fire-atmosphere)
  - Fuel information
  - Combustion
  - Emissions
  - Dispersion
- Develop a fire and smoke web-based management tool
  - Progress towards super-fog prediction

Fire front –heat, winds, core-plume

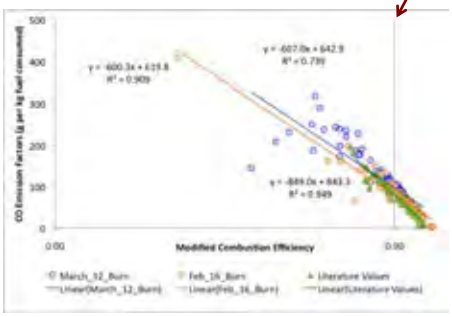


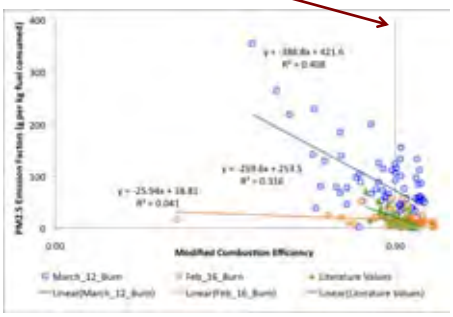




Emissions

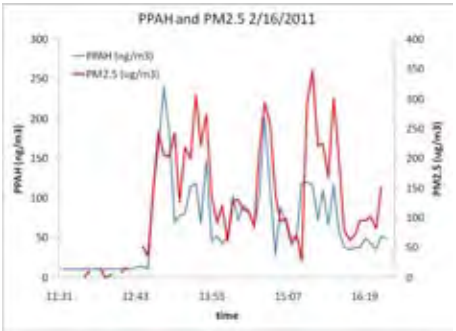
> 0.90 = Flaming



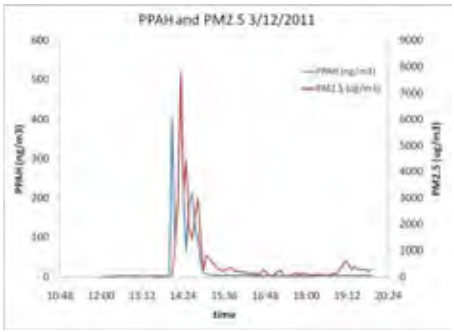


Smoke measurements

Near-fire (1 km)

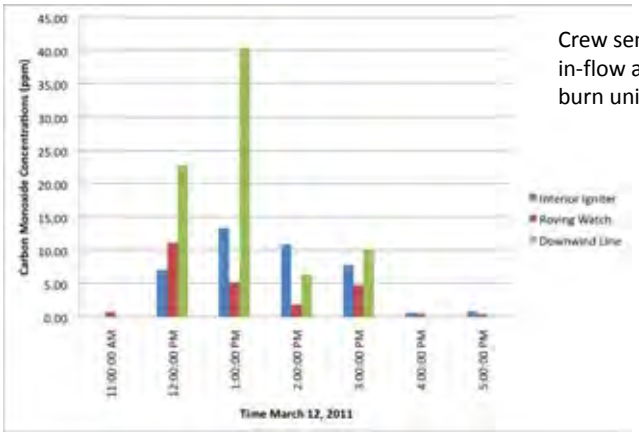


In-fire



Concentrations: Carbon monoxide

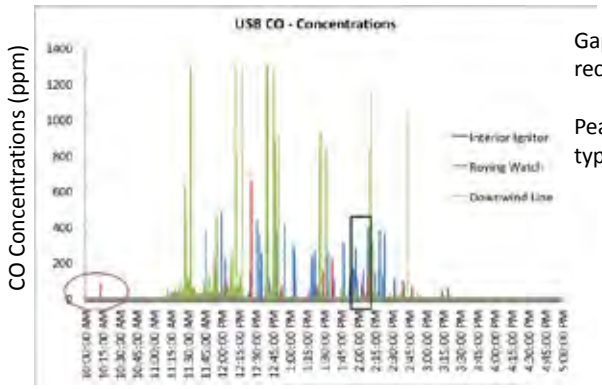
CO concentrations from sensors on TNC crew



Crew sensors help understand in-flow and out-flow of the burn unit

Concentrations: Carbon monoxide

CO concentrations from sensors on TNC crew



Gaps are good –allows for recovery

Peak-to-mean ratios are high, typical in exposure studies

Google Earth smoke prediction management tool

Real –Time

Using Observed Consumed Fuels

Adding observations decreased concentrations and plume width

Web-based fire and smoke tools: SMARTFIRE

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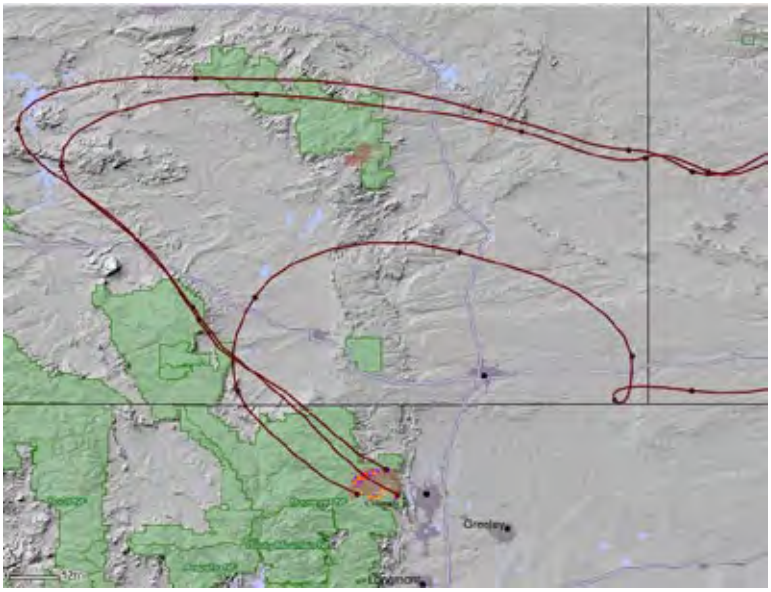
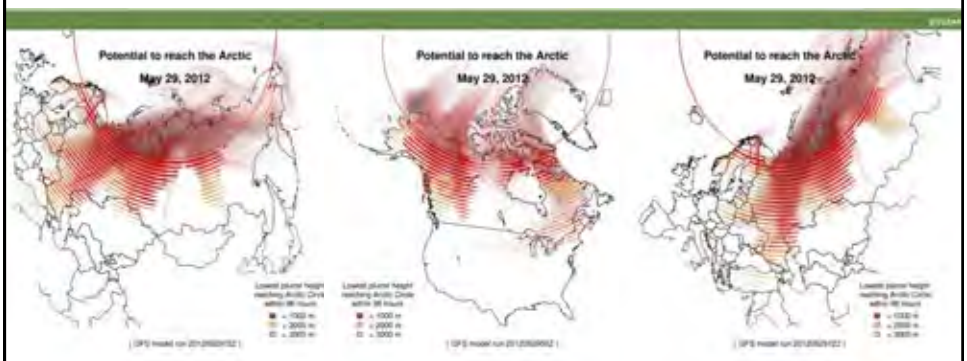
Web-based fire and smoke tools: Trajectories



Web-based fire and smoke tools: Black carbon transport



Fire and smoke behaviour science – Lack of observations limit advancement of tools

- Fire and smoke behaviour interactions
  - Meteorology
  - Terrain
  - Fuel change

Fire and smoke behaviour science – Language of the data limits use

- Translation of datastreams into useful information
  - Science
  - At the incident
  - Land management

Fire and smoke management tools and tech-transfer

- Use modern devices to place data and information into the hands of the decision-makers
  - Phones, Ipads, etc
- Data push NOT data pull
  - User designs a 'notebook' with thresholds that say:

    'Text me when …'

Smoke

- Must be managed
  - Health
  - Visibility
  - Tourism
  - Fire-crew safety

Fire

- Behaviour
  - Prescription
  - Wildfire
  - Deep organic

Acknowledgments –funding and logos

Funding:

Internships were supported by the American Recovery and Reinvestment Act (ARRA), which funded the internship through the Hispanic Association of Colleges and Universities.

Collaborators:


Thank you

Abstract

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Smoke impacts

Fabienne Resien (CSIRO & BFCRC)

Presentation title: Bushfire smoke impacts: Assessing exposure risks to firefighters and rural communities.

Smoke emitted from fires of all classes is a concern because of its real and perceived impacts on health and amenity.

Bushfire smoke is a complex mixture of gases and particles, and when inhaled has the potential to cause adverse health effects.

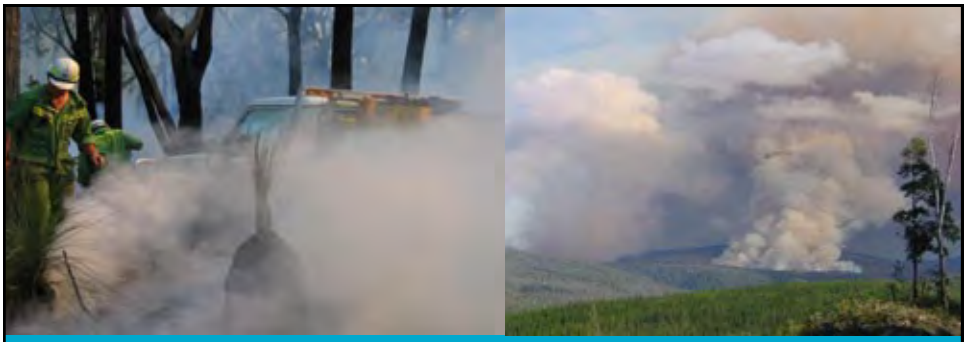
The impact on health will depend on the hazardous pollutants that people are exposed to, the levels of exposure to these pollutants, and whether adverse health effects are likely to occur in the populations exposed.

Fabienne will contrast exposure risks faced by firefighters on the fire ground and by communities regularly impacted by bushfire smoke.

She will discuss how the findings from the research can be used to develop mitigation strategies to keep exposures to air toxics to acceptable (low risk) levels and thereby minimise adverse health impacts.

Want to know more?

CONTACT: fabienne.reisen@csiro.au



Bushfire smoke impacts:

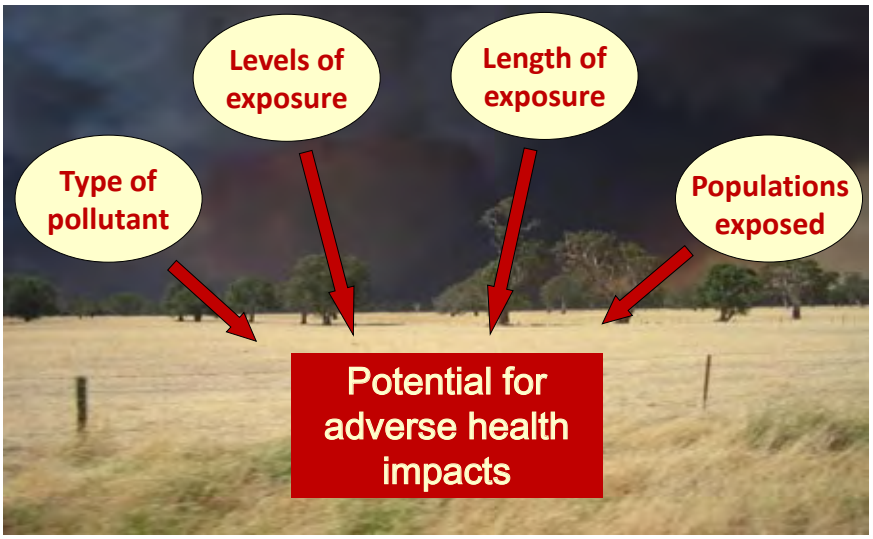
Assessing exposure risks to firefighters and communities

Fabienne Reisen | Research scientist
14 June 2012

CSIRO MARINE & ATMOSPHERIC RESEARCH
www.csiro.au

bushfire CRC

Bushfire smoke impacts

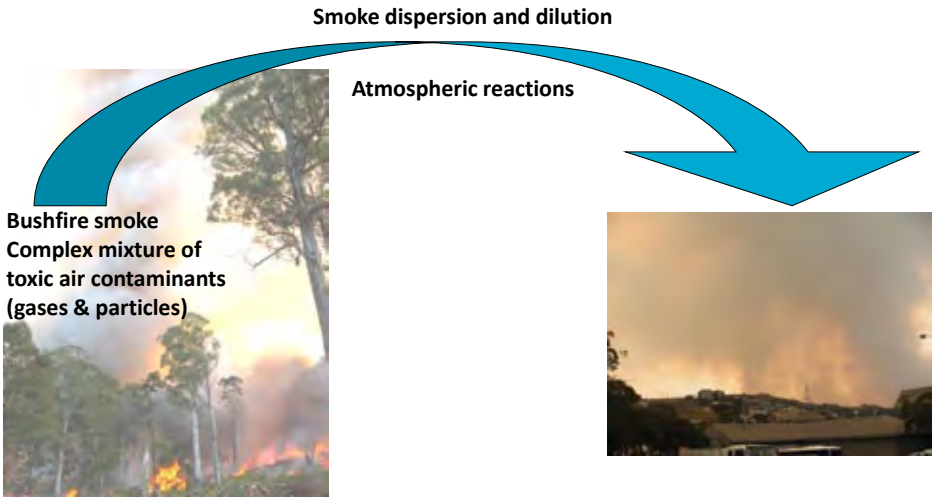


bushfire CRC

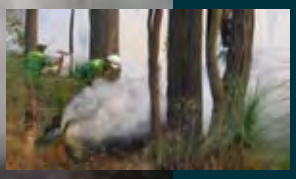
Standards

- **National Environmental Protection Measures (NEPMs)**
  - protect the health and well-being of community
    - maximum concentration
    - maximum allowable exceedances
- **Occupational Exposure Standards (ASCC)**
  - assess the quality of the working environment
    - time weighted average (TWA)
    - short-term exposure limit (STEL)

Bushfire smoke composition



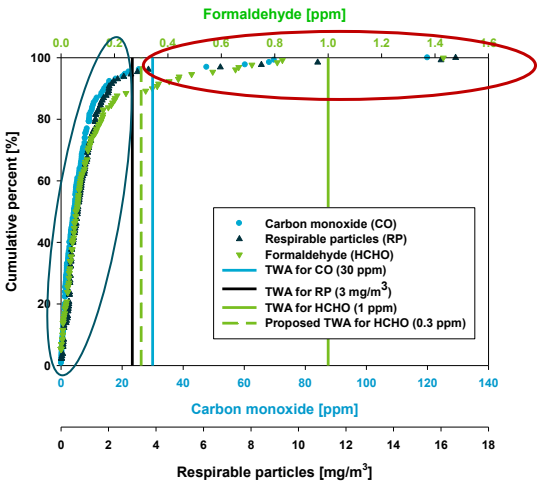
On the fire ground:



Exposure monitoring

6 | Bushfire Smoke Impacts | Fabienne Reisen

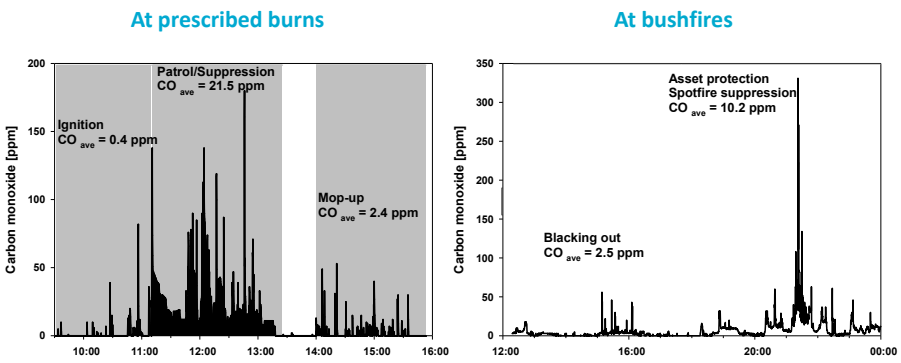
Firefighters exposures to air toxics



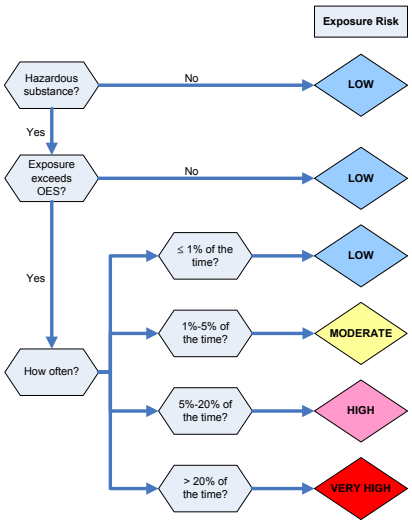
Drivers

- Work activities
- Burn conditions
  - Terrain
  - Lighting pattern
  - Smoke dispersion
- Fuel characteristics
  - Fuel type
  - Fuel moisture
- Meteorology
  - Wind speed/direction
  - Inversions

Exposures to CO on the fire ground

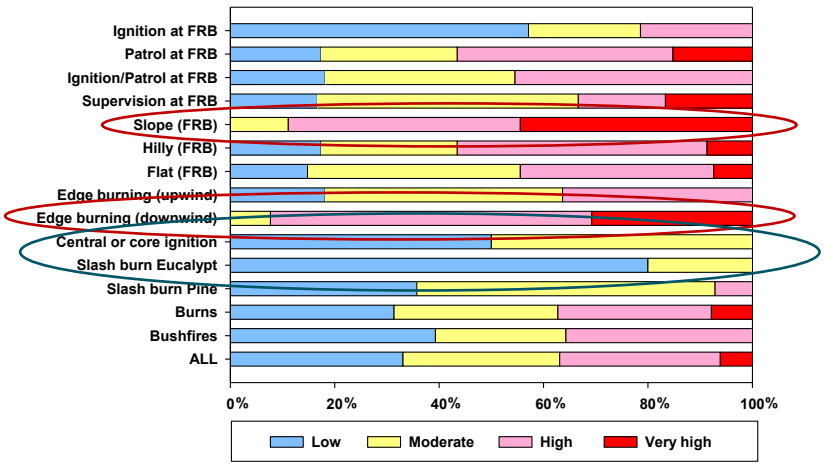


Exposure risk assessment - Methodology

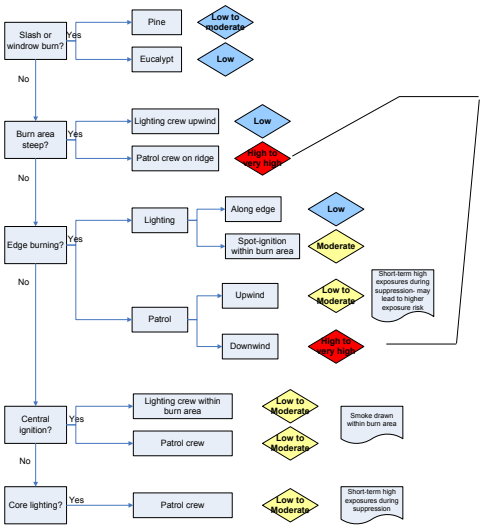


Adapted from American Industrial Hygiene Association rating scheme (Hawkins et al. 1991)

Exposure risk assessment



Outcome



Mitigation strategies

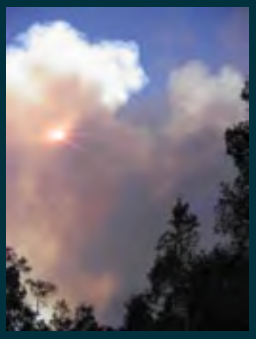
- Regularly rotate crews at the burn or fire
- Reduce time in heavy smoke
- Allow for sufficient recovery time
- Use ignition patterns that concentrate most of the smoke into a rapidly rising plume
- Provide respiratory protection

11 | Bushfire Smoke Impacts| Fabienne Reisen

bushfire CRC

CSIRO

Impact on communities:



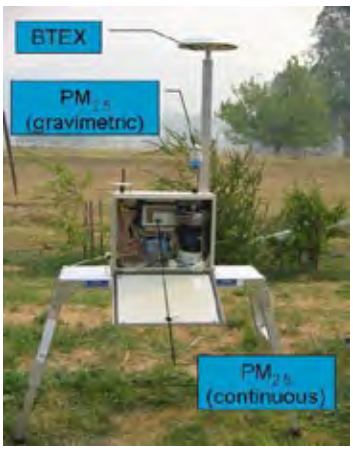
CSIRO

Bushfire smoke impact

bushfire CRC

CSIRO

Monitoring locations



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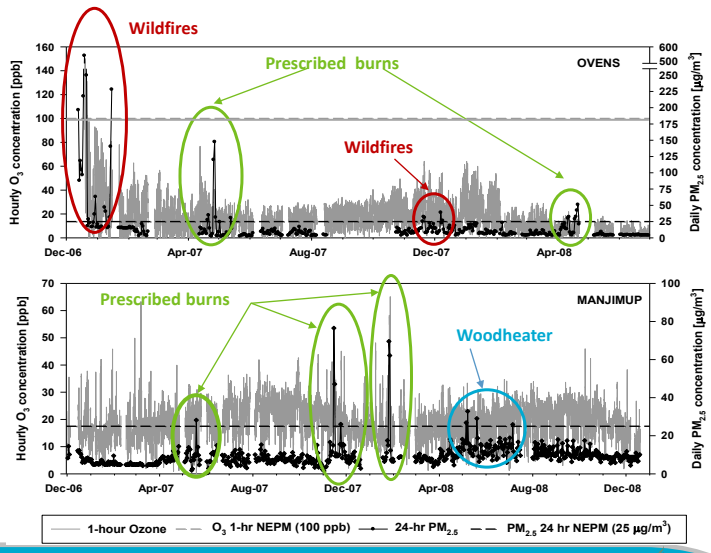
Rural exposures to O_3 and $PM_{2.5}$



Smoke events

	Ovens	Manjimup
Prescribed burns		
Frequency	6-9 days in autumn	1 day in autumn 2-7 days in spring 4 days in summer
Intensity	$PM_{2.5}$: 2-30 fold increase Max hourly conc: 39-377 µg/m^3	$PM_{2.5}$: 3-30 fold increase Max hourly conc: 49-320 µg/m^3 O_3: 1.5-4 fold increase
Duration	3-48 hrs (average of 15 hours)	2-12 hours (average of 6 hours)
Wildfires		
Duration	69 days	
Intensity	Max daily $PM_{2.5}$: 540 µg/m^3 Max hourly $PM_{2.5}$: 1780 µg/m^3	

Summary on exposure levels:

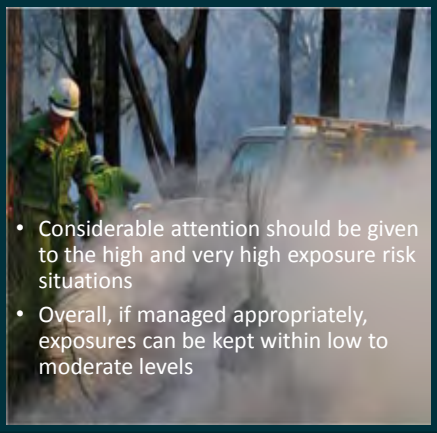
	Ovens Wildfires	Ovens Burns	Manjimup Burns	Fire ground
$PM_{2.5}$ average (μg/m³)	85.2	30.0-112	37.4-94.6	20 - 16,000 1,040 2,200
$PM_{2.5}$ daily max (μg/m³) (NEPM at 25 μg/m³)	541	34.8-147.5	15.1-76.5	
Benzene (μg/m³)	50.6-1059	38.7-188	33.5-237	1-790
Carbon monoxide (ppm)	0.43-10.9 (day)* 0.1-2.8 (night)*			0.1-120 10.2 17.8

* Samples collected at staging areas during VIC Bushfires

Personal & regional exposures:

	FIRE GROUND	COMMUNITIES
Type of pollutants	•Fine particles •Formaldehyde •Carbon monoxide	•Fine particles •Ozone •(VOCs)
Levels of exposures	Variable (low to very high)	Occasional exceedences of NEPMs
Length of exposure	Workshifts (Burns) Days-weeks (Bushfires)	Hours-days (Burns) Days-weeks (Bushfires)
Populations	Healthy adults	Healthy adults Susceptible people

Implications:



- Considerable attention should be given to the high and very high exposure risk situations
- Overall, if managed appropriately, exposures can be kept within low to moderate levels

- Biomass burning can have a substantial impact on air quality in rural areas
- Impact is dependent on season, fire activity and duration of plume strikes

Thank you

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Abstract

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Fire weather and atmosphere

Colin Simpson (BF CRC, UoC Geography)

Presentation title: Research highlights from a PhD investigating fire weather indices and fire-atmosphere interactions.

A collection of research highlights from an ongoing PhD supported by the Bushfire CRC.

Colin's PhD is comprised of a number of related projects:

- The first study investigates the ability of the WRF atmospheric model to accurately model fire weather conditions for a full fire season.
- The second study investigates the behaviour of a number of fire weather indices and how best to utilize the information they provide.
- The third study investigates the fire spread phenomenon known as "fire channeling" using coupled fire-atmosphere modelling.
- The final study investigates the nature of foehn winds in the South Island and their impact on local fire weather danger.

Want to know more?
CONTACT: ccs49@uclive.ac.nz

Fire Weather
PhD Research Highlights

Talk by Colin Simpson
University of Canterbury

PhD Research Topics

- Interests: atmosphere and fire linkages
- Tools: numerical models e.g. WRF, WRF-Fire
- Studying four important topics in fire weather:
  - NWP Model Verification (to be submitted)
  - Fire Weather Indices (write-up)
  - Fire Channelling (submitted, in review)
  - Foehn Winds (experiment design)

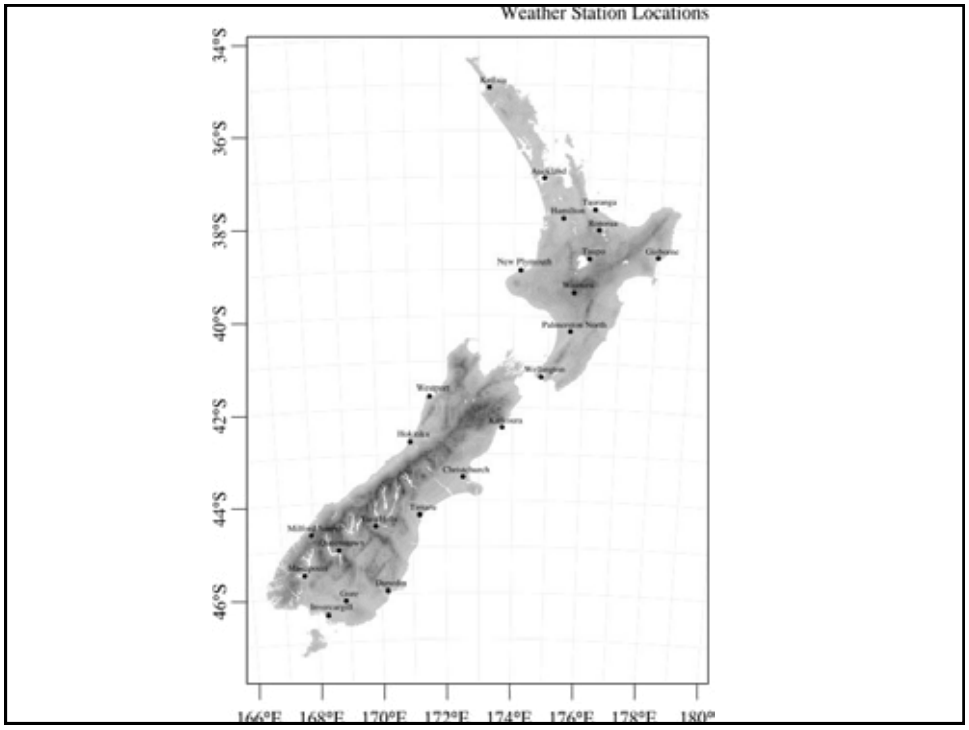
NWP Model Verification

Overview

- Question: how accurately can a state-of-the-art weather model reproduce observed fire weather conditions?
- Research benefits:
  - Build confidence in NWP modelling of fire weather
  - Understand biases in the model output
- Progress: final draft, soon to be submitted to IJWF

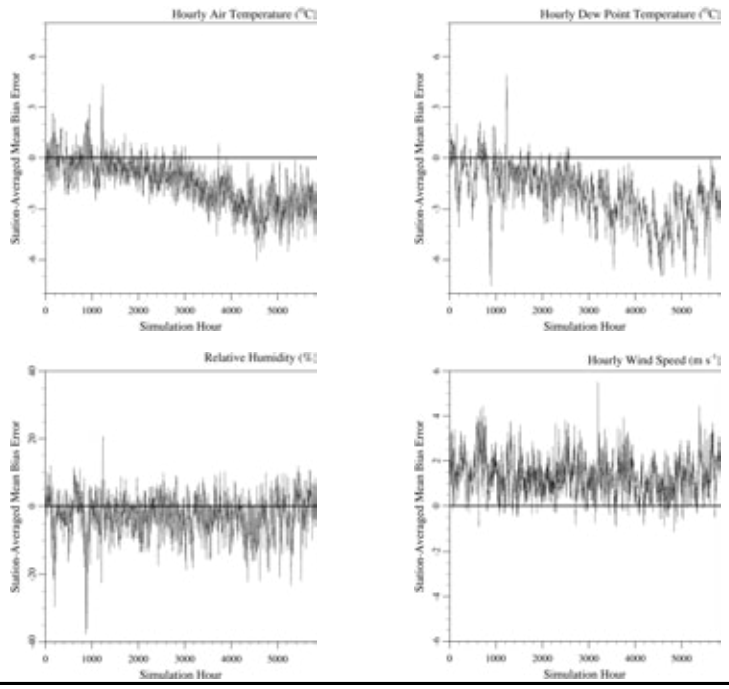
Background

- Weather Research & Forecasting (WRF) model
- 8 month simulation – 2009/10 fire season
- Compare model output with observations:
  - 23 weather stations
  - Coastal and inland locations
  - Mix of different climatic regions
- Compare for fire weather variables:
  - Temperature, Dew Point, Humidity, Wind, Rainfall
  - New Zealand Fire Weather Index (FWI)



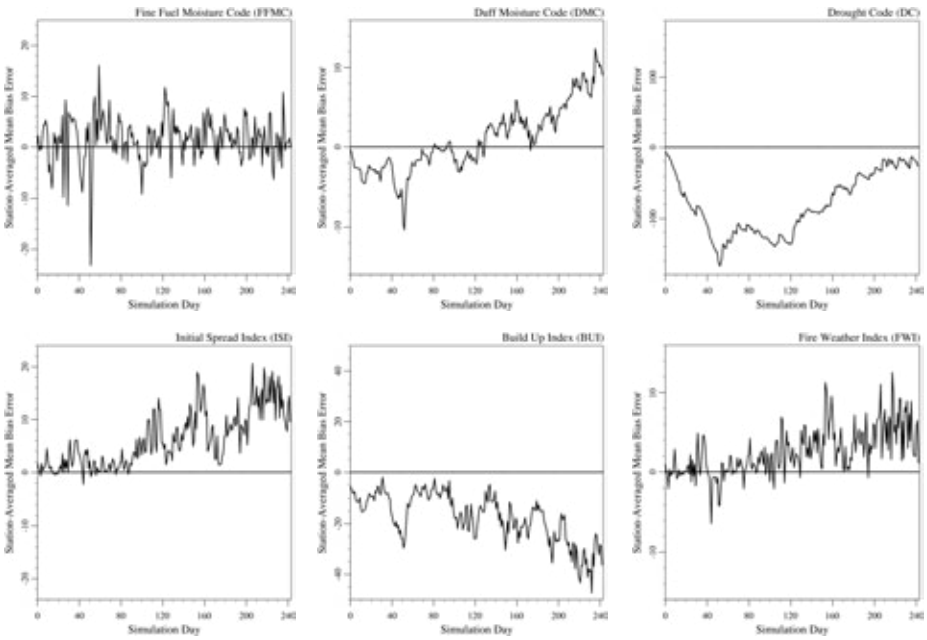
Fire Weather Conditions

- Air temperature: model cold bias
- Dew Point: model cold bias
- Relative Humidity: both overestimated and underestimated
- Wind Speed: overestimated in model
- Wind direction: both accurately and poorly modelled
- Rainfall: overestimated number of days of rain



Fire Weather Index

- FWI calculated using cumulative fire weather:
  - Temperature
  - Relative Humidity
  - Wind Speed
  - Daily Rainfall
- Accuracy of modelled FWI degrades in time:
  - Errors accumulate with time
  - Time limit for accurately modelling the FWI
  - Need to nudge with observations over long time-scales



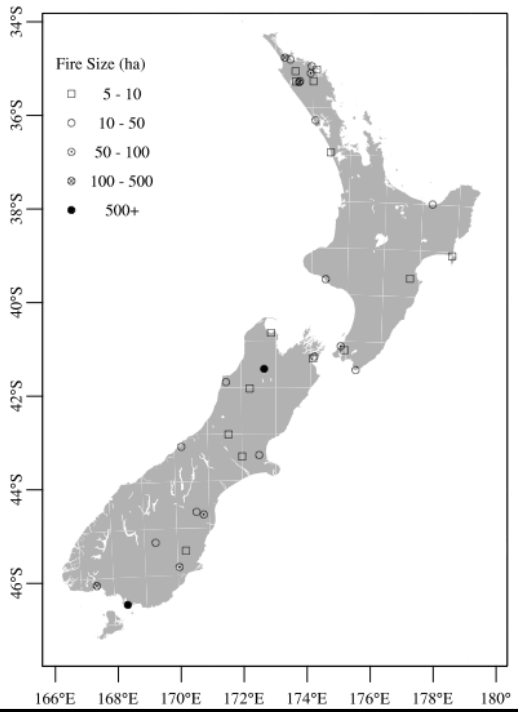
Fire Weather Indices

Overview

- Question: what is the behaviour and utility of different fire weather indices applied to New Zealand?
- Research benefits:
  - Improved understanding of behaviour of fire weather indices given the New Zealand weather
  - Better understanding of the potential operational utility of different indices
- Progress: second draft, soon to submit to IJWF

Background

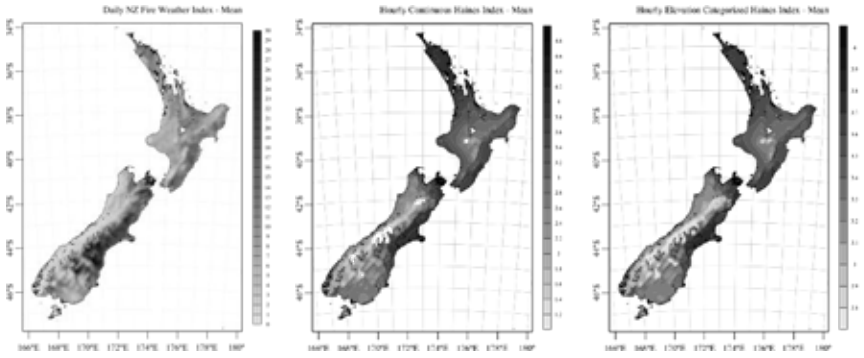
- Same simulation as model verification project
- Fire weather conditions considered:
  - Air Temperature
  - Dew Point Temperature
  - Relative Humidity
  - Wind Speed and Direction
  - Rainfall
- Multiple fire weather indices considered:
  - New Zealand Fire Weather Index (FWI)
  - Haines Index (HI)
  - Continuous Haines Index (CHI)
  - Planetary Boundary Layer Haines Index (PBLHI)



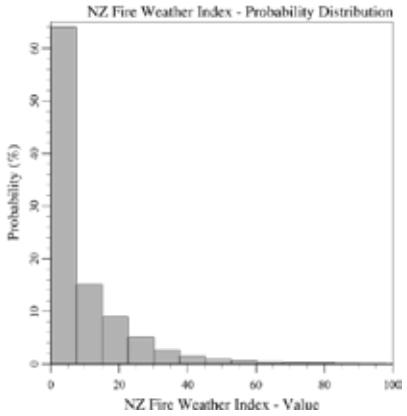
Behaviour of Indices

- Regional variation in seasonal mean
  - Fairly consistent between different indices
  - Highest in Canterbury, Otago, Northland
  - Lowest in Southern Alps
- Surface elevation related issue with the Haines Index and Continuous Haines Index:
  - Limited to elevations below around 1200 m
- Probability distributions differ between indices:
  - CHI: skewed normal
  - FWI: exponential decay

Indices - Season Mean



Indices – Probability Distribution



Utility of Indices

- 36 major fire events > 5 ha:
  - Fire weather conditions likely important
  - Calculate value of fire weather index for each event
  - Indices values given as absolute and percentile values
- Indices provide mutually beneficial information:
  - Better understanding of fire weather risk when multiple indices considered
  - More indices should be considered in fire management activities to better understand 3D atmosphere

Date	Area Burnt (ha)	Latitude S(°)	Longitude E(°)	LHI	MHI	HHI	ECHI	CHI	FWI	CHI P	FWI P
10-Aug-09	10.40	37.996	177.267	5	4	5	4	7.30	6.48	70	60
28-Aug-09	85.00	45.826	170.045	-	5	3	5	5.14	4.70	46	54
15-Sep-09	19.00	41.883	171.562	5	5	5	5	8.46	0.32	82	25
23-Oct-09	915.00	46.589	168.398	4	4	2	4	3.59	0.98	27	38
31-Oct-09	8.50	35.223	173.514	5	4	4	4	4.51	9.31	39	67
02-Nov-09	9.00	43.007	171.613	-	5	3	5	6.63	8.62	63	65
16-Nov-09	8.00	40.833	172.864	4	3	4	3	2.77	7.63	17	63
21-Nov-09	37.50	41.612	175.291	4	5	5	5	7.34	19.10	71	84
26-Nov-09	541.00	41.607	172.663	-	4	4	4	4.68	35.72	41	95
05-Dec-09	8.62	42.027	172.244	-	4	2	4	4.78	7.92	42	64
09-Dec-09	5.00	35.442	173.528	5	5	4	5	8.41	19.55	82	85
11-Dec-09	6.50	39.607	176.739	5	5	3	5	9.16	17.86	89	82
15-Dec-09	6.20	35.433	173.987	5	5	4	5	6.30	4.52	59	53
18-Dec-09	5.00	45.481	170.258	4	6	6	6	11.70	35.71	99	95
19-Dec-09	11.00	35.115	173.938	5	5	4	5	7.52	24.44	73	89
23-Dec-09	5.00	35.183	174.070	5	5	4	5	6.95	19.35	66	84
24-Dec-09	8.26	41.379	174.064	5	5	4	5	9.61	8.27	93	65
28-Dec-09	12.20	45.287	169.342	6	5	3	5	7.12	12.49	68	74
01-Jan-10	5.00	39.086	177.875	5	5	5	5	8.88	20.35	87	85
01-Jan-10	8.00	36.949	174.470	4	5	4	5	8.37	3.77	82	50
04-Jan-10	5.00	43.483	172.006	5	5	4	5	7.78	65.15	75	99
26-Jan-10	82.00	35.433	173.631	3	3	2	3	3.02	20.16	20	85
03-Feb-10	39.90	34.974	173.380	4	5	4	5	7.10	31.99	68	94
07-Feb-10	32.50	43.251	170.212	4	5	4	5	6.10	18.19	57	83
07-Feb-10	6.90	41.190	174.956	4	5	4	5	7.32	12.62	70	74
10-Feb-10	125.00	34.934	173.235	4	4	4	4	5.64	9.84	52	69
10-Feb-10	30.40	36.269	174.054	5	5	4	5	4.83	22.80	42	88
18-Feb-10	11.56	41.338	174.101	3	4	2	4	2.54	14.83	15	78
21-Feb-10	72.00	41.104	174.849	4	5	4	5	7.60	6.75	74	61
22-Feb-10	78.00	44.715	170.830	5	5	5	5	10.33	56.20	97	98
24-Feb-10	44.00	44.656	170.614	6	6	5	6	11.65	33.30	99	94
27-Feb-10	198.00	46.147	167.474	4	5	5	5	8.34	24.22	81	89
08-Mar-10	15.00	43.458	172.508	5	5	4	5	5.68	32.11	52	94
13-Mar-10	116.50	35.459	173.610	4	5	4	5	8.74	37.99	85	96
17-Mar-10	54.00	35.263	173.913	4	5	5	5	9.75	27.19	94	91
20-Mar-10	10.00	39.672	174.390	3	3	4	3	2.36	15.31	13	79

Fire Channelling

Overview

- Question: what physical mechanisms are responsible for fire channelling?
- Research benefits:
  - Better understanding of 2D and 3D atmospheric turbulence in complex terrain
  - New insights into physical processes driving the fire spread seen during fire channelling
- Progress: Paper submitted to IJWF
- Research conducted in collaboration with the University of New South Wales

Background

- Fire Channelling - atypical wildland fire spread on steep leeward slopes:
  - Fire spreads upslope, quasi steady-state
  - Fire spreads laterally when it reaches the ridge line
  - Lateral fire spread is rapid close to ridge and results in large-scale fuel burn-up over leeward slope
- Fire channelling seen in both landscape and laboratory scale fires

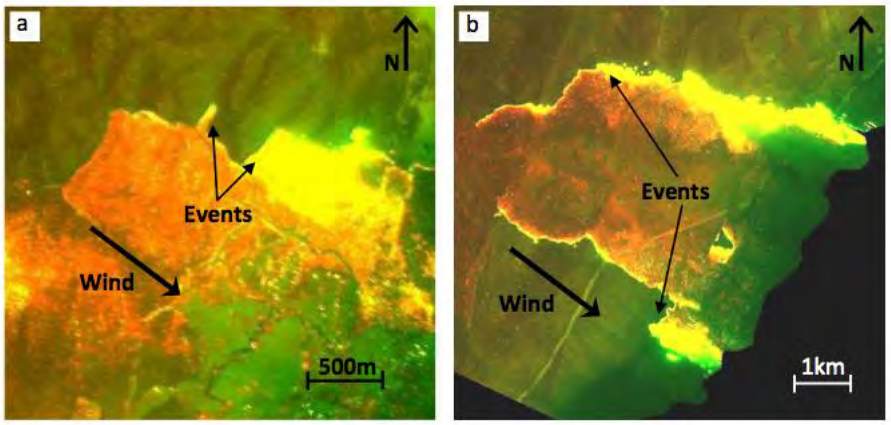
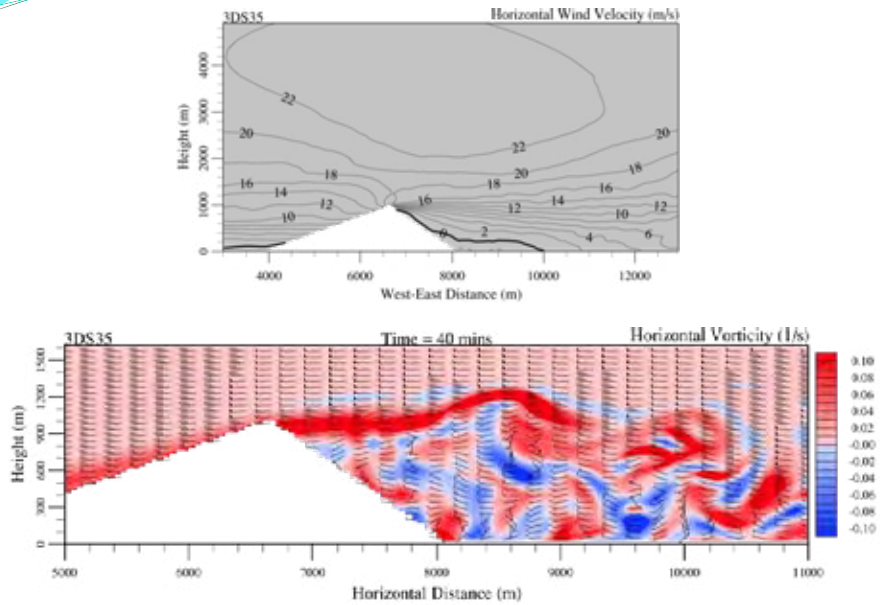


Figure 1. Multispectral line-scan imagery of the Canberra fires 18 January 2003 showing events at: (a) 'Pig Hill', and (b) 'Broken Cart'. Source: New South Wales Rural Fire Service.

10, 29
38, 59

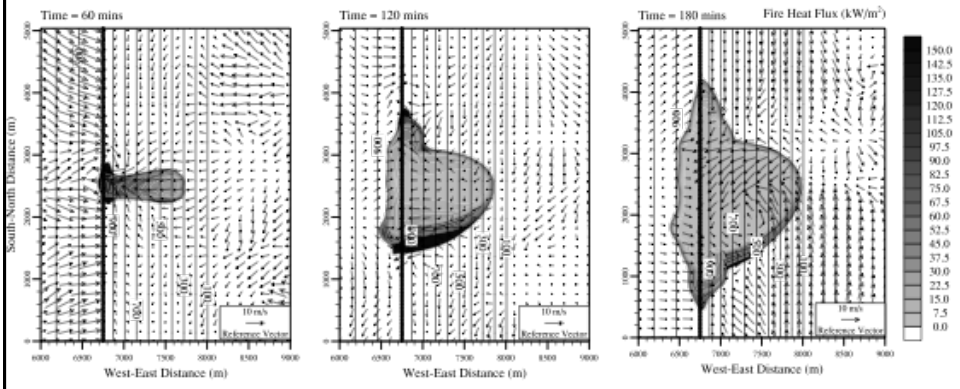
WRF-Fire Coupled Model

- Coupled atmosphere-fire model:
  - WRF: numerical weather prediction model
  - SFIRE: surface fire spread model
- Two-way coupled:
  - Fire spread influenced by: fuel, wind, slope
  - Weather influenced by: fire heat release
- Fire spread simulated across leeward slope

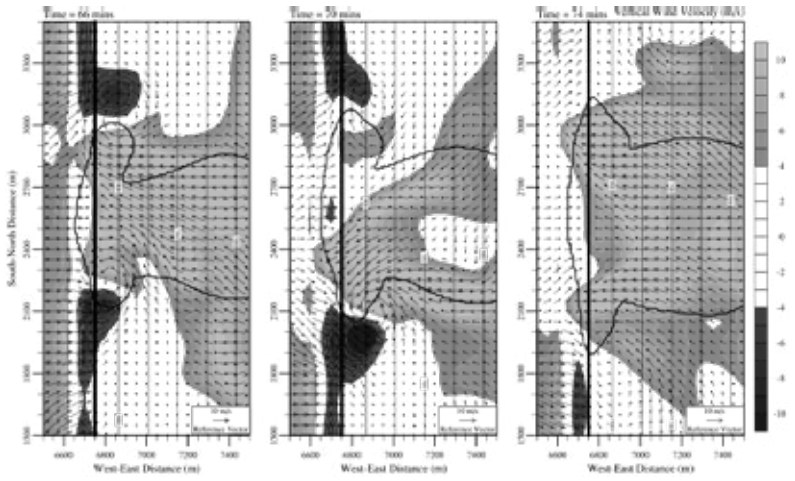


Modelled Fire Channelling

- Heavy logging slash fuel type



Physical Processes



FOEHN WINDS

Overview

- Question: what impact do foehn wind events have on fire weather danger in NZ?
- Four month project (Jul-Oct)
- Aiming to produce two papers:
  - Identification of foehn wind events
  - Impact of foehn wind events on fire weather conditions


QUESTIONS?

Abstract

Click here to return back to the contents page

Australian fire management

Liam Fogarty (Dept. Sustainability & Environment, Victoria)

Presentation title: The role of science in reducing uncertainty and achieving better bushfire risk management.

Our primary objective for bushfire management is to minimise the impact of major fires on human life, communities, essential and community infrastructure, industries, the economy and the environment. Many ways exist to achieve this objective.

Risk is the impact of uncertainty on objectives, and can be described as likelihood of unwanted consequences occurring. Risk management involves determining the best ways to avoid or reduce the events and consequences we can least afford or want. This requires making decision on whether or not to act to avoid, eliminate or reduce risk, on how to best achieve the outcomes we desire and on what we are prepared to pay or give up.

Decision making needs to address uncertainty by either accepting the margin for error involved, or reduce uncertainties that hinder decision making through investigation and analysis. Normally we need to do both – make the best decisions we can using the best available information we have at the time, and then reduce uncertainty and improve decision making through a combination of science, monitoring, review and improvement.

The role of science and bushfire risk management in Victoria is described.

Want to know more?

CONTACT: liam. fogarty@dse.vic.gov.au

This presentation was not delivered

Abstract

Click here to return back to the contents page

Operational practices

Tony Teeling (DOC Canterbury)

Presentation title: Research into operational practises.

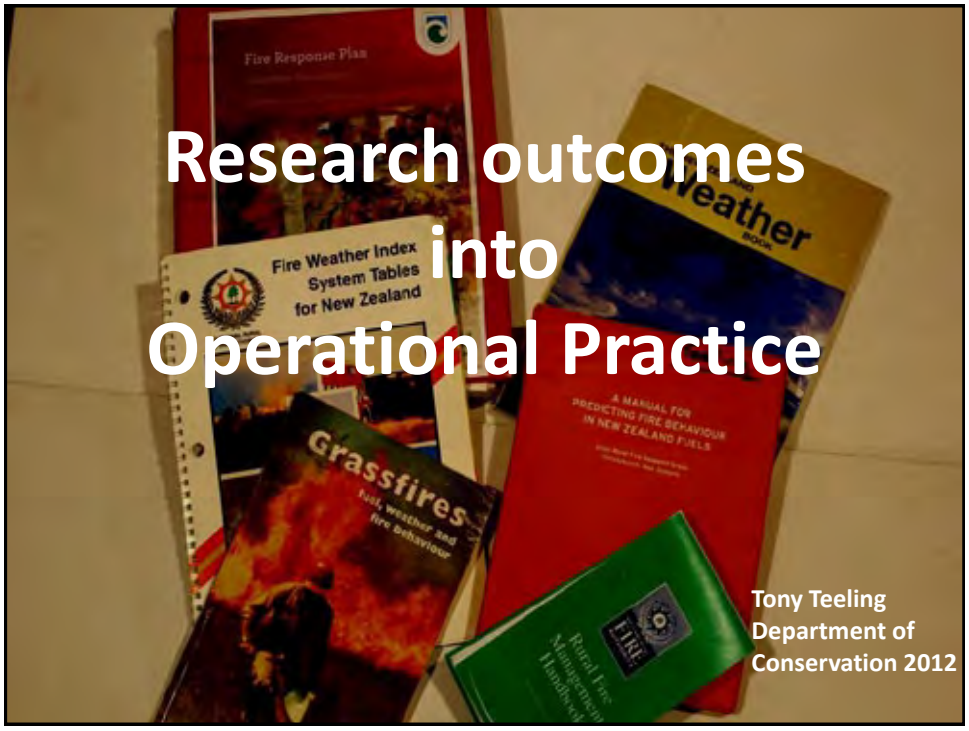
Tony will highlight the importance of fire management being based on sound science, by describing examples of how research findings and tools can be applied to support the development of operational fire management strategies and planning.

These include the use of fire behaviour models and tools, such as the Prometheus fire growth simulation model, together with guidelines on fire suppression resource productivity, to develop response plans as part of the Strategic and Tactical Fire Management Planning (STFMP) process.

Fire data collection and research is also informing other fire risk mitigation activities, while social research is supporting the engagement of communities in fire management planning.

Want to know more?

CONTACT: tteeling@doc.govt.nz



PURPOSE

To highlight the importance of fire management being based on science.

Context

- Canterbury Regional geographic area.
- Where science is being used to inform the fire management planning process.

Outline

- Rural Fire Authority business
- The Science Program and its value
- Risk Management planning process with examples

Rural Fire Authorities

- Protection of life and property
- Business framework with organisational policies, objectives, strategies and procedures
- Planning and service delivery uses the 4Rs of emergency management framework and decision support tools developed from science research.

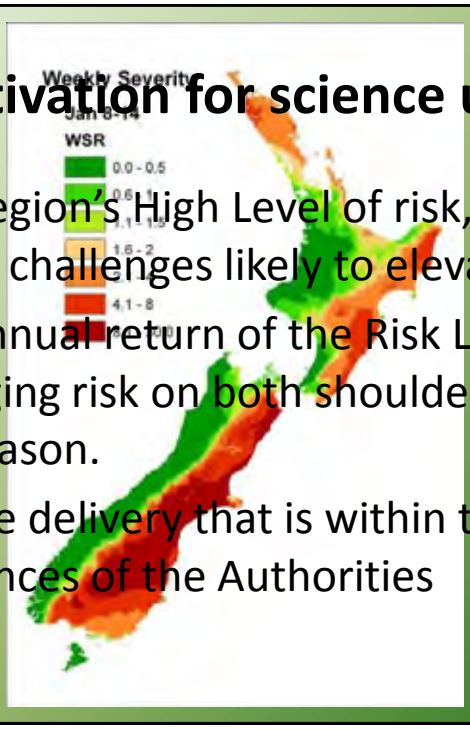
Fire Management and Science

- Rural Fire Authorities are motivated by their Level of Risk (vegetation fire) and the requirement to manage it.
- Vegetation Fire is complex in the physical and chemical world.
- The Human factor is a complex matter across the 4Rs

Science and Risk

- Rural Fire Authorities address fire risk using a risk management framework and target **Likelihood and Consequence** with the aim to reduce them both
- Therefore science needs to deliver outcomes for both the human factor and physical fire.

Motivation for science uptake



- The Region's High Level of risk, with future challenges likely to elevate the risk
- The annual return of the Risk Level with emerging risk on both shoulders of the fire season.
- Service delivery that is within the risk tolerances of the Authorities

Support for Science

- The Science Program is supported, as is other university research to meet management needs.
- Maintenance of fire records have built a history allowing for science project input
- Support is in both directions.

Support Examples

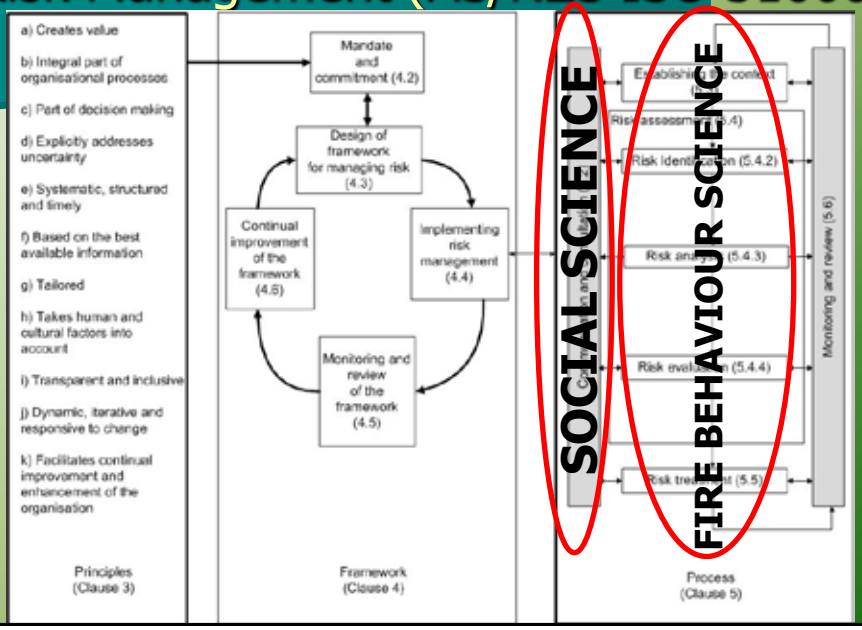
Science Program

- Project FuSE scrub fire experiments
- Fire affected communities
- Mitigating the risk of human caused wildfires
- Communicating of fire danger
- Validation and application of Prometheus
- Analysis of occurrence data in relation to the fire environment
- Rural firefighter workload including production rates

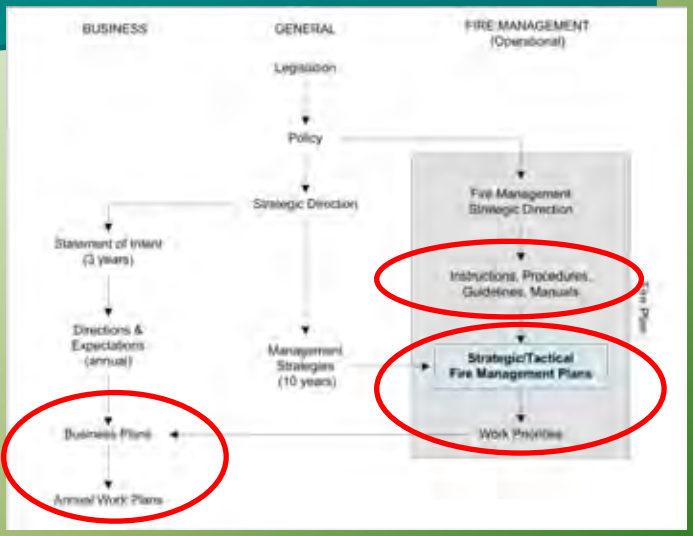
Science and Fire Management Planning

Linking science developed tools to the planning process and operations

Risk Management (AS/NZS ISO 31000)



Fire Risk Management Framework



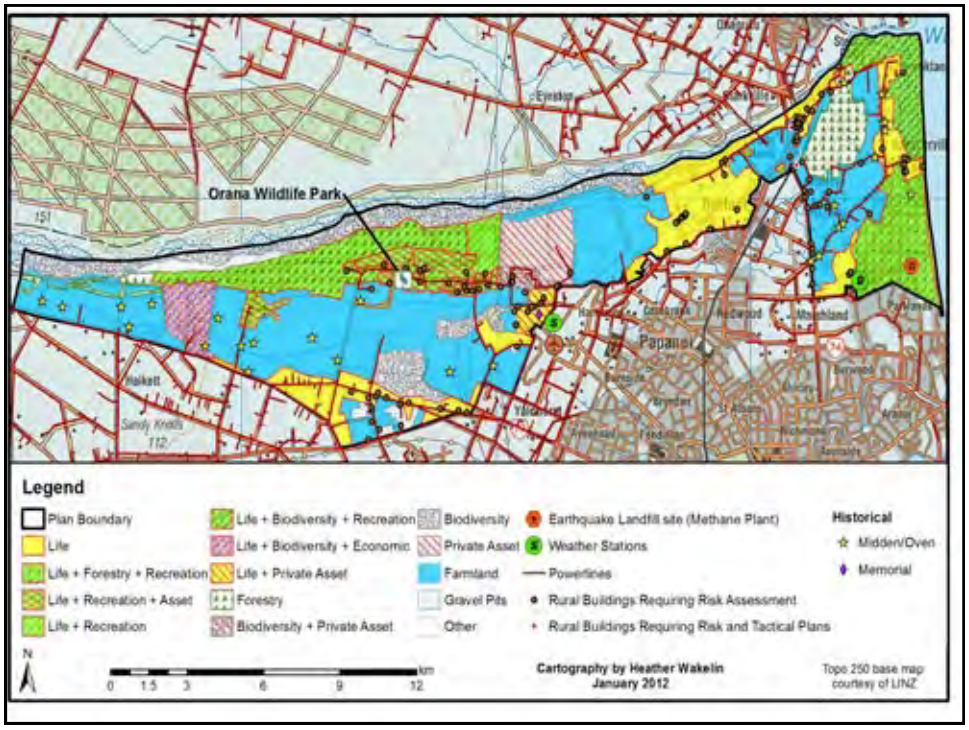
Tony Teeling (Department of Conservation)

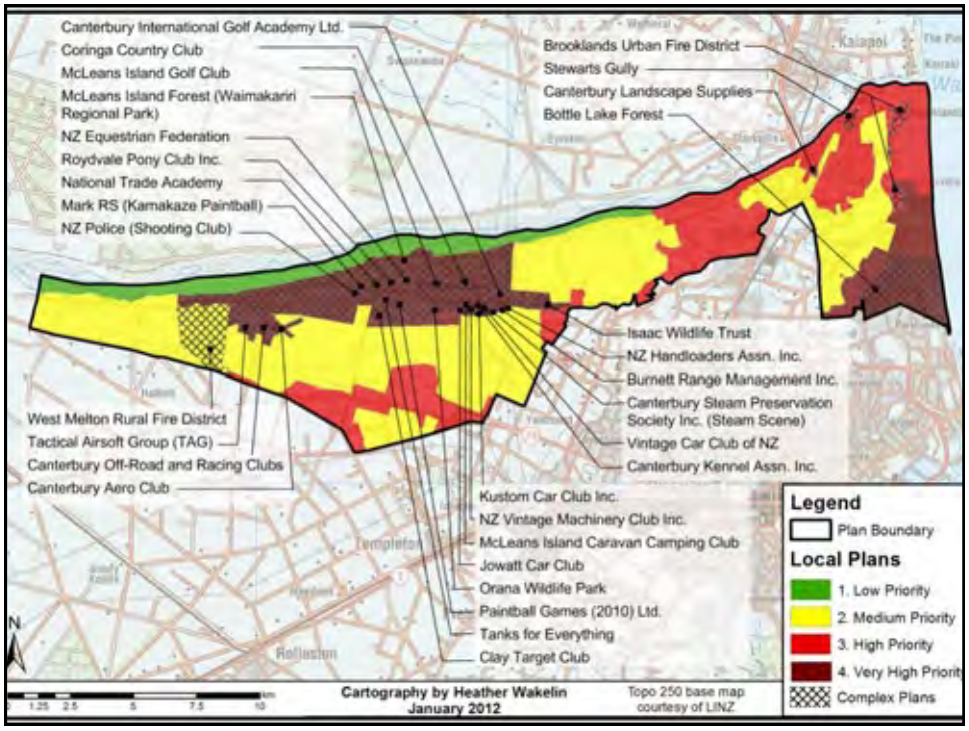
Example 1

Using social science to guide public communications and engagement of the community.

Result

- increased awareness of wildfire.
- behavioural change related to fire cause and better preparedness
- ownership of the issues
- enhanced relationships with the Authority





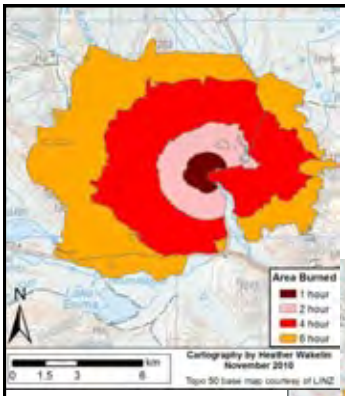
Example 2

Using Prometheus fire growth modelling to determine potential fire spread over the landscape.

Result

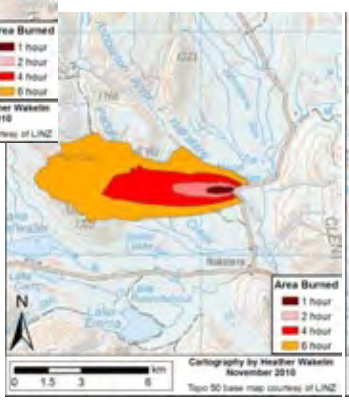
- increased awareness of the fire environment and likely fire behaviour within it.
- enhanced understanding of issues related to readiness and response for specific locations
- information on when a wildfire cannot be contained - therefore invest in not having one

Prometheus
Very High/Extreme Grassland Fire Danger

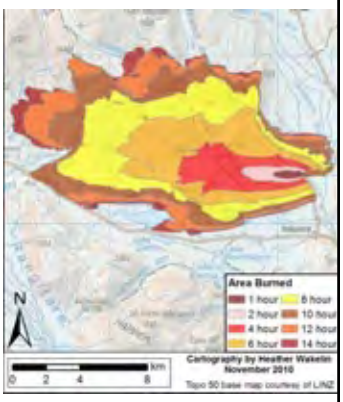


Very High - No wind

Grassland Curing = 85% for these scenarios



Very High - Wind 15 km/h



Extreme (diurnal) – 14 hours
Wind 15 km/h

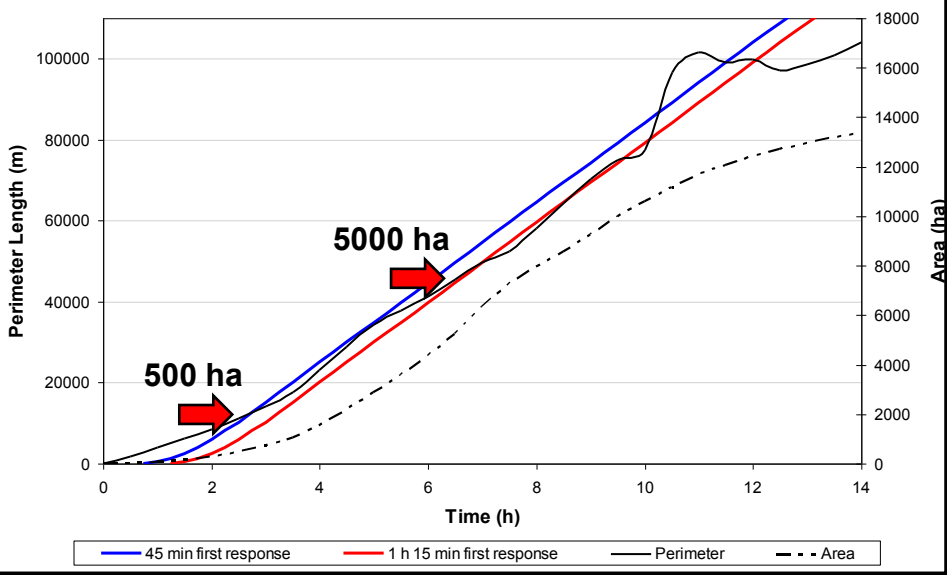
Example 3

Using resource production rates to determine containment success

Result

- increased understanding of issues related to elapsed time since ignition.
- increased knowledge of resource requirements therefore justification of Authority resourcing levels
- increased appreciation of the limitations of resource type

Predetermined Response – Extreme (diurnal) Fire Danger (Plan MC_B)



Example 4

Using examples 2 and 3 to help determine suppression objectives related to New Zealand Fire Danger Class Criteria.

Result

- knowledge of realistic fire damage potential and the resource requirements to reduce it
- required resource types identified and responded early for successful containment

Predetermined Response objectives and actions

Ashburton Basin (Responding via Ashburton Gorge Road)

Medium and High Priority Local Plans

Grassland Fire Danger	Objective	Plan of Action		
		Resources	Location	Approximate Arrival Time*
Low or Moderate	To contain the fire to < 5 ha within 2.5 hours.	1 ground crew (3 pax)	ADC Mt. Somers	45 min
		1 ground crew (4 pax)	NZFS Methven	1 h 15 min
	Standby Requirements	1 helicopter	Mt. Hutt	
High	To contain the fire to < 50 ha within 2.5 hours.	1 ground crew (4 pax)	ADC Mt. Somers	45 min
		1 helicopter	Mt. Hutt	45 min
		1 ground crew (4 pax)	ADC Mayfield	1 h
		1 ground crew (4 pax)	ADC Alford Forest	1 h
		1 helicopter	Mt. Hutt	1 h
		1 ground crew (4 pax)	NZFS Methven	1 h 15 min
		1 filling crew	NZFS Methven	1 h 15 min
		1 ground crew (6 pax)	ADC Ash Rural	1 h 30 min
		Other Resources: RFO (Initial Attack IC) - with backup smoke chaser if from DOC, Air Support Supervisor, Operations Manager, Logistics Manager and 2 support personnel, Command Unit, 100 litres foam		
	Standby Requirements	1 helicopter	Rakaia Gorge	
		1 fixed wing	Methven	N/A
		Bulk foam retardant supplies		
Very High or Extreme	To contain the fire within the first 12 hour operational period.	1 ground crew (4 pax)	ADC Mt. Somers	45 min
		1 helicopter	Mt. Hutt	45 min
		1 helicopter	Upper Rakaia	45 min
		1 ground crew (4 pax)	ADC Mayfield	1 h
		1 ground crew (4 pax)	ADC Alford Forest	1 h
		1 helicopter	Mt. Hutt	1 h
		1 fixed wing	Methven	1 h
		2 filling crews	NZFS Methven	1 h 15 min
		1 ground crew (4 pax)	ADC Rakaia Gorge	1 h 15 min
		1 ground crew (4 pax)	ADC Laureston	1 h 15 min
		2 helicopters	Christchurch	1 h 15 min
		1 helicopter	Hokitika	1 h 15 min
		1 filling crew	NZFS Ashburton	1 h 30 min
		1 ground crew (6 pax)	ADC Ash Rural	1 h 30 min
		1 ground crew (4 pax)	SCRFD Peel Forest	1 h 30 min
		1 ground crew (4 pax)	ADC Hinds	1 h 30 min
		1 ground crew (4 pax)	ADC Willowby	1 h 30 min
		1 fixed wing	Twizel	1 h 30 min
		1 filling crew	SDC Colleridge	1 h 45 min
		1 ground crew (4 pax)	ADC Pendarves	1 h 45 min
		2 ground crews (8 pax)	ADC Rakaia	1 h 45 min
		1 fixed wing	Waikari	1 h 45 min
		1 ground crew (4 pax)	DOC Geraldine	2 h
		1 ground crew (4 pax)	DOC Geraldine	2 h 30 min
		2 ground crews (8 pax)	DOC Rangiora	2 h 30 min
		2 ground crews (8 pax)	DOC Christchurch	2 h 30 min
		Other Resources: Full Regional Incident Management Team (fully kitted), DPRFO or PRFO, Northern and Southern Retardant Units, ICP adequate site with power, phone and assembly area, Fire Depot Maintenance Services, 300 litres foam		
	Standby Consideration	Full National Incident Management Team (fully kitted)		

Questions.

Abstract

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Firefighter research

Sally Ferguson (Appleton Institute)

Presentation title: The fighting without the fire: Simulating campaign bushfire suppression activities for research and training.

This presentation describes the development of a simulation to investigate the impact of consecutive long shifts in hot, smoky conditions during campaign fires.

Construction of the simulation involved three stages:

1. Data collection and analysis: The frequency, intensity, duration and type of physical work performed on the fireground in Australia is well documented, as is the pattern of shifts; a focus group with experienced firefighters helped describe the non-physical aspects of the work.
2. Design and development: The design and development phase integrated the physical and non-physical aspects of the work into simulated tasks allowing us to measure variations in performance in a valid, realistic and reliable manner. Elements such as PPE and equipment were also incorporated to increase fidelity and realism for participants.
3. Trial and refinement: Experienced firefighters participated in trials of the simulation and/or reviewed digital recordings. Refinements were then made based on feedback from participants and other subject-matter experts.

The result is a realistic, and reliable simulation that produces meaningful research outcomes.

Want to know more?

CONTACT: sally.ferguson@cqu.edu.au

The fighting without the fire: Simulating campaign bushfire suppression activities for research and training.

Sally A Ferguson, Matthew JW Thomas

Appleton Institute, CQUniversity, SA

Brad Aisbett

Centre for Exercise and Sports Sciences, School of Exercise and Nutrition Sciences, Deakin University, VIC.

AWAKE, SMOKY AND HOT (ASH) STUDY

bushfire CRC

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AWAKE, SMOKY AND HOT (ASH) STUDY

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CONTEXT FOR THE WORK

Environmental and Occupational Challenges

bushfire CRC

ASH: physical, physiological and cognitive performance changes under conditions of sleep restriction, heat and smoke.

Aim: to provide an evidence base on which decisions can be made about resourcing, workload, task allocation – managing risk.

THE CURRENT EVIDENCE

What we do know?

bushfire CRC

Currently available evidence:

- Laboratory data – not specific to volunteer bushfire-fighters
- Observational field data – not controlled

Proposed Research

- Builds a bridge between the laboratory and the field
- Aims to measure performance in a *controlled* but *realistic* environment

SIMULATION FIDELITY

Ensuring research objectives can be met

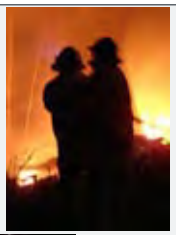
bushfire CRC

Ultra-High Fidelity Representation of Bushfire Scenario

Highly dynamic environment — **DANGEROUS**

DIFFICULT TO REPEAT & CONTROL

DIFFICULT TO ACCURATELY MEASURE PERFORMANCE



Low Fidelity Representation of Bushfire Scenario

Laboratory Experiment — **ABSTRACTED FROM REAL WORLD**

HIGHLY CONTROLLED

EASY TO ACCURATELY MEASURE PERFORMANCE

Simulation Fidelity and Research

Simulation in the research environment must achieve a balance between various dimensions of fidelity and the rigours of experimental control. This balance results in inevitable trade-offs, each of which must be carefully considered in order to maximise the overall value of the research process.

SIMULATION CONSTRUCTION
Phase One: Data Collection

bushfire CRC

Physical aspects of the firefighter task:

- Data collected during series of incidents (e.g. Black Saturday fires)
- Use physiological parameters to assess fidelity
- Designed to mimic workload and work tasks

SIMULATION CONSTRUCTION
Phase One: Data Collection

bushfire CRC

Cognitive aspects of the firefighter task:

- Focus groups and interviews with firefighters
- Selected simple tasks that can be done in the simulation
- Well-validated tasks for comparison to past and future work

- Hand-eye coordination
- Concentration/vigilance
- Taking in and remembering information
- Communication
- Reaction times – and reacting correctly

SIMULATION CONSTRUCTION

Phase One: Data Collection

bushfire CRC

Cognitive aspects of the firefighter task:

SIMULATION CONSTRUCTION

Phase One: Data Collection

bushfire CRC

SIMULATION CONSTRUCTION

Phase Two: Design and Development

bushfire CRC

4-day simulated campaign tour

- *arrive in the evening, briefing, adaptation and familiarisation*

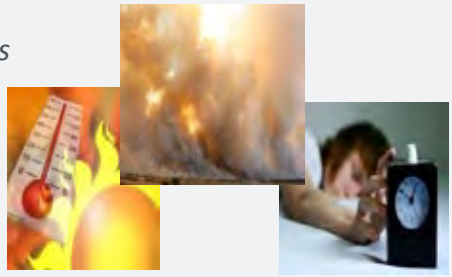
12-hour day shifts

- *three day shifts and just morning on the fourth*

Conducted in a classroom

- *testing during waking hours*
- *including sleep periods*

Volunteer firefighters



SIMULATION CONSTRUCTION

Phase Two: Design and Development

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SIMULATION CONSTRUCTION

Phase Three: Trial and Refinement

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Timing, validity, reality

- Volunteer firefighters completed full pilot testing run in SA.
- Human factors expert assessed fidelity – questionnaire, different subject matter experts
  - Physical tasks high fidelity, for both physical and cognitive components
  - Cognitive tasks lower fidelity for physical aspects but good fidelity for cognitive

PROJECT QUESTIONS

bushfire CRC

How is sleep impacted by heat, CO, sleep restriction and combinations thereof.

How does physical performance change with sleep restriction?

What physiological and psychological stress responses do firefighters experience under conditions of physical work, heat and sleep restriction?

How is cognitive ability impacted by combination of heat and sleep restriction?

Can we use the simulated tour to test other groups (IMTs), or for fitness for duty testing, or training?

PROJECT COLLABORATORS

bushfire CRC

Supported by the Bushfire CRC.

Deakin University

CQUniversity

Country Fire Service – South Australia

Country Fire Authority - Victoria

ACT Parks and Conservation Service

Abstract

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Safety and productivity

Richard Parker (Scion)

Presentation title: Improving safety and productivity in the rural fire workforce.

Richard will present the new Rural Fire Research theme "Improving safety and productivity in the rural fire workforce".

The scope of this work is to continue gathering data from firefighters at real fires and develop more capable and less obtrusive equipment data gathering equipment.

The methods and technologies developed for recording people will be used to develop ways of measuring the productivity and effectiveness of other fire fighting resources such as fire appliances and aircraft.

The data will be incorporated into production guidelines but also provide an insight into work activities in emergency situations which could have applicability to Incident Management Teams and other disaster situations.

New technologies will also be evaluated under operational conditions. For example, unmanned aerial vehicles such as drones and multicopters offer significant potential in rural fire fighting for collection of aerial imagery and other fire intelligence information.

Want to know more?

CONTACT: richard.parker@scionresearch.com

Scion Rural Fire Research Group

Safety & Productivity

Research Workshop, Rotorua

Richard Parker

14 June 2012

Research Aim

Improving safety and productivity in the rural fire workforce

- Firefighter data collection
- Aircraft and fire appliances
- Production guidelines
- New technology

Firefighter data collection

- Continuing to collect data at real fires
  - Difficult, synchronising timing
  - Recording gear is fragile and tricky
  - But we have got unique data and getting insights
    - Reflective interview
    - Workload analysis

Reflective Interview

Firefighter explains events while watching video of their own work

- Head mounted video
  - immersive, not an actor in the scene

Video with firefighter commentary

Comparison - who is at the fire

Task analysis

- Only know the helmet camera wearer

Reflective interview

- Three person crew, two are women who have not been to a real fire before
- All work for DOC
- Two other people handling the hose work for a forest company crew
- The two crews don't know each other
- Another DOC Crew Boss appears but is actually working with a second DOC crew

Comparison - why events are occurring

Task analysis	Reflective interview
•No understanding of why events are occurring	•Getting slack in hose so it can be pulled further up the hill •Removing kinks in the hose so water flows well •Ensuring hose not on hot ground where it could burn •Not all crews have radios but DOC do •Breathing hard because of exertion and adrenaline •May need a second 'dam' and pump to get water higher up the hill •Trying to put another hose on the line to get water higher •Hose may be blocked with a kink

Reflective interview

- Removes chaos from the video record
- Allows understanding of risks and risk management
- Allows understanding of decision making and command
- Provides authentic training material

Improved gear

GPS & high definition video with no cables!

1st integrated helmet

Duct tape & cardboard
Low definition video

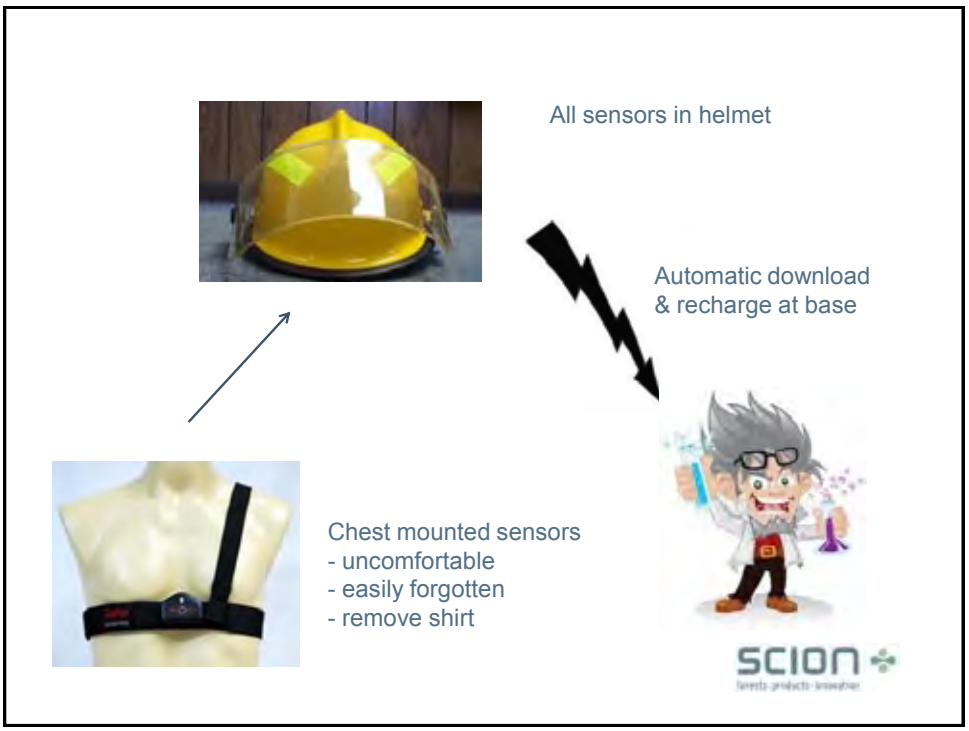
SCION

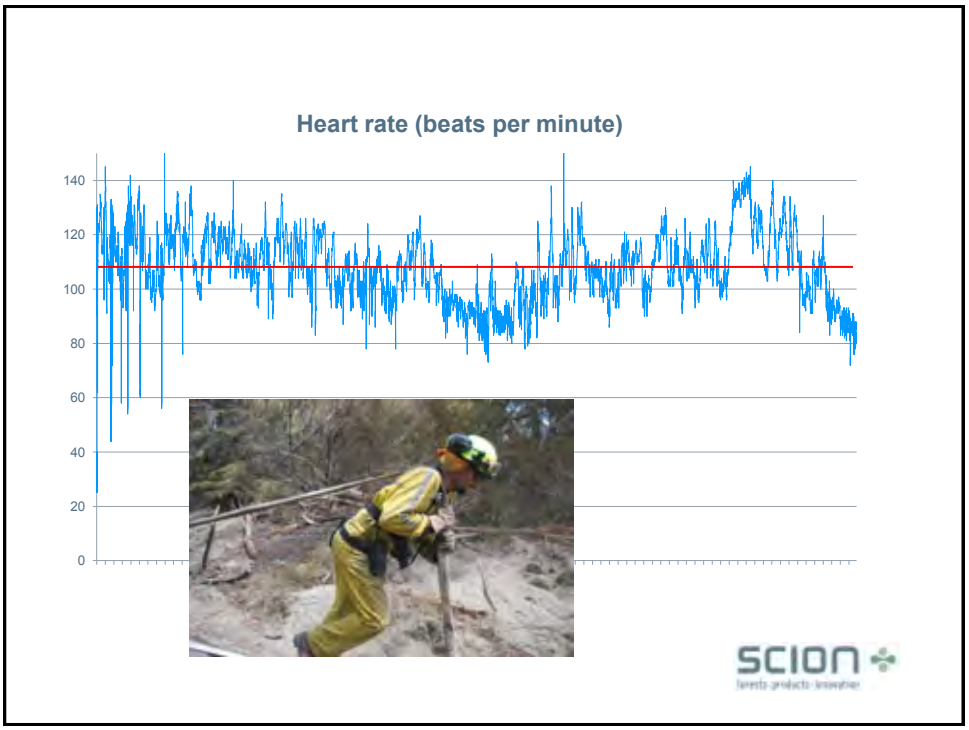
GPS linked HD video

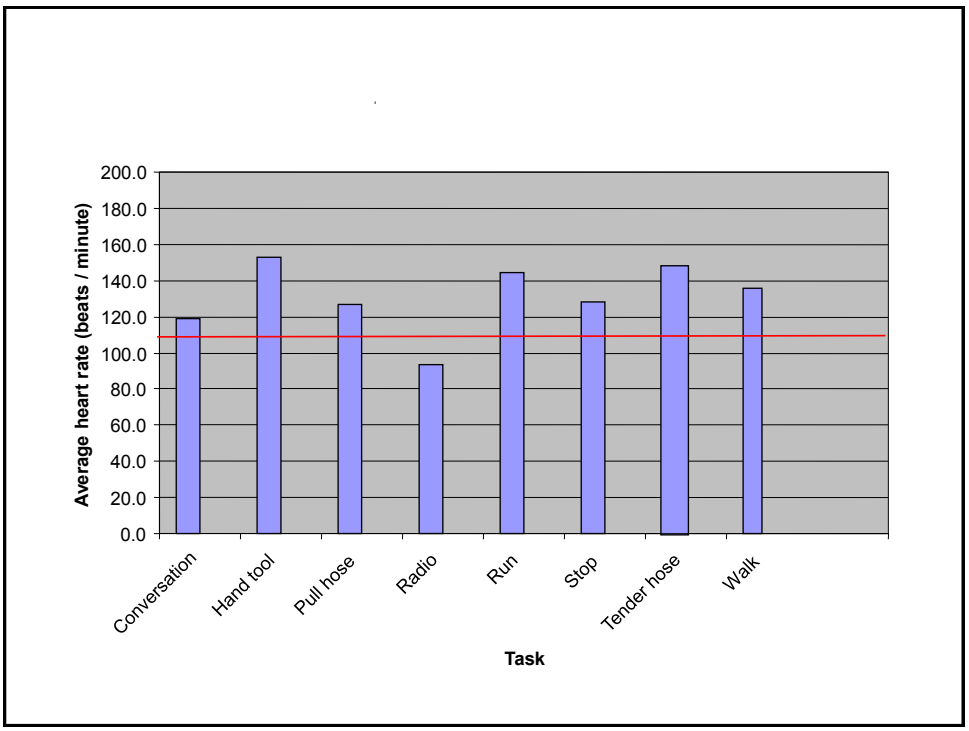
SCION

- Continue to improve gear, handle data & generate guidelines
  - University of Canterbury
    - Wireless Research Centre
    - Spatial Engineering Research Centre
- Working with University of Canterbury
  - 'Collect, filter and visualise vast amounts of digital data'
  - $7M project over 5 years
  - "Distribution of Digital Content for Situational Management by Emergency Services"

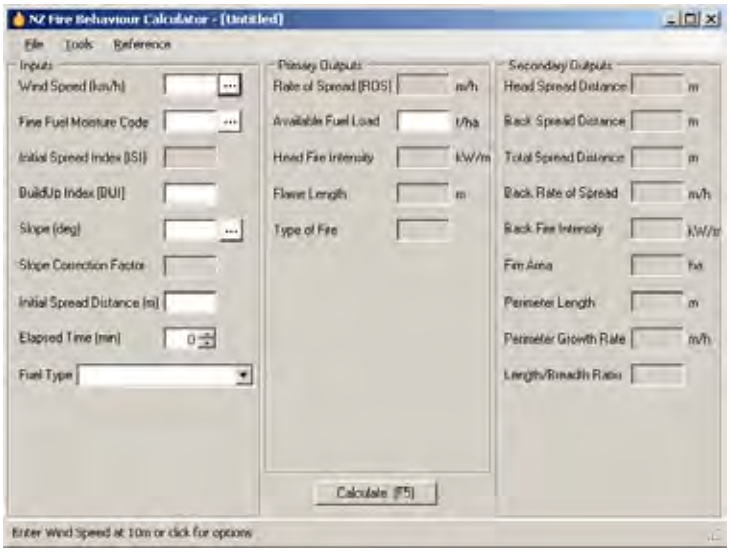
Data collection ensemble for rural firefighters


All sensors in helmet
Automatic download
& recharge at base
Chest mounted sensors
- uncomfortable
- easily forgotten
- remove shirt
SCION


Heart rate (beats per minute)
140
120
100
80
60
40
20
0
SCION



Fire Behaviour Toolkit



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Fire Behaviour Toolkit

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Fireline construction rates for forests, logging slash and grass for different techniques at each of five different initial attack levels (from Fogarty and Smart, 1994)[1].

Table 1 - Fireline construction rates (m/h) for forests

Initial attack levels	1 (0-10 kW/m)	2 (10-500 kW/m)	3 (500-2000 kW/m)	4 (2000-4000 kW/m)	5 (> 4000 kW/m)
Fireline construction technique	Fireline construction rate (m/hr)				
5 person crew with hand tools	160	160	130	100	80
3 person smoke chaser	80	80	60	50	40
5 person pumper crew	400	400	320	260	200
Hot spotting crew	600	600	480	390	300
Bulldozer	600	600	480	390	300

Table 2 - Fireline construction rates (m/h) for logging slash

Initial attack levels	1 (0-10 kW/m)	2 (10-500 kW/m)	3 (500-2000 kW/m)	4 (2000-4000 kW/m)	5 (> 4000 kW/m)
Fireline construction technique	Fireline construction rate (m/hr)				
5 person crew with hand tools	100	80	80	65	50
3 person smoke chaser	60	80	50	40	30
5 person pumper crew	400	400	320	260	200
Hot spotting crew	750	750	600	490	380
Bulldozer	750	750	600	490	380

Carbon monoxide (CO)

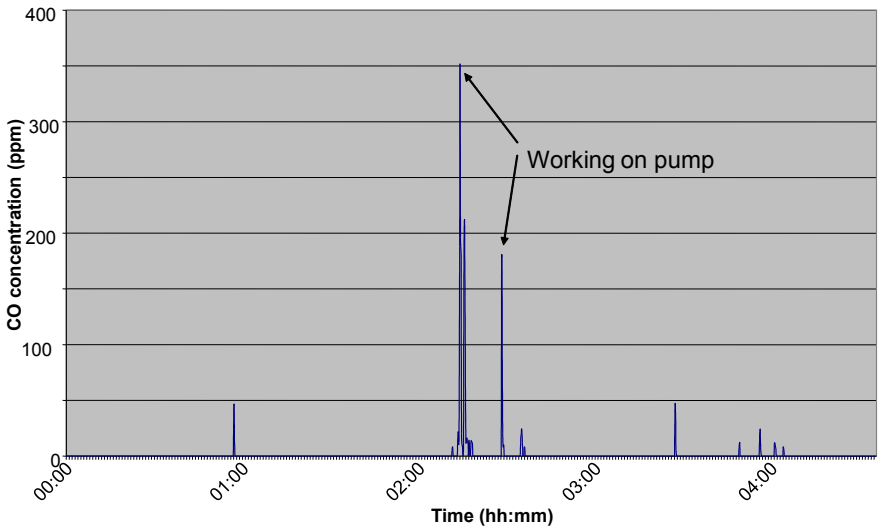
- Product of combustion
- Colourless, odourless gas
- Binds to haemoglobin – reduces work capacity

Carbon monoxide

- Exposure limits
  - 30 ppm for 8 hour day
  - 200 ppm for 15 minutes
  - 400+ ppm to be avoided
  - 800 ppm seizures & coma
- Linked to concentration of other pollutants
  - Benzene, formaldehyde, particles
- No studies linking detailed work activity with exposure

Mopping up

- Highest CO around pump – 300 ppm
- Smouldering stumps and roots – 50 ppm


400
300
200
100
0
CO concentration (ppm)
Working on pump
00:00
01:00
02:00
03:00
04:00
Time (hh:mm)


21184
2009. 02. 05
16: 15: 46

Carbon monoxide issues

- More to learn
- Variation in tolerance for CO?
- No filters to remove it
- Stay out of the smoke

Other fire suppression resources

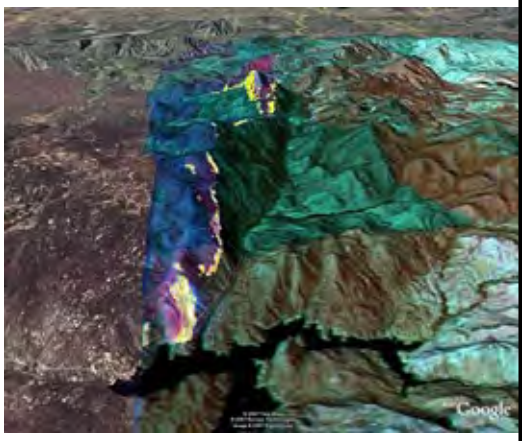
- Extend to aircraft and ground based resources

Measurement technology

- Already available
  - Existing cameras, gps, understand software
- Retrofit equipment?
  - Our cameras, gps

New Technology

- Drone
- UAV – uninhabited air vehicle
- Situational awareness



Reaper
UAV

SCION

LHD
Load Haul Dump

SCION

Operating 40 tonne LHD

Twin TV screens linked to 6 cameras

Small ready to use UAVs

- Different types of drone
  - Fixed wing
  - Multicopters
- Issues working around other aircraft

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AR Parrot
$500 'toy'

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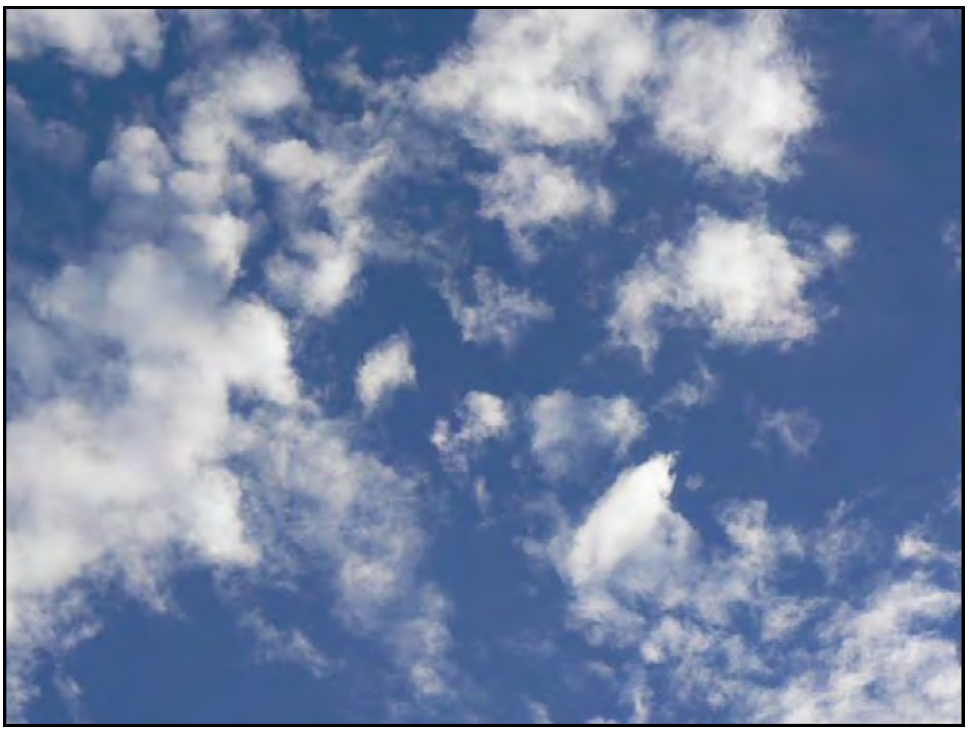

Conclusions

- New science and technology
- Safe & healthy firefighters
- Productivity guidelines based on real fires
- New tools for forest & rural firefighting

Acknowledgements

- The fire fighters who generously give their time and expertise
- The members of the Rural Fire Research Advisory Group
  - National Rural Fire Authority
  - New Zealand Forest Owners' Association
  - Department of Conservation
  - Local Government
  - New Zealand Defence Force
  - Federated Farmers
- Ministry for Science & Innovation

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Abstract

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Fire management

Kerry Hilliard (retired, ex DOC)

Presentation title: A historic perspective: how fire management has changed through research

Kerry takes a light-hearted look and walk through fire management and how this has changed through research.

New Zealand's fire management building blocks were developed from those of North America, particularly Canada and have been enhanced with continued contact with North American fire managers and researches, with substantial input from Australian fire managers and researches.

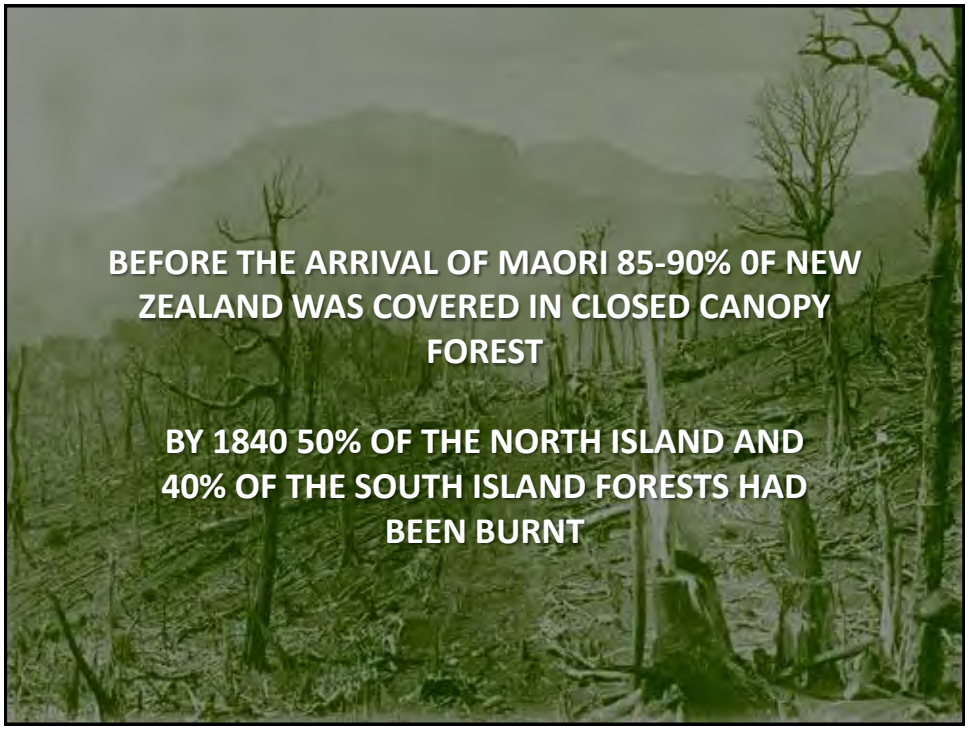
Want to know more?
CONTACT: khilliard@inspire.net.nz

HISTORIC PERSPECTIVE: HOW FIRE MANAGEMENT HAS CHANGED THROUGH RESEARCH

KERRY HILLIARD

FIRE MANAGEMENT BEGINS IN NEW ZEALAND

- THE ARRIVAL OF MAORI
- THE ARRIVAL OF EUROPEAN SETTLERS
- BOTH HAVE THE FIRE MANAGEMENT OBJECTIVE OF "BURN AND CLEAR THE BUSH"



MAORI GARDENS

Maori burnt the bush to form productive gardens, planted on the northern aspect, and to provide access for hunting and gathering

BURNING THE POHANGINA VALLEY

Early European settlers rushed to meet government contractual obligations of converting standing forest to pasture

ESTABLISHING FARMS IN THE POHANGINA VALLEY EARLY 1900'S

Sowing grass seed

Linklater house and farm grassed for sheep

FIRE MANAGEMENT PRACTICES

- The bush was felled in winter and set on fire in the drier summer months
- It was found best to leave the bigger trees standing as felled they retained moisture and would not burn
- Many fires were lit and left uncontrolled
- This put settlements under threat

EUROPEAN SETTLEMENTS FORMED AS THE BUSH WAS CLEARED AND VULNERABLE TO WILDFIRE

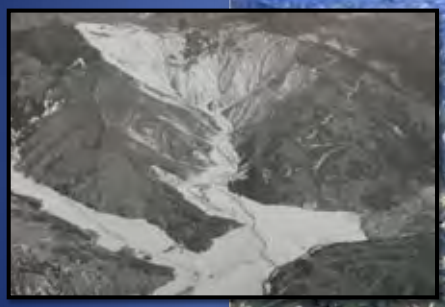
1860'S - CONCERNS ABOUT RAPIDLY DECLINING NATIVE FOREST

Loss of valuable timber resource

Loss of native bird habitat

EROSION EVENTUALLY STRIKES FOLLOWING BUSH CLEARING

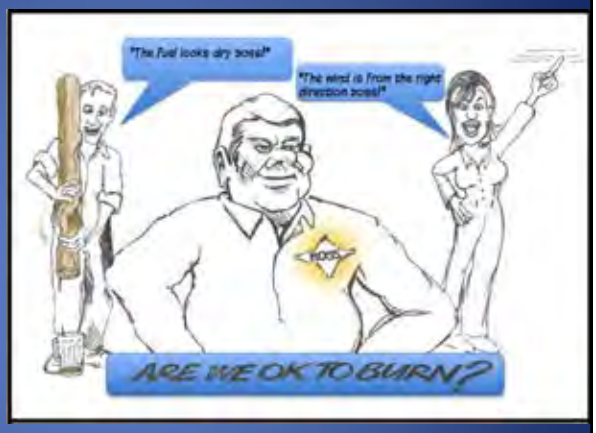
Tarndale Slip 1961



Waimata Catchment after Cyclone Bola 1988

THE DAY TO BURN

Local knowledge was crucial to decide when to burn, the tools of today were not available.



LEADING UP TO 1946 AND THE 1946 TAUPO FIRES

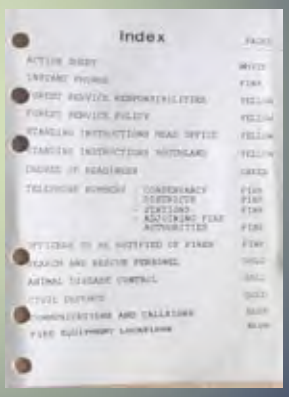
CONSEQUENCES OF THE 1946 FIRES

- The fires burnt 100,000 ha, including 12,000 ha of private plantation
- The 200,000 ha of plantations on the central plateau were put at risk
- The Forest and Rural Fires Act 1947 consolidated by the Forest and Rural Fires Act 1955 set the scene for today's fire management with the Forest and Rural Fires Act 1977, Forest and Rural Fires Regulations 2005, NZ Fire Service Act 1975 (and all amendments to these)

1947 -NZ FOREST SERVICE TAKES ON THE ROLE AS LEAD AGENCY FOR RURAL FIRE MANAGEMENT IN NEW ZEALAND

- The NZ Forest Service was a government department with land management responsibilities throughout NZ
- Seven conservancies were established headed by a conservator and staffed with personnel skilled in the disciplines of forest management, including fire suppression
- A chief fire officer was appointed to head office to ensure all aspects of fire management were implemented consistently throughout the NZ Forest Service

EACH CONSERVANCY PRODUCED A FIRE PLAN



NZ RURAL FIRE RESEARCH

- The Forest Research Institute was established in 1947 and a fire danger meter was released in 1948 to assist in monitoring the conditions that affect fire ignition
- Weather stations were located at most forest headquarters and the local fire danger calculated using the fire danger meter
- In the 1950's NZ turned to North America particularly Canada for guidance and improvement in forest and rural fire management

FIRE DANGER METER

The meter was the most significant tool available for assessing fire danger and applying the readings from it to fire management.

Inputs for calculations:

Moisture content of sticks
Relative humidity
Temperature
Wind force
Day since rain
Seasonal variance

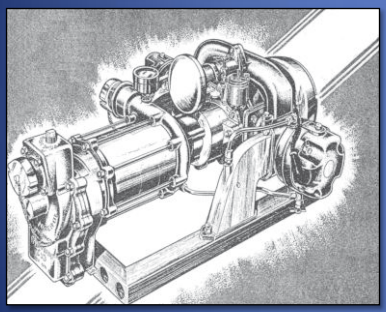
THE FUEL MOISTURE INDICATOR STICKS

400 gm and 100 gm

The old master Bill Girling-Butcher
CFO NZ Forest Service 1968-79

THE PARAMONT CUB CANADIAN PUMP

Drawing of pump from manual



Introduction to this new tool

FIRE RESEARCH LACKING BUT NOT INNOVATION

Fire equipment legend Johnny McDonald

Quad fire engines

INNOVATION

Lighting of large areas by helicopter

Heli Torch

INNOVATION

Collapsible heli buckets and relay dams

Static fire fighting water supplies suitable for helicopter use

INNOVATION

Heli hose laying box

Extreme pumping

PLANTING BOOM 1960'S-1970'S

Pump powered flamethrower


1987 - THE DEMISE OF THE NZ FOREST SERVICE
RURAL FIRE MANAGEMENT TAKES A MAJOR HIT


1992- FOREST AND RURAL FIRE RESEARCH PROGRAMME BREATHED NEW LIFE
FIRE MANAGEMENT HUNGRY FOR KNOWLEDGE AND TOOLS

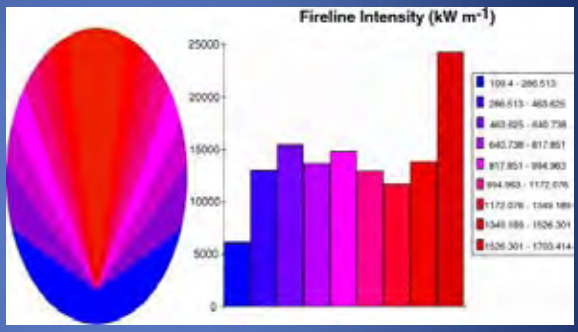
MARTY THE MASTER

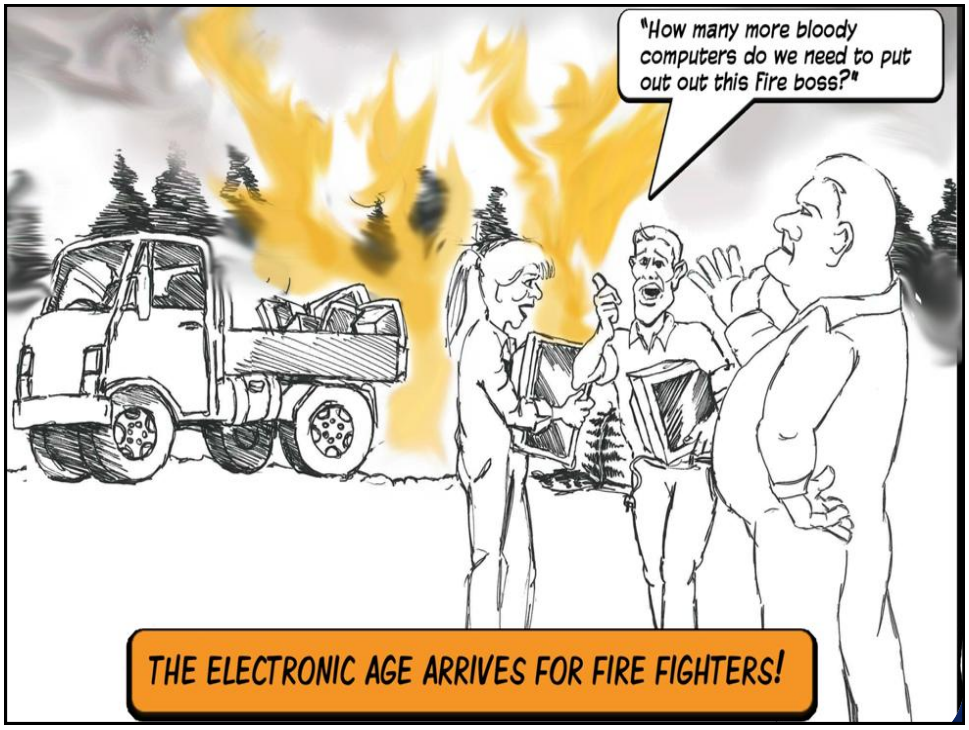
I = H x w x r

Scientific calculators

Fire case studies

Course examinations





EXAMPLES OF FIRE MANAGEMENT IMPROVEMENTS SINCE 1992

- Better understanding of fire behaviour and fuels in the NZ environment
- Real time fire weather prediction
- Declaration of realistic fire seasons
- Fire policy supported by good science and technical guidelines
- Firefighter safety and performance
- Different approach to fire suppression
- Better understanding on how communities react to fire management decisions

FIREFIGHTER PPE

Before PPE standards

The 2012 firefighter

BUILDING FIRE MANAGEMENT BUDGETS

THE END

ACKNOWLEDGEMENTS

- Photos slides 1,2,12,25,32 Raewyn Hilliard
- Photos slides 4,8,9 and drawing slide 3 Te Ara "The Encylopedia of NZ"
- Photos slides 5,6a County Fayre Pohangina Village
- Photo slide 6b Ross Linklater collection
- Photo slide 10a "The Story of Mangatu"
- Photos slides 15,17,18,19b,21,22,23,24a,30a Lindsay Golding collection
- Photos slides 19a,20 FRFANZ "Rural Fire History of NZ"
- Photos slides 10b,24b,26,27 Google images
- Photo slide 30b DOC National Office
- Cartoons slides 11,28,31,33 Steve Leurink "Designaddiction"

- Many thanks to the FRFANZ "Rural Fire History of NZ" (Gavin Wallace) website for some of the content, or lead into content of this presentation

- Kerry Hilliard May 2012

Abstract

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Use of fire in NZ

Veronica Clifford (Scion)

Presentation title: Use of fire as a land management tool in New Zealand.

Veronica will cover a new Rural Fire Research theme "Fire as a land management tool".

The focus of this project is to understand how fire is used around the country, and the risks and issues if land owners could or couldn't use fire.

The ultimate goal is to provide enough information to the public to minimise the risk of harm to life, property and the environment when using fire as a land management tool.

The research will identify the main rationale for the use of fire as a land management tool, and seek to understand the varying stakeholder perspectives as to the benefits and risks to local communities, business operations and the rural environment from this practice.

This information will assist practitioners, land managers, regulatory authorities and rural communities in making informed decisions on the use of fire as a land management too.

Veronica will highlight:

- what we currently know,
- what are the big knowledge gaps
- what we plan to investigate in the future.

Want to know more?

CONTACT: veronica.clifford@scionresearch.com

Rural Fire Research Workshop 2012
Scion Campus, Rotorua

Using fire as a land management tool

NZ Rural Fire Research Group
Veronica Clifford

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Introduction

- Theme Three - Use of fire as a land management tool
- Seeks to determine: how & when to manage fuel loads
- By researching: what are the risks, benefits, consequences & outcomes
- maximise benefits and minimise effects

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Background

- Fire's role in vegetation cover
- Cost effective tool to landowners
- Fire is used to:
  - Remove weeds
  - Sterilise lands
  - Promote growth for grazing
  - Promote stock access
  - Dispose of rubbish

Background

- Risks associated with use of fire:
  - Escalating into uncontrolled wildfires
  - Impacts on ecosystems (soil, water & biodiversity)
  - Economic loss & damage to infrastructure

Background: Statistics

- Statistics from 2008, averaged over 15yrs
  - 3000 - 4000 wildfires
  - 6,000 ha burnt
  - 20% result of using fire
  - 46% of the area burned

Background

- the risks and benefits of fire as a tool is not well understood
- Little is known on the extent of burning undertaken in NZ
- no equivalent database for controlled vegetation burns.

Background: Landowners

- No national survey to understand when, where and how fire is used
- A number of issues hindering more widespread use
- Feed back to date has highlighted the need for guidelines

Background: Land management agencies

- Concern expressed on lack of scientific knowledge to support policies
- The potential for increased fire risk due to retirement of land has been a feature
- Lack of understanding on the effects on ecosystems

Aims

- What are the benefits and risks to using fire?
- What are the knowledge gaps?
- What are the perceptions of prescribed burning?
- Identify smoke tools to mitigate against air quality issues
- Guide future research

Project method

Undertake:

- Literature review
- Consultation with relevant agencies & landowners
- Identify suitable plume tools for smoke modelling
- Collated into a final report & identify future research

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Method: Literature review

- Scope the use of fire in NZ
- Review policies and guidelines in NZ and overseas
- Effects on ecosystems
- Identify suitable smoke dispersion models

Method: National survey

- Various views of key stakeholders
  - Opinions of practises and factors that lead to escapes
- Views of landowners and managers
  - When, where and how fire is used within different rural sectors
  - Risks and benefits of such practises

Method: case studies

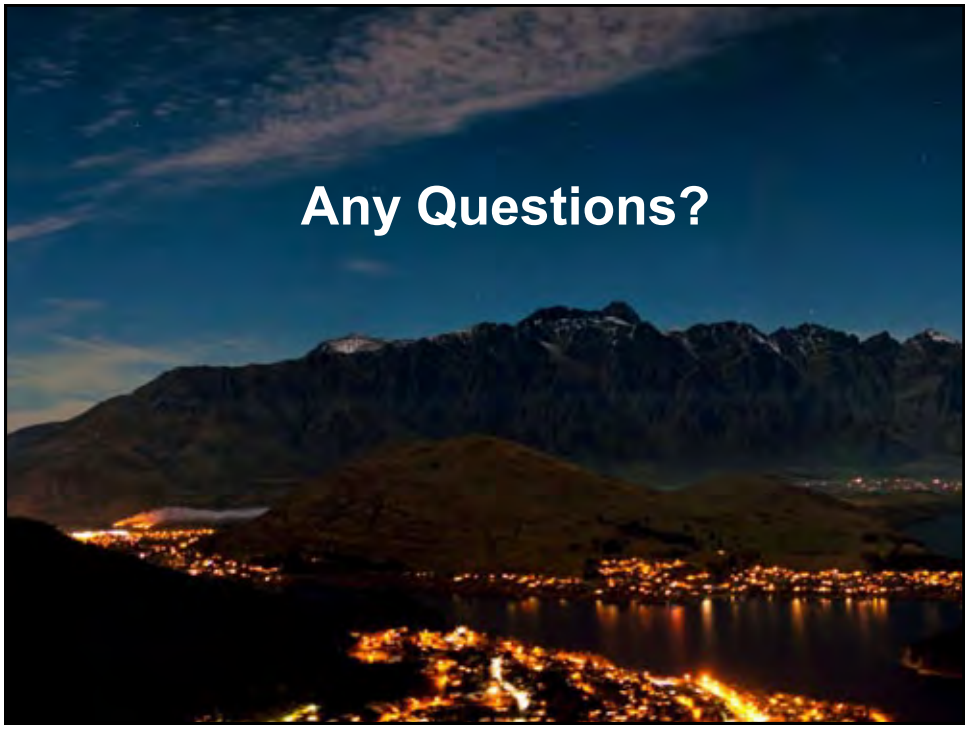
- The plan is to review some of the international smoke models
- Test models with several controlled burns and wildfires
- Identify suitable future sites to monitor impacts on ecosystems

Summary

- What are the benefits and risks to using fire?
- What are the knowledge gaps?
- What are the perceptions of prescribed burning?
- Identify smoke tools to mitigate against air quality issues
- Guide future research

Summary

- Support rural communities in understanding
- Provide guidance to stakeholders for management practises
- Facilitate the safe use of fire
- Ultimately reducing the risk and numbers of fires escaping and doing damage



Abstract

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Prescribed burning studies

Graeme Doole (UWA & BFCRC)

Presentation title: New Zealand case study results on tussock burning in Central Otago.

This study involved the use of a framework to consider the relative merits of alternative plans for environmental assets in a data-poor environment.

The overall goal of the study was to combine science, community, policy, and economic perspectives to guide decision making regarding fire management in Australia and New Zealand.

The key objectives were to assess combinations of management and policy options, understand the most important factors driving the relative merit of these combinations, and enhance mutual understanding of these issues among stakeholders.

This talk presents results from a New Zealand case study involving tussock burning in Central Otago.

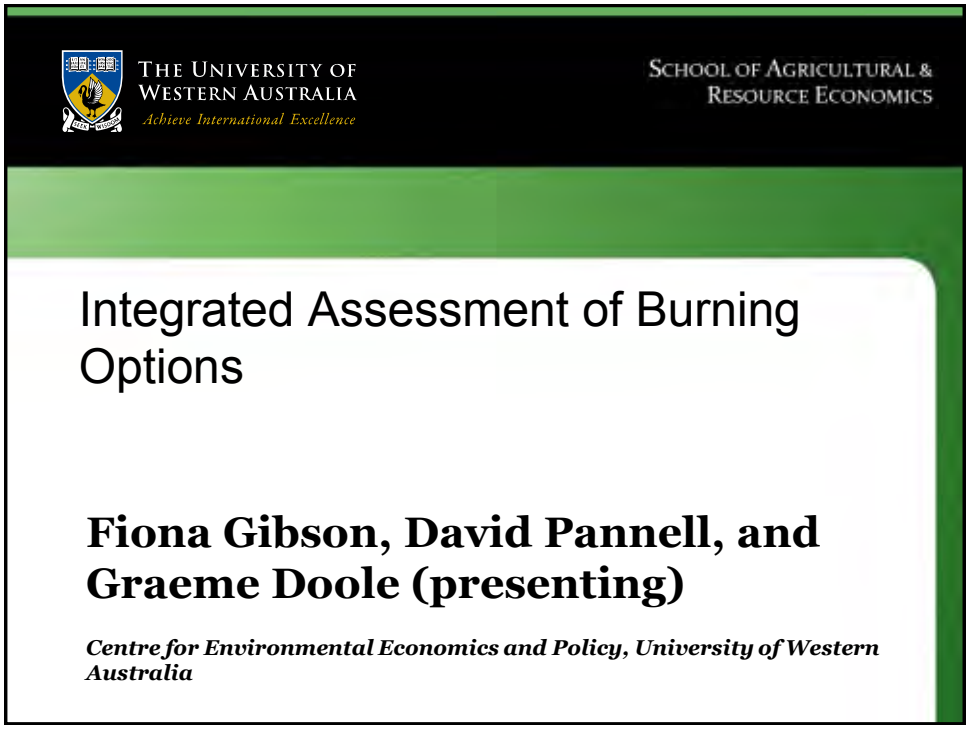
The process of engagement with stakeholders, key model output, and information gaps are described.

Overall, it is shown that a modelling approach can have significant benefits for evaluating alternative management options, even in data-scarce situations.

Want to know more?

CONTACT: gdoole@waikato.ac.nz

Image: Rough Ridge, Central Otago (Geoff Rogers)

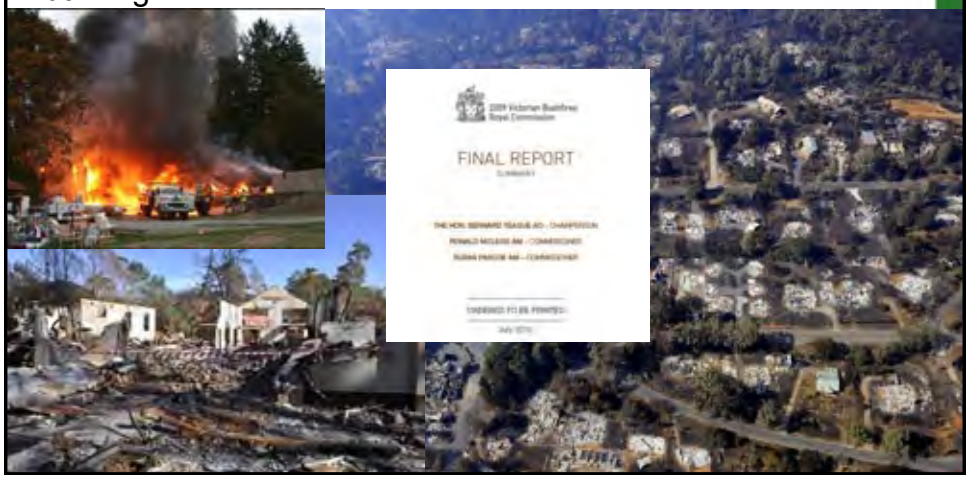


Background

- Bushfire CRC conducts research on many aspects of fires
- Identified a need to integrate scientific research with community, policy, and economic info.
- Use integrated information to support decision making
- Selected two case studies

Australian case study: Mt Lofty Ranges, Adelaide

Reducing fire damage to life and property using prescribed burning



NZ Case Study: Naseby and Upper Clutha

Reducing fire ignitions and spread through land management and behaviour change

Aims

(a) To assess combinations of management and policy options to find those that are positive overall, and those that are unlikely to be

(b) To understand the most important factors that determine the benefits and costs of different management options

(c) To enhance mutual understanding of the issues amongst participants

No preconceptions

Philosophy about information

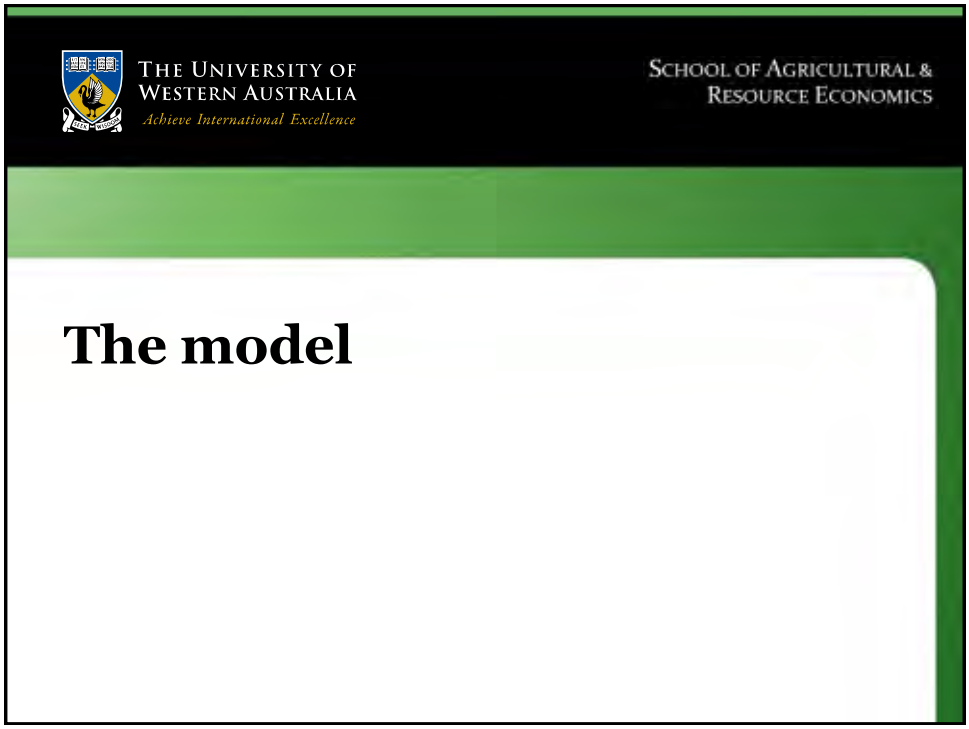
- Data scarce situation
- Use best information available
- Sources: scientific data, official data, people's preferences, local knowledge, expert judgements
- Integrate in a decision model and use to compare benefits and costs
- Process helps identify knowledge gaps
- Use better information if and when available

Workshops

- Participants: farmers, NRFA, DOC, councils, scientists
- November 2011 in Alexandra
  - Defining the problem for Naseby case study
  - Subsequent data collection
- May 2012 in Alexandra
  - Presenting initial results
  - Receiving feedback on model structure
  - Refining input values
  - Defining problem for Upper Clutha case study

Current stage

- Goal of this talk is to summarise existing work
- Development of comprehensive decision support model
- Assess the cost-effectiveness of different management strategies to reduce fire risk to Naseby town and forest
- Identify important drivers of relative cost-effectiveness of different options from model output



Model description

- Model represents a range of potential management regimes
- Evaluates whether they are better or worse than the status quo
- Model computes a Benefit: Cost Ratio (BCR)
- If BCR > 1, then the additional benefits of the new regime are greater than the additional costs ⇨ new regime is better than the status quo

The objective

- Maximise net benefits (benefits minus costs) of fire management
- Constructed in Microsoft Excel spreadsheet
- Accounts for different aspects:
  - Probabilities of escapes and spread, in different weather conditions
  - Risks to the assets (buildings, life, forest)
  - Costs of the management regime

Some terms used

- Escapes: the number of ignited fires that requires a fire crew for their control. These fires are reported fire incidents.
- Spread: movement of an escaped fire beyond the zone it started in, towards the assets of concern.
- Severity: the level of damage to the assets incurred by an escaped fire.

Assets and management zones

Zone 1 Town	Zone 3 Close agric. land / Zone 4 More distant agric. land
Zone 2 Forest	Zone 5 Close public land / Zone 6 More distant public land

Zone	Definition	Value
1	Value of buildings	$41,000,000
	Lives of 100 permanent residents	$200,000,000
2	The commercial forest adjoining Naseby	$10,000,000

Spread

Prob. of spread depends on zone, weather conditions and management

Zone 1 Town	Zone 3n/ 3s Close agric land / Zone 4n/ 4s More distant agric land
Zone 2 Forest	Zone 5n/ 5s Close public land / Zone 6n/ 6s More distant public land

Damage depends on fire severity, which depends on weather

Frequency depends on zone, weather conditions and management

Different levels of fire severity

Table 1 Fire severity description and model values.

Severity	Damage	Percentage	
		Zone 1	Zone2
Low	20% of a single property and 10 ha forest	.01	.48
Medium	One single property and 50 ha of forest	.06	2
High	Five single properties and 350 ha forest	.28	17
Very high	30 properties, two lives and 1050 ha forest	3	50
Extreme	280 properties, 30 lives and 1800 ha forest	41	86

Baseline costs per year

Losses in Zone 1

Fire Severity	Number of fires/year	Cost/year
Low	1.39	$38,322
Medium	0.19	$26,242
High	0.04	$30,424
Very high	0.02	$170,990
Extreme	0.01	$887,723
Total	1.66	$1,153,700

Losses in Zone 2

Fire Severity	Number of fires/year	Cost/year
Low	0.14	$6,929
Medium	0.06	$16,203
High	0.02	$25,956
Very high	0.01	$53,305
Extreme	0.00	$33,287
Total	0.24	$135,679

Zone 1 result: community education

- Community education
- Benefit = $448,075
- Cost = $20,000
- Benefit: Cost Ratio = 22.4

Zone 1 result: regulation

- Regulate fires lit by town residents, especially for burning rubbish
- Benefit = $806,535
- Cost = $200,558
- Benefit: Cost Ratio = 4.02

Zone 2 results: fire breaks

- Fire break around N edge of forest
- 6 metre fire breaks
  - Benefit = $28,045
  - Cost = $8,697
  - Benefit: Cost Ratio = 3.22
- 10 metre
  - Benefit = $42,656
  - Cost = $10,595
  - Benefit: Cost Ratio = 4.03

Zone 3 and 4 results: payments

- Pay farmers in Z3 and Z4 not to burn, to compensate them for lost profits
- $200/ha for land usually burnt
- 80% adoption level
- 90% efficacy in reducing escapes
- Benefit = $6,533
- Cost = $4,219,648
- Benefit: Cost Ratio = 0.0015

Zone 3 and 4 results: regulation

- Regulate farmers to restrict burning
- Compliance costs are $200/ha for unburnt ha usually burnt
- Penalise farmers for non-compliance
- Benefit = $6,533
- Cost = $4,219,648
- Benefit: Cost Ratio = 0.0015

Why is the BCR so low?

- Costs of practices are high (~$4m)
- 20 fires over 14 years for zones 3 & 4 (1.5/yr)
- Risk reduces with distance from Naseby
- Only control prop. of fires coming from agricultural burning
- How many fires start in zone 3 and reach Naseby each year? 0.0072 (1 in 138 years)
- How many fires start in zone 6 and reach Naseby each year? 0.0015 (1 in 667 years)

Zone 3 and 4 results: on-ground support

- Provision of burn planning and logistical support to landowners
- Cost of $100/ha
- Benefit = $5,444
- Cost = $398,080 (around 20k ha burnt in Z4)
- Benefit: Cost Ratio = 0.014

Zone 3 and 4 results: training program

- Inform landowners of best practice burning
- Zone 3
  - Benefit = $964, Cost = $1,300
  - Benefit: Cost Ratio = 0.74
- Zone 4
  - Benefit = $4,843, Cost = $4,550
  - Benefit: Cost Ratio = 1.06
- Zone 3 and 4
  - Benefit = $5,807, Cost = $5,850
  - Benefit: Cost Ratio = 0.99

Conclusions

- Model used to assess cost-effectiveness of fire management strategies
- Cost-effective to focus management on Zone 1 and Zone 2
- Community education is most beneficial strategy
- Subsidies or regulation in agricultural areas has low return
- Cost-effective to improve best practice (training)
- Information gaps exist, use best knowledge

Information gaps

- Risks of fires reaching Naseby from different distances away, in different weather conditions, under different management regimes
- Cost to farmers from reducing fire
- Admin .costs of a program
- Environmental impacts from burning
- Causes of fires
- Damage from fires
- Frequency of severe fires

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Questions/comments welcome

Abstract

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Fire in the landscape

Neil Cooper (ACT Parks & Conservation)

Presentation title: Fire in the landscape - Bushfire CRC research.

This programme of research is looking at two of the key issues facing fire and land managers now and into the future – water and carbon.

In Australia the issue of water has always been of major importance. Any activity such as fire that is seen as affecting either the quality or quantity of that water becomes a national issue high on the political agenda.

Likewise the elevation of the carbon debate has focussed attention on all activities that cause a production of carbon and the use of planned fire has not escaped that scrutiny.

This research has four areas that are being investigated; two for water (quality and quantity) and two for carbon (above ground and below ground).

It aims to provide tools by which the land and fire manager can try and predict what the affects of their actions will be and make conscious decisions knowing those affects.

Want to know more?

CONTACT: neil.cooper@act.gov.au

Lead end User

- Link between research and end users
- Transfer of values both ways – helped me and helped researchers
- Linked into research teams
- Connections into agencies across Australia
- Meetings – transfer of applied and transferable research
- Fast integration of high end science

Overview

Two critical areas in the environment – Carbon and Water

Four research areas in this program:

- 1. Carbon in the air - Atmospheric carbon emissions
- 2. Carbon on the ground - Soil carbon formation
- 3. Water quality
- 4. Water quantity

1. Carbon in the air

"Greenhouse gas emissions from fire and their environmental effects"

University of Sydney
Tina Bell
Malcolm Possell

Research Questions

- What are the impacts of planned and unplanned fire on the forest carbon pool (where does the carbon go)? GHG emissions and the carbon balance of forests
- How do GHG emissions affect growth of native forests and surrounding agriculture?

End User goal

- Carbon Accounting - Tools to predict the carbon cost of placing fire into the landscape.
- Guidelines on how to minimise ecological and economic impacts from prescribed fires.

Research update

Recent work:

- Identification of GHG emissions from three widespread *Eucalyptus* species and a number of grasses under defined combustion conditions and fuel moisture content

Next important steps:

- Identification of GHG emissions from different forest fuel types (bark, litter, green leaves) under defined combustion conditions
- Development of an emissions model incorporating fuel moisture content
- Prepare peer reviewed papers and advice for end users

2. Carbon on the ground

"The impact of fuel reduction burning on forest carbon storage"

Chris Weston & Luba Volkova, University of Melbourne

Research Questions?

- What are the impacts of prescribed fire on the forest carbon balance (soil, litter and vegetation)? How does this change over time since fire?
- How are rates of carbon turnover affected by prescribed fire?
- How can we predict the likely net CO_2 release from a planned fire?
- How does organic matter in the surface and upper soil layers change after prescribed burning? (PhD supplementary project)

End user goals

- Tools to predict the likely net CO_2 release from a planned fire and hence establish the “cost “ of planned fire

Research update

Recent work:

- Field work before and after prescribed burning in mixed-species forests in Victoria, Tasmania, Queensland and NSW
- Measurement of carbon emissions after burning
- Modeling of carbon losses from these forests – update National Carbon Accounting system as inaccurate

.

Next important steps:

- Looking at correlation between fire intensity and carbon losses.
- Prepare peer reviewed papers and advice for end users

3. Water Quality

"Quantifying water quality risks following wildfire"

Gary Sheridan, Petter Nyman & Patrick Lane, University of Melbourne

Research Questions?

- What is the likelihood of extreme erosion events and debris flows following planned and unplanned fires?
- What is the relationship between burn severity and the probability of water quality impacts?
- Through planned fire, can we reduce the risk of adverse water quality outcomes associated with wildfire?
- Can we develop tools to predict the likelihood of extreme erosion before implementing a planned fire?

End User Goals

- Tools to predict the likelihood of extreme erosion from a planned fire?
- Tools for BAAT teams to utilise post wildfire
- Tools to identify high susceptible sites in the landscape which then can be placed in pre-suppression plans and treated as a location to protect

Research update

Recent work:

- Developed methods for measuring debris flows (occurrence, magnitude).
- Historical documentation of frequency and magnitude of extreme erosion events and predict water quality impact.

Next important steps:

- Utilise aerial photographs and ground-truthing to predict likelihood of erosion events occurring.
- Improve relationships of water quality with burn severity and hill slope hydrology
- Ongoing measurement of erosion and runoff from small burnt areas.
- Prepare peer reviewed papers and advice for end users

Research update

- Utilise aerial photographs and ground-truthing to predict likelihood of erosion events occurring.
- Ongoing measurement of erosion and runoff from small planned burn areas
- Installation (in <0.5ha catchment) in April and 2 weeks later after a thunder storm.

4. Water Quantity

"Fires and hydrology of mixed-species forests in Victoria"

Tarryn Turnbull, University of Sydney

Background

- Water yield from forested catchments is tightly coupled to vegetation water-use
  - e.g. 5% change in vegetation water-use may result in 20% reduction in streamflow

Research Questions?

- What is the water use in re-sprouting mixed-species forests following planned and unplanned fire?
- Can we predict future tree water-use in regenerating mixed-species forests?
- Can we refine the existing models to predict water use in regenerating mixed species forests for a range of species, soils and topographical microclimates?

End User goals

- Models to predict water use across various mixed species forests following both planned and unplanned fire.

Research update

Recent work:

- Four sites instrumented to continuously log tree water use
- Measurements of leaves to assess variation in water-use within the changing canopy and leaf type
- Field work to look at features affecting tree water-use

Next important steps:

- Controlled experiments to look at water use with various leaf characteristics – refine the model
- Write up and present results
- Prepare peer reviewed papers and advice for end users

SUMMARY
Bringing it all together

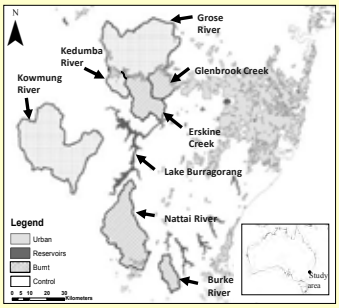
- Common sites, students, data, stakeholders and outcomes
  - eg, greenhouse gas emissions from fuels from mixed-species forest in NE Victoria
- Field analytical work well underway
- Stakeholders engaged in ACT, NSW, Victoria, Tasmania and Queensland
- Postgraduate students progressing well

PHD STUDENT PROJECTS

WILDFIRE IMPACTS ON HYDROLOGY WITHIN SYDNEY'S DRINKING WATER SUPPLY CATCHMENTS

Student: Jessica Heath

End User: NSW Parks and Wildlife Service



PHD STUDENT PROJECTS

EFFECT OF SMOKE FROM BUSHFIRES ON PLANT PHYSIOLOGY

- Student: Vicky Aerts
- End User: Forests NSW

PHD STUDENT PROJECTS

IS ALIEN PLANT INVASION A THREAT TO BURNING OF AUSTRALIAN FORESTS?

Student: Felipe Aires

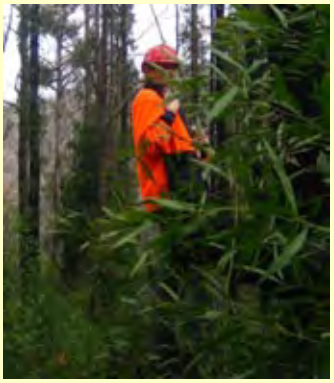
End User: ACT Parks and Conservation Service

PHD STUDENT PROJECTS

DO WOODY LEGUMES USE FLAMMABILITY TO PROMOTE THEIR PERSISTENCE?

Student: Valerie Densmore

End User: Forests NSW



PHD STUDENT PROJECTS

RECOVERY OF SOIL CARBON AND NITROGEN IN *EUCALYPTUS DELEGATENSIS* FOREST FOLLOWING WILDFIRE

Student: Hari Ram Shrestha

End User: ACT Parks and Conservation Service

PHD STUDENT PROJECTS

QUANTIFYING WATER QUALITY RISKS FOLLOWING WILDFIRE

Student: Rene Van Der Sant

Abstract

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Effective communication

Dr Susan Chaplin (RMIT & BFCRC)

Presentation title: Effective Bushfire Communication for Communities on the urban fringe: amenity-led migration, rapid changes and preparedness.

The communication of risk and preparedness information to residents in bushfire prone urban-rural interface areas in south eastern Australia presents many challenges to emergency managers.

Amenity-led in-migration is bringing rapid structural and demographic changes that are creating diverse and sometimes divided communities.

Such diversity is characterised by dramatic differences in annual income, age, mobility, environmental knowledge and levels of infrastructure.

The factors that influence peoples' understanding of bushfire risk and their capacity or willingness to engage in awareness and preparedness activities will be explored through two community case studies.

Our findings highlight an urgent need to develop different communication approaches and strategies to improve levels of preparedness.

Such a changed approach also needs to take account of the different ways such diverse people respond to risk based on how they interpret environmental and geographic conditions as well as their risk tolerance, and how they balance this against the benefits of living in that place.

Want to know more?
CONTACT: susan.chaplin@rmit.edu.au

Effective Communication: Communities and Bushfire project

PROPOSITION

Effective communication is dependent upon the degree of social cohesion that characterises the community

OUTCOME

To provide an understanding of the social, political and historical bases of community awareness and resilience in bushfire contexts

FOCUS

On the intersection between community, institutions and organisations in relation to the forms, modes and processes of communication

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Project stages

1st stage - ethnographic research examining the dimensions of community awareness and preparedness for bushfires in 4 states

- completed

2nd stage – development of two work packages:

- education as capacity building
- building and strengthening effective social networks for communication
- initial work commenced

First stage – community case studies

States chosen

- Victoria
- NSW
- Tasmania
- Western Australia

Types of localities

- Traditional farming/rural community
- Tree-change/sea-change/tourism community
- Rural-urban interface community

Additional characteristics

- High risk area
- Local fire brigade
- Bushfire education
- Population size must be comparable across the states
- Have some recent bushfire experience

Understanding community

Three perspectives:

1. community as locality – a set of people living in a specific place

   "we're on this peninsula with just that little access there. We tend to stick together a bit" (Ku-ring-gai participant)

2. community as a shared sense of belonging – kind of imagined communal feeling

   "The sense of community is not the same as you get with perhaps when we were first here" (Kingborough participant)

3. community as a social network connections through shared interests

"I have quite strong connections to certain aspects of the community. By default, I get asked a bit about bushfire" (local government officer Kingborough)

Methodology

- Snowball method
- Contacted community groups, officers at the local council and referrals by interviewees of friends.
- Tended to largely excluded people who lacked awareness of bushfire risk
- 20 – 30 people for each community
- 10-12 people working at state level in fire agencies for each of the 4 states
- Included local fire brigade members and local government officials/s

Questions for community participants

- About them and their networks/group memberships
- Types of communication/preparedness information received and assessed
- Household preparations
- Sense of community
- Understanding of shared responsibility
- Suggestions for informing and educating the community about bushfire risk and preparedness

Rural-urban interface communities

1. Structural and demographic changes

- Amenity migration
- An ageing population
- Nature of urban development
- New transport infrastructure enables commuting

2. Diversity and complexity

- Differences in annual income, length and type of residency, environmental knowledge and bushfire experience
- Influences how residents **understand** bushfire risk and **their capacity** to engage in awareness and preparedness activities

Rural-urban interface community case studies

- Kingston and the Kingborough Municipality, southern edge of Hobart Metropolitan area
- Ku-ring-gai Municipality, North Shore, Sydney Metropolitan area

Geography and bushfire risk

Kingborough

High risk due to last major fire in 1967

Households in environmental zone

New housing estates being built near bushland

Vulnerability of Southern Outlet

Hilly terrain & single road access

Ku-ring-gai

3rd highest bushfire risk area in metro Sydney

Surround by 3 national parks

Large percentage of households within 300 metres of bushland

Limited road access out of many suburbs

Kingborough municipality, Tasmania

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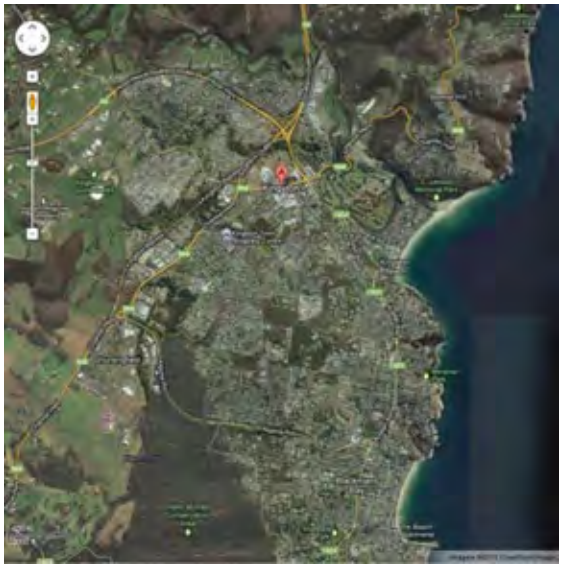
Kingston



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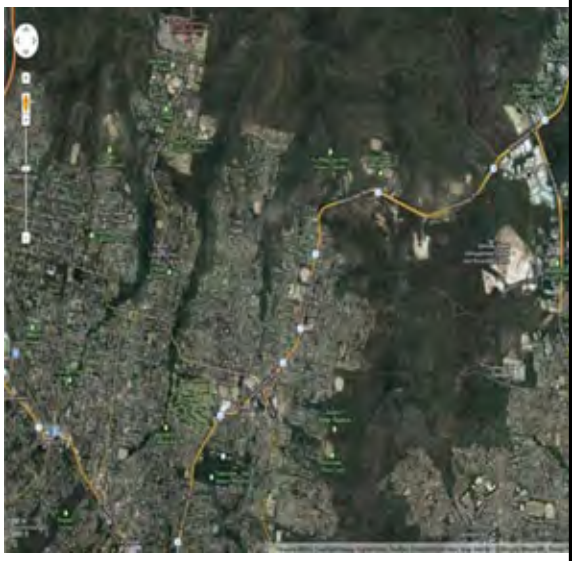
Ku-ring-gai municipality

North Turramurra & St Ives



South Turramurra and West Pymble

Findings from case studies

1. a 'one size fits all' approach **does not work** in raising levels of awareness and preparedness
2. homeowner perceptions of bushfire risk often **reflect a trade-off** between their lifestyle, environmental and economic values
3. the need to **provide new residents** with more comprehensive information about living in bushfire prone areas
4. more recognition of the role of **informal social networks** as an effective method of distributing preparedness information
5. placing greater emphasis on **one-to-one communication** and providing location specific information for residents to encourage the personalisation of risk

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Amenity migration

Kingborough

New housing estates

Living near beach (The Channel)

5 acre block with trees

Convenience of commute to Hobart

Time poor lifestyles

Ku-ring-gai

Wanting access to schools and colleges in the area

Very desirable address

Environmental values

Convenience of commute to Sydney CBD

Availability of medium density housing

Time poor lifestyles

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Kingborough area

Kingston & Kingston Beach

Tinderbox Peninsula & Kettering

Ku-ring-gai municipality, Sydney

Community divisions/tensions - Kingston

Tensions between new and long term residents

"when you go for a walk around the place, you can see there's no real interaction between the people because they're all out working ... At the weekends they're probably busy doing something or going off for recreation" (KIN 05/06)

Socio-economic divisions

- Affluent Channel area is one of the most advantaged areas in Tasmania
- Lower socio-economic suburbs – Maranoa Heights located on hillside
  - Poor access to public transport
  - Significant percentage of residents 65+ years
  - Higher level of chronic disease and illness

"there are a lot of people who are living in the Maranoa Heights community who are really poor. There are lots of problems with vandalism, drug usage" (KIN 14)

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Community divisions/tensions – Ku-ring-gai

Tensions between new and long term residents over environmental values

"[some people] see the trees as a threat and others who see them as habitat for wildlife and part of the amenity of the area ... Then there's other people who are just wanting to realise the commercial value of their properties and don't care about the bush at all" (KUR 06).

Urban development policies

Medium density housing (up to five storey blocks of apartments)

- 'Save our suburb'/environmental groups argue this population growth is adding to the bushfire

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Ageing of population

Kingborough

Dependence on govt allowances

High levels of chronic disease & illness

Retirees often only have family on mainland or overseas

Isolated women

Expressed dependence on agencies for bushfire information

Ku-ring-gai

36.5% of residents are over 50 years of age, and 12.8% over 70 years of age

Large number of retirement villages and nursing homes

Implications for Community Fire Unit membership

Formal and informal social networks

Kingborough

Community Fireguard Groups

Coastcare & Bushcare groups

School based parents groups

Mothers groups

Many women involved in organising 'phone trees'

Informal conversations over the fence/in the street

Ku-ring-gai

Community Fire Units

Environmental groups/Save our suburbs

School based parents groups

Bushcare groups

Mothers groups

Informal conversations over the fence/in the street

- '*I think with any behavioural shift, one strategy is just not going to do it, it's just got to come from every angle and the messages have got to be consistent and complementary.*'

- *"The people that you want to educate are the mothers. Don't worry about anyone else, just educate the mothers. If you can educate these women [about bushfire preparedness], then things will happen in families. You can educate kids as much as you like but they're got no legitimate power when they go home'* (Huon Valley participant)

Abstract

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Community resilience

Lisa Langer (Scion)

Presentation title: Scion social fire research past, present and future: Community resilience.

Since 2003 Scion's social fire research in New Zealand has focused on:

- Lessons from communities recovering from rural fires;
- Perceptions of fire danger warning communication to indicate short-term behaviours and reduce ignitions; and also
- Mitigating the risk of human-caused rural fires through malicious intent or carelessness, and accidents by recreationists and landowners.

Lisa will present Scion's new research direction that will focus on enhancing community resilience in New Zealand.

The research aims to improve community preparedness by developing a suite of appropriate and tailored strategies for more effective communication and better community planning before an event.

Part of the new research will be in collaboration with RMIT in the Effective Communication: Communities and Bushfire project (with funding drawn from MSI and the Australasian Bushfire CRC).

By meeting the diverse needs of communities in Australia and New Zealand the strategies are intended to enable more effective management of wildfire risk.

Want to know more?

CONTACT: lisa.langer@scionresearch.com

Scion social fire research past, present and future: Community resilience

E.R. (Lisa) Langer

Content

- Social fire research since June 2003
  - Case study research
  - Fire insurance
  - Mitigation of human caused fires
  - Fire danger communication
- New research theme: Enhanced community resilience.

Case study social research

- West Melton, rural-urban interface, Canterbury
  - Laura Kelly, Bushfire CRC scholarship
- Mt. Somers, remote rural community, Canterbury
  - Joint research with Pam Jakes, USDA Forest Service
- Wither Hills, rural farming community, Marlborough
  - fire insurance
  - Raewyn Graham.

West Melton fire: rural-urban interface

- Highlighted new lifestylers and old lifestylers differences in community
- New lifestylers
  - urban experience
  - depend on authorities
  - relatively unprepared.

- Fire did little to build bridges between different community groups.

Mt. Somers: self-reliant community

- Strong sense of community – networks and relationships
- Local knowledge
- Moved stock and provided pasture
- Fed firefighters
- Housed evacuated
- Helped neighbours fight fire
- Reinforced belief self-reliant and capable of meeting challenges.

SCION

Communication with farmers: Wither Hills fire

- **Regular meetings with landowners to ensure 2-way dialogue**
- **De-brief meetings which include members of involved or affected community**
- **Make good use of local knowledge (e.g. role of liaison person)**
- **Encourage farmers to establish and maintain phone tree system**
- **Consider basic firefighting training/education of farmers**
- **Include community recovery in fire plans.**


Case studies: lessons learned
• Share knowledge - communicate with community before and during the event
• Involve property owners before and during event
• Utilise existing community networks
• Tackle rural fire risk management challenge collaboratively
• Involve community in planning
⇨ Can result in increased community resilience and improved recovery.


Rural fire insurance recommendations: Wither Hills fire
• Include insurance in fire plan and review annually
• Increase knowledge of insurance policy e.g. company, contact/broker, coverage and adequacy
• Deal with a reputable insurance broker
• Obtain quotations for wide coverage and make decisions not to insure based on facts
• Prepare introduction packs for new lifestylers
• Make public aware of liabilities of suppression/damage.

Mitigating risk of human caused wildfires

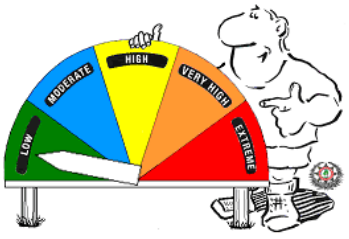
- Wildfires lit through malicious intent or carelessness
- Accidental rural fires by recreationists and landowners
  - Literature
  - Focus groups
  - Canterbury and national focus.

Acknowledgement: Mary Hart

Why are we concerned about fire danger communication?

- > 99% wildland fires caused by human activity
  - *essential to communicate fire danger to public effectively*
  - *correct interpretation required by public to ensure they adopt appropriate behaviour*
  - *reduce risk of starting wildland fires.*

- Northland
- Canterbury.



Acknowledgement: Sophie Hide & David Tappin.

Fire signs: fire and land managers

- Fire danger signs widely recognised
- Reservations about effectiveness of current fire danger warnings
- Uncertain about specific public behaviour(s) expected at different ratings
- Signs only convey presence of risk and need for caution, rather than guidance on behaviour
- Regional differences confusing.

General public: fire danger sign

- Awareness, but lack of behaviour change guidance
  - 66% acknowledged that sign identified fire danger or risk level but only 35% reported that this also alerted them to need to change their behaviour.
- Poor perception of sign currency and relevance.
  - Survey 118 people
  - Northland and Canterbury
  - Mix of rural residents, NZ and overseas visitors.

Fire danger communication: recommendations

- Publicise range of risk factors
- Provide guidance on expected behaviour and link to fire risk
- Clarify and simplify information
- Improve sign technology, accuracy/maintenance and placement locations
- Integrate 'fire danger warning sign' and 'fire season' systems
- Develop media campaign to target specific groups and provide guidance on behaviour change.

New research theme : Enhanced Community Resilience

- Aim: improve community preparedness by developing strategies that enable more effective communication and community planning before an event.
  - Develop strategies: inform and educate to improve community readiness
  - Provide framework to enable development of community preparedness plans.

SCION

Effective Communication project : NZ

- Improvement of community preparedness through more effective communication
- Focus on communication of risk and threat, how warnings and information are best communicated, and best use of media and community education.

- 3 NZ case studies
  - Atawhai, Nelson: RUI
  - Closeburn, Queenstown: tourist community
  - Mahia Peninsula, East Coast: rural community.

Community resilience

- Extend research to determine what actions lead to greater community resilience
  - Advance current understanding of community preparedness
  - Stepwise strategy - to encourage managers to roll out recommendations to vulnerable communities to increase community resilience to wildfire and potentially other natural hazards.

Acknowledgments

- End-users
- Rural Fire Research Advisory Committee
- Researchers - Dr Pam Jakes, Mary Hart, Raewyn Graham, Sophie Hide, David Tappin & Laura Kelly
- Reviewers – including Tony Teeling & Sioux Campbell, DOC.

Abstract

Click here to return back to the contents page

European social fire research

Maria da Conceição Almeida Colaço

Presentation title: Wildfire social vulnerability: a contribution to the European project MATRIX – New Multi-Hazard and Multi-Risk Assessment Methods for Europe.

Matrix is a multi-risk assessment project that covers a variety of natural extreme events, including earthquakes, landslides, volcanic eruptions, tsunamis, river floods, winter storms, wildfires and coastal phenomena that threaten different regions of Europe.

These extreme events lead to communities suffering losses not only from individual hazards, but also from multiple events that occur in combination.

The main goal of the Matrix project is to develop methods and tools to tackle multi-type natural hazards within a common framework, focusing on methodologies that are suited to Europe.

Within the framework of risk assessment, the vulnerability component is analysed in terms of economic and social dimensions.

In Portugal, where the main hazard is wildfires, four case studies in the wildland-urban interface are being developed for communities that were most affected by major wildfires in 2003.

Maria Colaco's presentation will give a general view of the results from the 4 case studies.

Want to know more?
CONTACT: ccolaco@isa.utl.pt

MATRIX
New Multi-Hazard and Multi-Risk Assessment Methods for Europe

Wildfire social vulnerability: a contribution to the European Project MATRIX

Maria Colaço; Marta Rocha; Liliana Bento; Francisco Rego

Centre for Applied Ecology Baeta Neves, Institute of Agronomy, Lisbon, Portugal

Rural fire research workshop, Scion, Rotorua, 14-15 June 2012

www.fireparadox.org

March 2006 – February 2010

An innovative and integrated approach to wildland fire management.

Philosophy

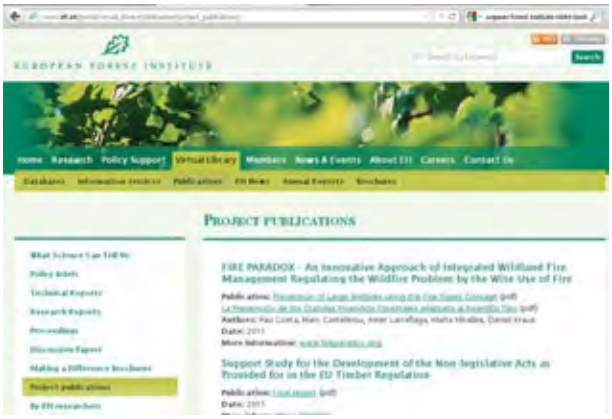
- Learning to live with fire
- The fire paradox
  - a highly destructive disturbance
  - a powerful management tool

- Educational and training tools for forest fire technicians.
- Traditional use of fire for land management throughout Europe.

Rural fire research workshop, Scion, Rotorua, 14-15 June 2012

http://www.eufirelab.org/

EUFIRELAB, a wall-less Laboratory for Wildland Fire Sciences and Technologies in the Euro-Mediterranean Region



http://www.efi.int/portal/

http://www.firesmart-project.eu/

FIRESMART: Forest and land management options to prevent forest fires

2011 - 2012

- Awareness rising and training for fire prevention
- Socioeconomic aspects of forest fire prevention

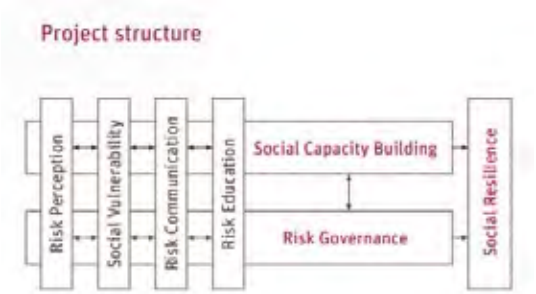
http://www.move-fp7.eu/

Methods for the Improvement of Vulnerability Assessment in Europe

October 2008 – October 2011

http://caphaz-net.org/ June 2009 to May 2012

How can we enhance the capacities of European societies to prepare for, cope with and recover from the negative impacts of a ›natural‹ hazard?



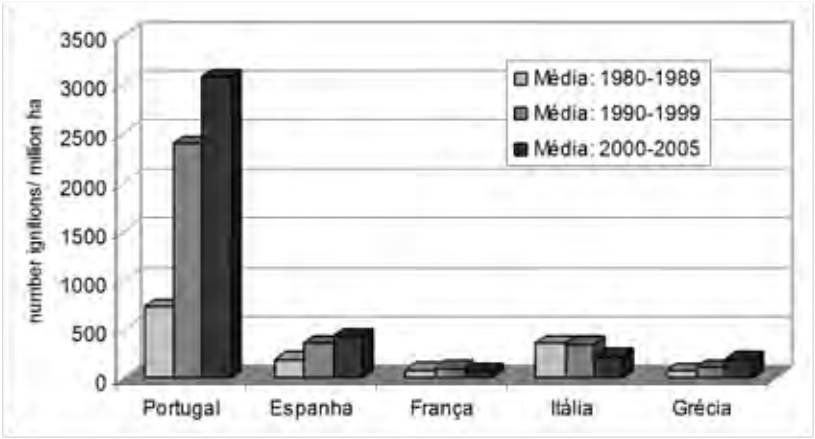
MATRIX
New
Multi-HAzard and MulTi-RIsK
Assessment MethodS
For Europe

Start: 1.10.2010 End: 31.9.2013

OBJECTIVE: Develop and apply a common theoretical framework for tackling multiple natural hazards and risks!

WP 4 - Social and economic impact of disasters

Task.4.3 Social Vulnerability to Wildfires in Portugal



(baseado em DGRF 2006 - Fonte: Comissão Europeia)

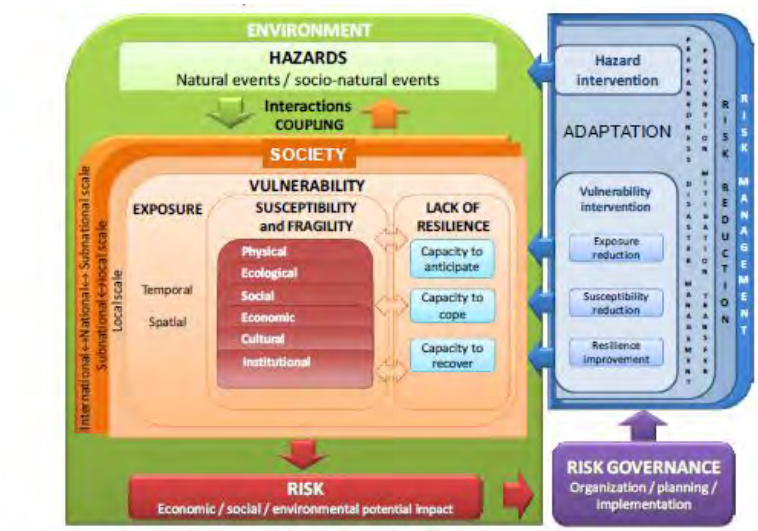


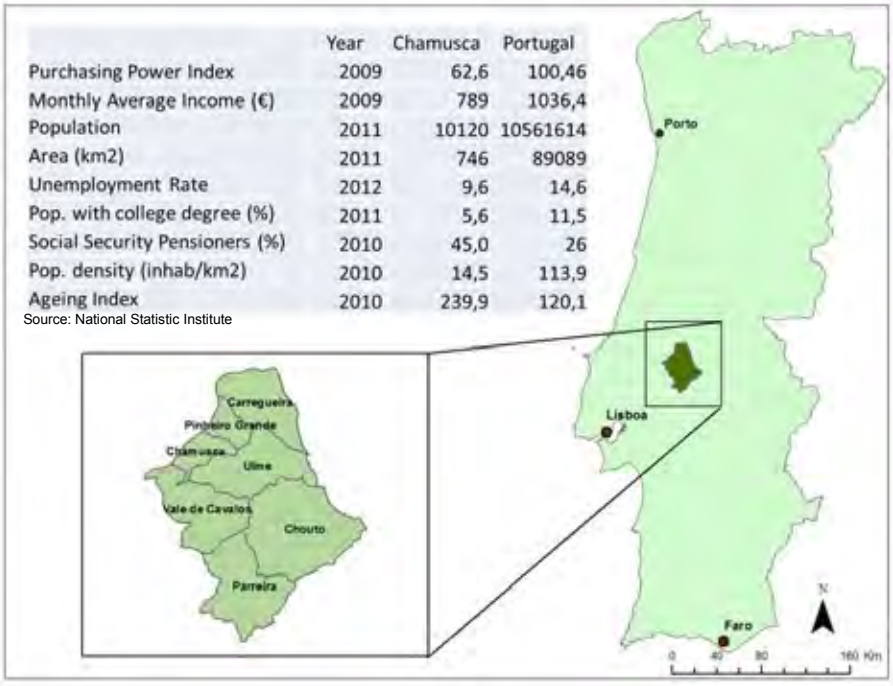
Figure 4.3 The MOVE Generic Framework (Source: MOVE Consortium).

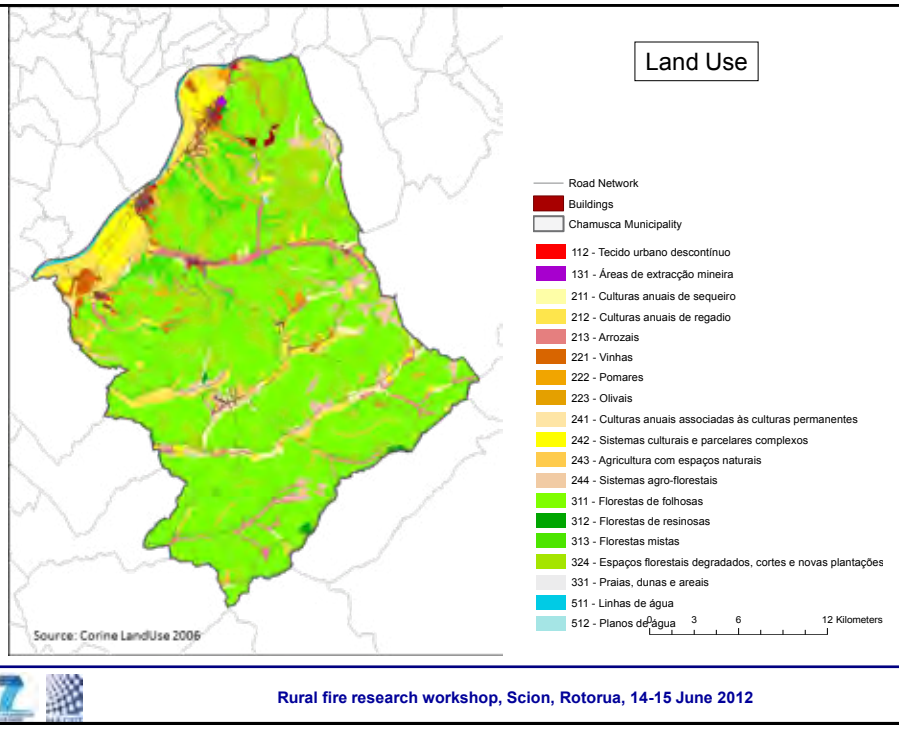
Methodology:

- Social economic data analysis from the National Statistical Institute;
- Interviewed different stakeholders from each municipality;
- Focus groups with members of the community
- Analysis of the forestry context.

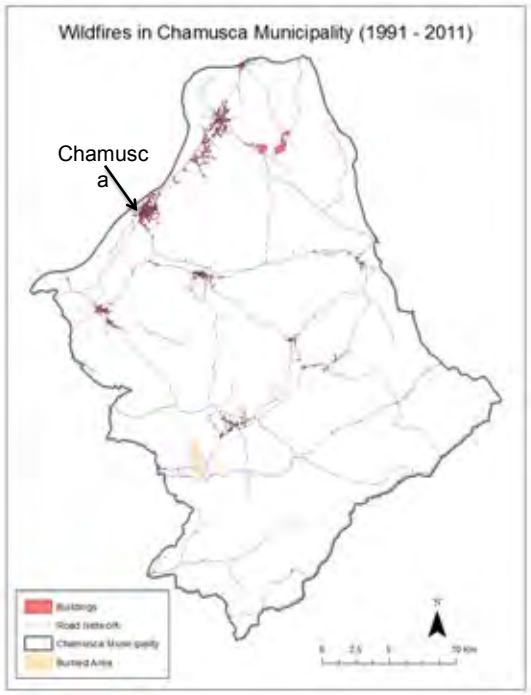
	Year	Chamusca	Portugal
Purchasing Power Index	2009	62,6	100,46
Monthly Average Income (€)	2009	789	1036,4
Population	2011	10120	10561614
Area (km2)	2011	746	89089
Unemployment Rate	2012	9,6	14,6
Pop. with college degree (%)	2011	5,6	11,5
Social Security Pensioners (%)	2010	45,0	26
Pop. density (inhab/km2)	2010	14,5	113,9
Ageing Index	2010	239,9	120,1

Source: National Statistic Institute



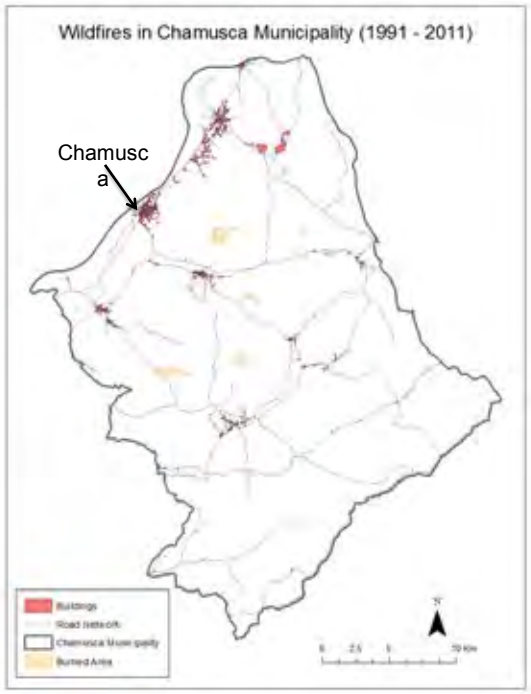


1991



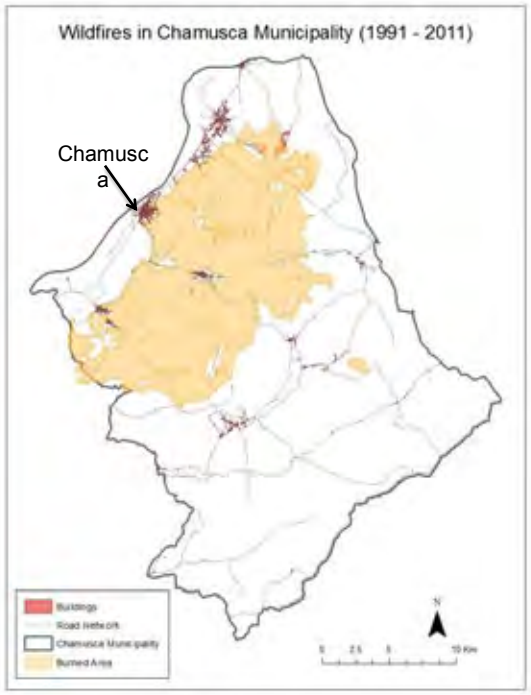
Source: Forest Services

2001



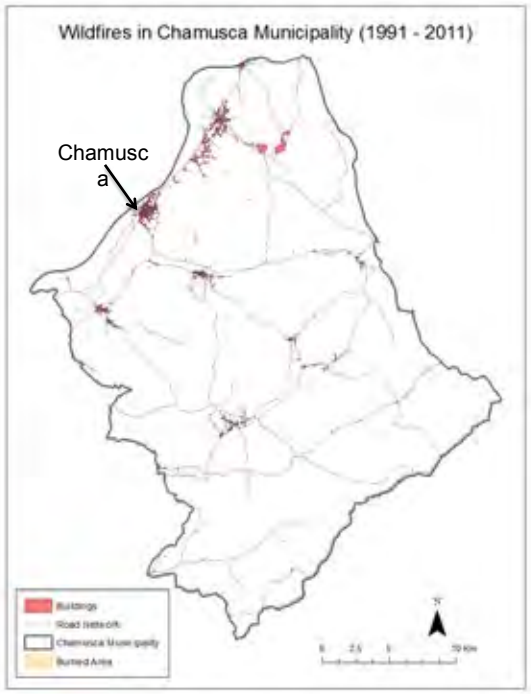
Source: Forest Services

2003



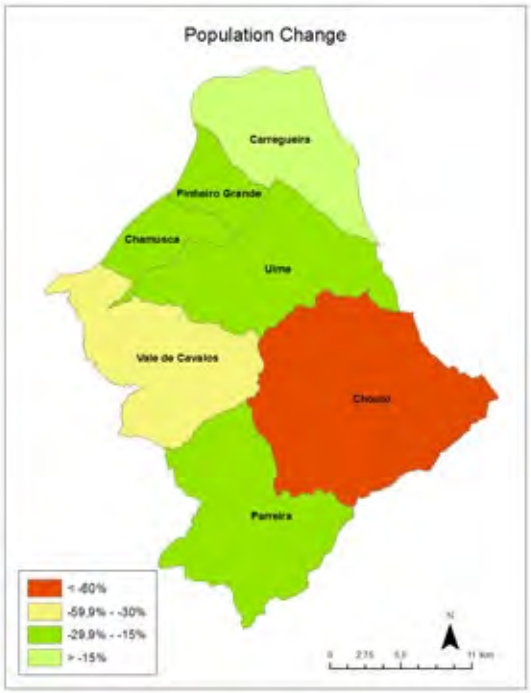
Source: Forest Services

2011

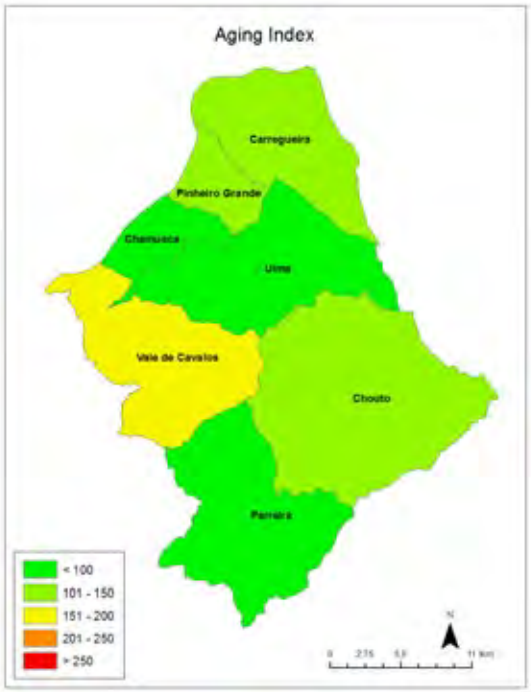


Source: Forest Services

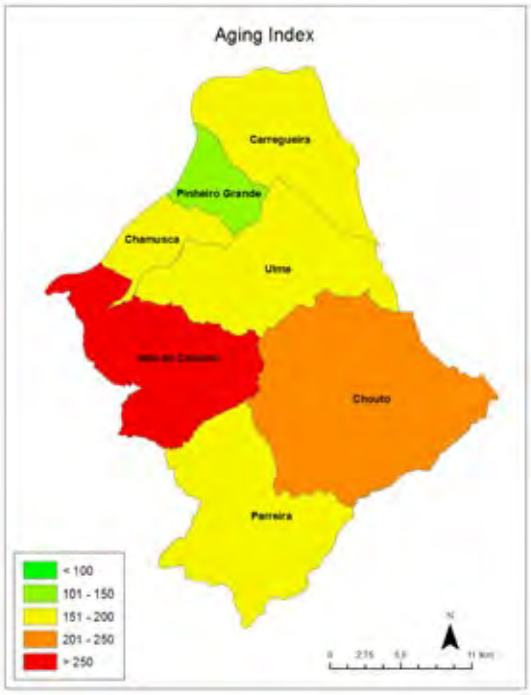
1991-2011



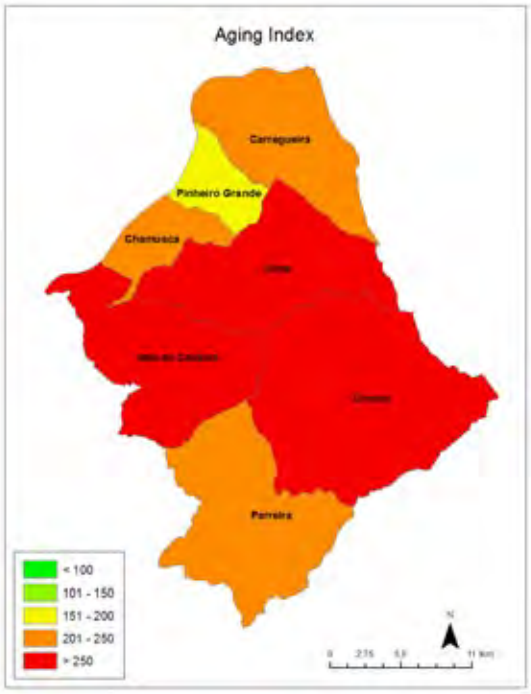
1991



2001


Aging Index
Carregueira
Pinheiro Grande
Chamusca
Ulme
Chouto
Parreira
< 100
101 - 150
151 - 200
201 - 250
> 250

2011


Aging Index
Carregueira
Pinheiro Grande
Chamusca
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101 - 150
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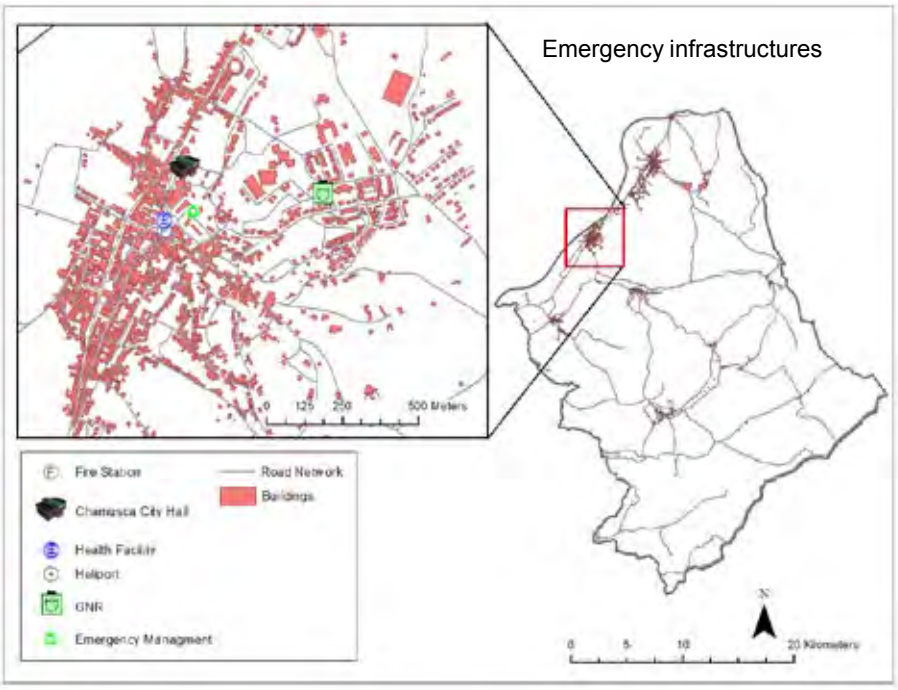


Preliminary results from the interviews:

- Importance of leadership

- Before 2003 there was no community preparedness. But some preparation from the formal institutions (Municipality, civil defence office, fire-fighters)

- During the fire, help came from everywhere (women cooking; Motorbike riders helped in the communication; younger people helped their neighbours)

- After the fire (huge wave of national and local solidarity)

What changed after 9 years?

- Communities are more prepared as they clean around their houses and properties.
- Civil defence more prepared (updated plans, trust between all civil groups)

Thank you, "Muito obrigada"

Congratulations to SCION 20 years of fire research

ccolaco@isa.utl.pt

Abstract

Click here to return back to the contents page

Community engagement

Julie Warren (Julie Warren & Associates)

Presentation title: Encouraging fire safety ownership. Effective methods for working with at-risk rural communities: Feedback of research results.

This research, designed to improve fire safety outcomes for rural communities, was based on three Southland case studies: Otautau, Otatara, and the rural area adjacent to the Awarua Wetlands.

The research tested new ways for the National Rural Fire Authority and the New Zealand Fire Service to engage with communities to raise their awareness of fire risk and encourage them to take responsibility for reducing risk.

Results showed the importance of face-to-face contact between fire safety agencies and communities over distribution of any written or visual information. Results also showed the importance of community acknowledgement of fire risk for any behaviour change to occur.

One product of the research is a toolbox for building community resilience, through engaging with rural communities about fire safety.

Want to know more?
CONTACT: julie.warren@clear.net.nz

Improving engagement with rural communities

Overview of Southland-based research results

The research team

- Julie Warren
- Carla Wilson
- Key agencies
- Three case study communities

Objectives

- Raise at-risk rural communities' awareness of their fire risk
- Identify barriers to and opportunities for working with at-risk rural communities
- Develop more effective ways to establish partnerships with communities
- Develop ways to build and facilitate community self-reliance

Final products

- An evaluation of a range of community engagement processes
- Guidelines for effective community engagement in rural areas
- A rural household fire safety assessment tool
- A profile of rural household fire safety

Overview of research

- Case study communities
- Approach used – action research
- Tools and their evaluation
- General lessons
- Using the research findings
- Thoughts for future work

Three Case studies

- Awarua Wetlands and adjacent rural area
- Otautau township
- Otatara

Otautau

- Community change with transition to dairying
  - Growing population of new migrants
  - More absentee landowners
  - More working elsewhere
- Socio-economic disadvantage
- Incidence of structure fires, risks including:
  - Lower socio-economic profile
  - Older age profile
  - Older housing

Awarua wetlands and adjacent rural area

- High conservation, cultural, recreational values
- Mix of sheep farming and dairy
- Few social centres of focus

Fire risk from:

- Vegetation and peat composition
- Recreational use
- Use of fire as a land management tool

Otatara

- Urban/rural interface and high conservation values
- High socio-economic status, growing population
- Mixed residential: small lots, bush sections, life-style blocks and farming

Fire risk from:

- Lack of reticulated water supply in bush areas
- Lack of defensible spaces around houses
- Poor access for fire fighting equipment
- Use of fire in land management

Action research

Action research encourages stakeholder participation, collaboration and ownership, with the researcher facilitating, but not leading, the process

Action research phases

- Relationship building
- Case study selection
- Needs analysis
- Review existing engagement processes
- Identify and trial engagement tools
- Reflection and evaluation

Overview of tools trialled

- Farmers' discussion group
- Neighbourhood planning/mapping process
- Key stakeholders as agents of change – e.g. Rural Women New Zealand
- Household fire safety assessment tool
- Presentations at community events
- Fire safety focus groups with target groups
- Demonstrations at community/school events

Farmers' discussion group

- Brings farming leaders and agencies together in a facilitated process
- Participants get to know each other and their views – builds community
- Organisers can learn about and better respect local knowledge
- Participants develop new ways to function and interact with each other
- Can produce tangible useful outputs – e.g. Place-based best practice guidelines

Neighbourhood planning meeting

- Small group in a neighbour's lounge
- Facilitated discussion
- Generate community
- Identify actions

Rural Women as Agents of Change

- Research shows that women and children are effective messengers – e.g., for safety, conservation, health, etc.
- This research trialled whether Rural Women NZ would be effective messengers to take home some *Rules of thumb to address fire safety in rural areas.*

General lessons from case studies

- Rural communities are changing and people's lives are busier and more complex. They are often reluctant to engage in new events and activities.
- People admitted to a range of risk behaviours.

General lessons continued…

- People's behaviour (safe and unsafe) is influenced by others in their communities.
- Building self-reliance and building 'community' are closely linked, so creating opportunities to bring people together can lead to better fire outcomes.

General lessons continued…

- Fire safety may not be a motivating topic – so you need to take advantage of existing community networks and events.
- Engagement activities will require extra resources but they could be off-set by fewer unintended fire events.

General lessons continued…

•People need to acknowledge their risk before any behavioural change will occur.

•Respect for and use of local knowledge will lead to more community trust/confidence in agencies.

General lessons continued…

•Tools need to be applied in an ongoing process of community interaction – important not to lose momentum established by this research.

•Engagement activities need to align with existing community calendars not agency calendars.

Using research findings

Southern Rural Fire Authority

- Social research provides important evidence base for strategic planning to better achieve 4 Rs outcomes

  (Reduction, Readiness, Response, Recovery)
- Showed value of organisational restructuring to better focus on education and community relations

Using research findings continued...

New Zealand Fire Service, Southland

- Reinforced value of face-to-face community contact - therefore informs fire safety strategies *(e.g., with community and voluntary fire fighter groups).*
- Message content and communication means need to target values, circumstances, etc of different groups, regions, cultures.

Using research findings continued...

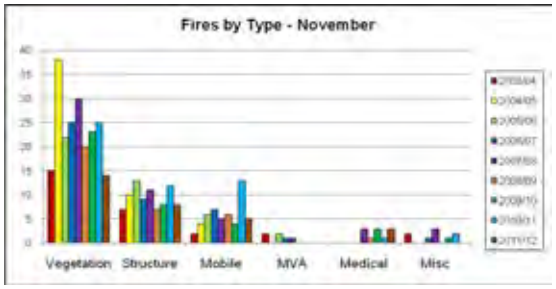
Other agencies *(Southern RFA, NZ Fire Service, Department of Conservation, Southland District Council, Environment Southland, Venture Southland)*

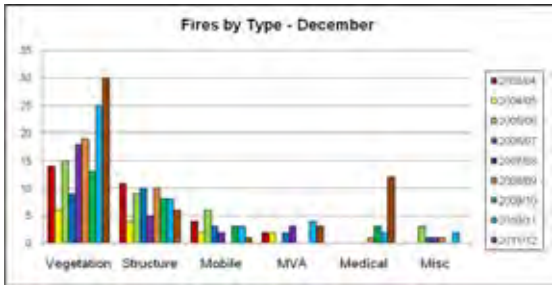
- Collectively funded a third case study to strengthen research findings because they recognised the value of the research to their community relations strategies and activities.

Future research

How to strengthen link between intentions of fire safety messages and the meaning people take from them - at-risk groups include new migrant farm workers, international students, visitors.

Recent fire statistics in Southland show need for continuing education and behavioural change


Fires by Type - November
Vegetation
Structure
Mobile
MVA
Medical
Misc


Fires by Type - December
Vegetation
Structure
Mobile
MVA
Medical
Misc

Abstract

Click here to return back to the contents page

Bushfire research institute

Richard Thornton (BFCRC)

Presentation title: The Bushfire CRC: Past Present and Future

The Bushfire Co-operative Research Centre (CRC), was established in 2003 for a period of seven years.

Following the Black Saturday fire in Victoria in 2009, it was granted an extension of funding for three years to examine some of the national issues arising from the fires and the subsequent Royal Commission.

The Bushfire CRC is funded by the Australian Commonwealth Government and fire and land management agencies from across Australia and NZ.

The Bushfire CRC funds research across Australia and NZ funding more than 80 researchers in areas as diverse as physical science to social sciences.

This talk will outline the current research agenda and plans for the Bushfire CRC to transition to a new institute with a focus on fire and other natural hazards.

Want to know more?
CONTACT: richard.thornton@bushfirecrc.com

BUSHFIRE CRC
An Australasian resource

Richard Thornton
Deputy CEO & Research Director

BUSHFIRE CRC MISSION

bushfire CRC

To enhance the management of the bushfire risk to the community in an economically and ecologically sustainable manner

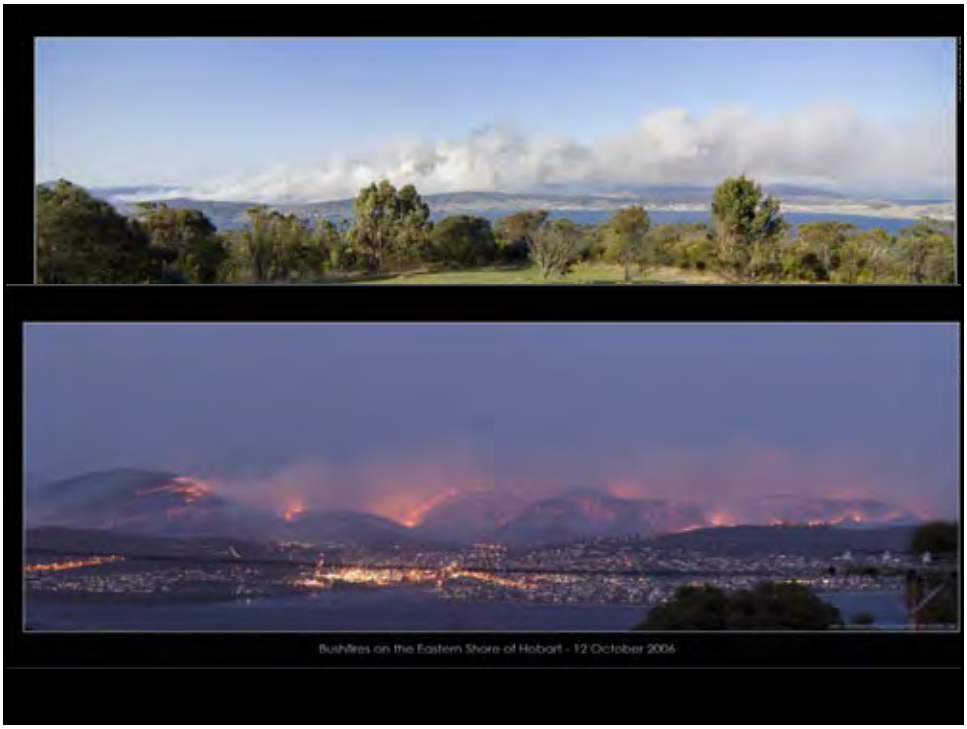
It includes the following objectives:

•To develop an internationally renowned centre of excellence to lead bushfire research in Australia

•To provide a research framework that will improve the effectiveness of bushfire management agencies

•To increase the self-sufficiency of communities in managing the risks from bushfires.


BLACK CHRISTMAS FIRES
BLACK CHRISTMAS FIRES
THE Daily Telegraph
On a scorching afternoon, arsonists make a city's nightmare come true
SYDNEY BURNS
Suburbs fight running battle with flames
Hundreds flee mountain firestorm
Exclusive: Hunt for the fire suspect


Bushfires on the Eastern Shore of Hobart - 12 October 2006


bushfire CRC
© BUSHFIRE CRC LTD 2012

THE BUSHFIRE CRC EXTENSION

bushfire CRC

- Announced $15M over three years extension from July 2010 in Senate in March 2009.
- For issues arising from The February 7th Victorian Bushfires and the Royal Commission
  - National Issues
- Based upon Research following Black Saturday; evidence and interim reports of Royal Commission, and feedback from agencies heads.


bushfire CRC
bushfire CRC
Research Extension Program
2010 - 2013
© BUSHFIRE CRC LTD 2012


RESEARCH EXTENSION PROGRAM
bushfire CRC
Understanding Risk
Communicating Risk
Managing the Threat
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UNDERSTANDING RISK

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UNDERSTANDING RISK

COMMUNITY EXPECTATIONS

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UNDERSTANDING RISK

RISK ASSESSMENT AND DECISION MAKING

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UNDERSTANDING RISK

FUELS AND RISK PLANNING IN THE INTERFACE

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COMMUNICATING RISK

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COMMUNICATING RISK

EFFECTIVE COMMUNICATION

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COMMUNICATING RISK

HUMAN BEHAVIOUR UNDER STRESS

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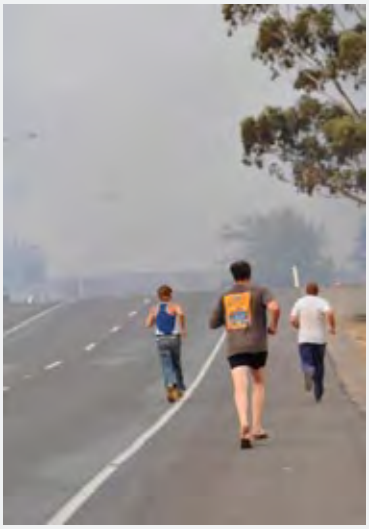
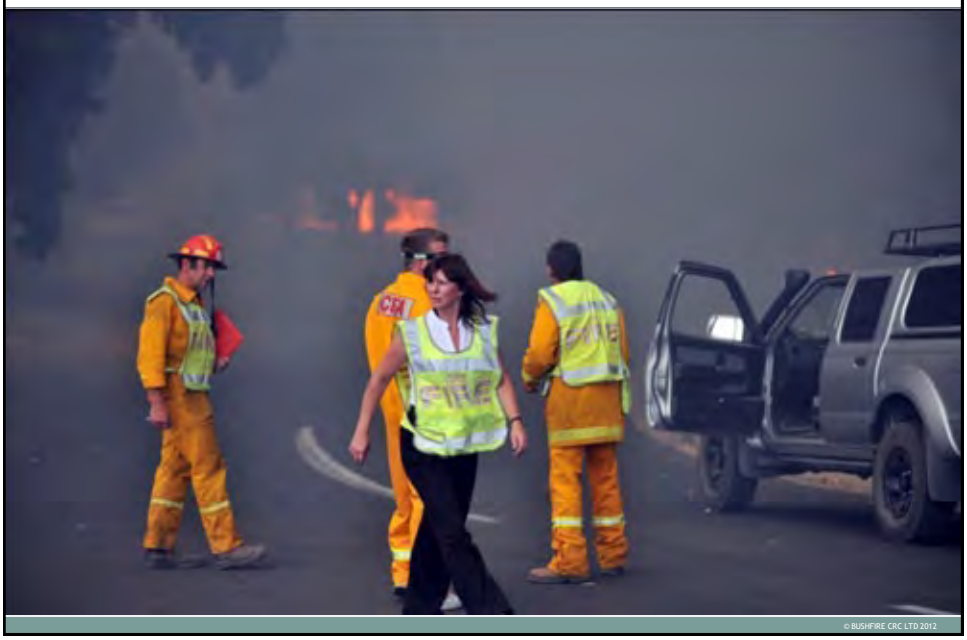


MANAGING THE THREAT

bushfire CRC



MANAGING THE THREAT

INCIDENT MANAGEMENT SYSTEMS

bushfire CRC

MANAGING THE THREAT

FIRE IN THE LANDSCAPE

bushfire CRC

MANAGING THE THREAT

EXTREME FIRE BEHAVIOUR

bushfire CRC

MANAGING THE THREAT

OCCUPATIONAL HEALTH AND SAFETY

bushfire CRC

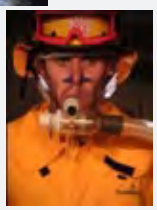
MANAGING THE THREAT

ECONOMICS AND FUTURE SCENARIOS

bushfire CRC

EDUCATION

bushfire CRC




SECOND WAVE OF STUDENTS
bushfire CRC
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EVIDENCE BASED POLICY
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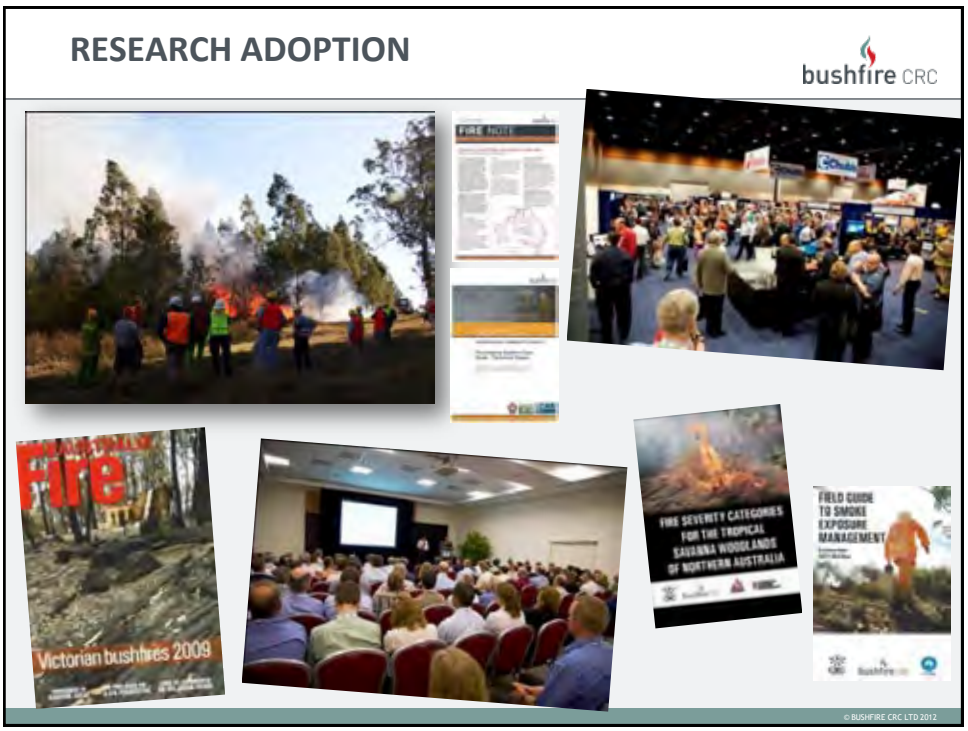
RESEARCH ADOPTION
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Victorian bushfires 2009
FIRE SEVERITY CATEGORIES FOR THE TROPICAL SAVANNA WOODLANDS OF NORTHERN AUSTRALIA
FIELD GUIDE TO SMOKE EXPOSURE MANAGEMENT
© BUSHFIRE CRC LTD 2012


PUBLICATIONS
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AUSTRALIA Fire
BURNING ISSUE
Latest on prescribed fire
FPA AUSTRALIA VISITS NFPA
IMPROVING FIREFIGHTER HEALTH & SAFETY
AUSTRALIAN STANDARD AS 3959 UPDATE
WILDFIRE
Prescribed Burning
Prescribing Fire
A Hot Australian Topic

RELATIONSHIPS & PARTNERSHIPS

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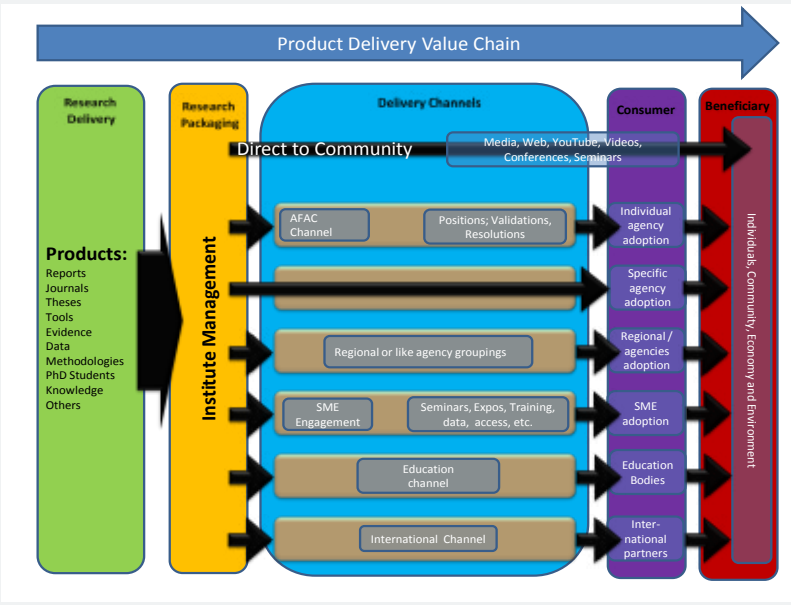


Events calendar

bushfire CRC

www.bushfirecrc.com

Conferences
Forums
Master Classes
Workshops
Knowledge cafes
Clinics

Gaps in natural hazard knowledge - Still a lot to do !

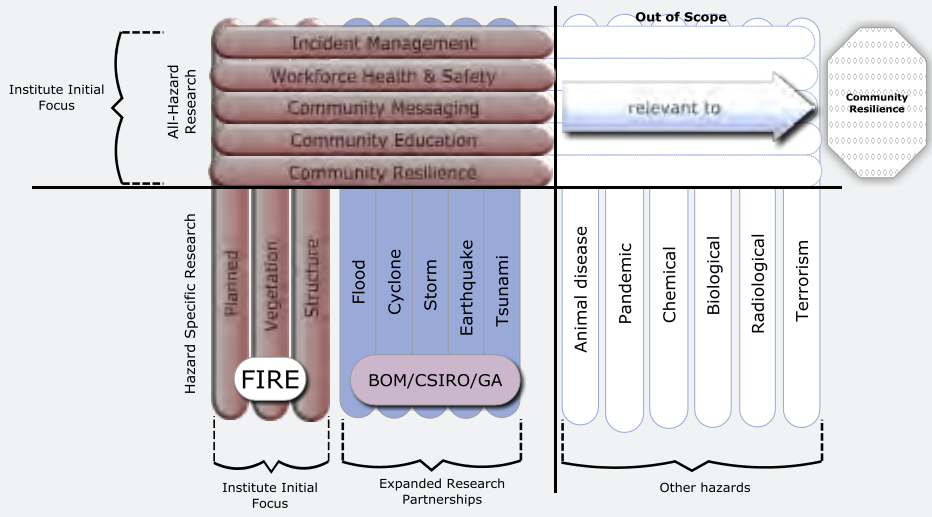
- Community safety
- understanding the risk
- a shared responsibility in learning to live with hazards
- ensuring sustainable ecosystems with climate change
- making the best use of systems and technology
- sharing the scientific knowledge.

Involving collaboration across multiple disciplines

Critical step is commitment of funding from Commonwealth before 2013 to ensure momentum is not lost.

INSTITUTE RESEARCH SCOPE

bushfire CRC



www.bushfirecrc.com

Abstract

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Research adoption

Dr Noreen Krusel (BFCRC)

Presentation title: Research Adoption - or Making the Most of Your Research

How do we get the most out of research? How do we make it useful?

This presentation is about the progression and development of a fledging Research Adoption initiative to a comprehensive and strategic approach to Research Utilisation.

The Bushfire CRC is now in the eighth year of a 10 year funded Research Program. In New Zealand, The National Rural Fire Authority, Scion and the University of Canterbury are all partners.

This talk presents an overview about the experience to date of the Bushfire CRC in Research Adoption and Utilisation.

It highlights the Success Factors that currently underpin the Bushfire CRC's Research Utilisation Strategy, and challenges the audience to think about what they are doing, or could be doing, in some of these areas.

Want to know more?
CONTACT: noreen.krusel@bushfirecrc.com

RESEARCH UTILISATION

DR NOREEN KRUSEL

RESEARCH UTILISATION MANAGER

Bushfire CRC

THE CHALLENGE

bushfire CRC

(The industries') *greatest risk is not Climate Change or Technology but* (a) *failure to adapt/innovate and drive a mantra of continuous improvement through our sector...*

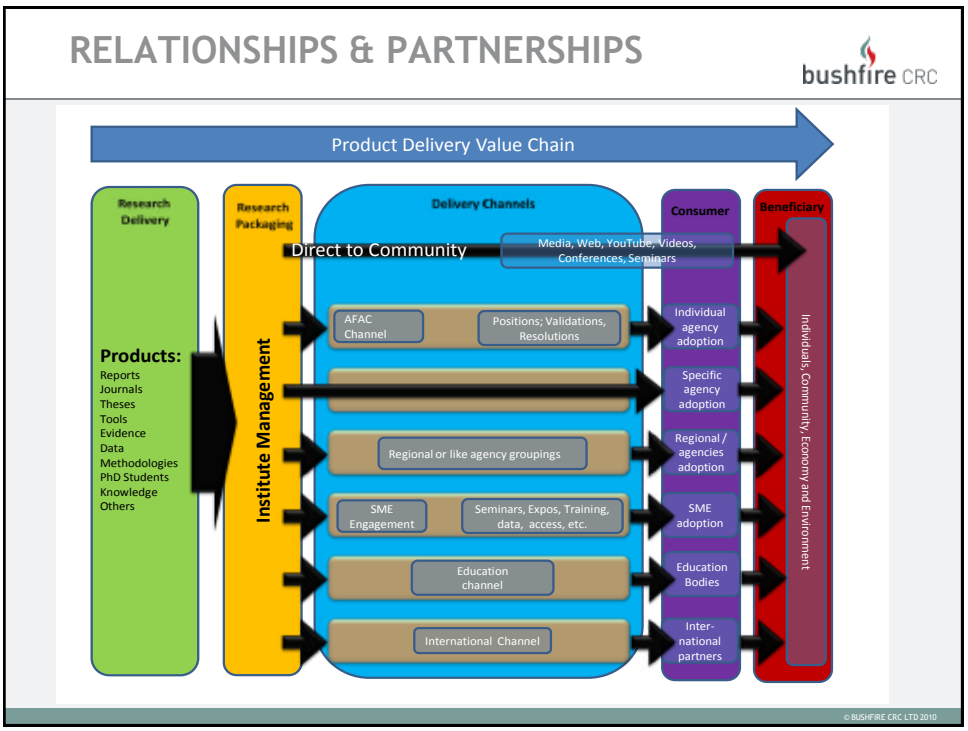
BUT...

bushfire CRC

CRITICAL SUCCESS FACTORS

bushfire CRC

- **Relationships & partnerships**
- Engagement and **active involvement**
- **(Responsive & learning cultures** within agencies)
- Building **capacity & capability** within agencies
- High Quality **products**
- Agencies to make research **meaningful** for their context


RELATIONSHIPS & PARTNERSHIPS
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Product Delivery Value Chain
Research Delivery
Research Packaging
Delivery Channels
Consumer
Beneficiary
Products:
Reports
Journals
Theses
Tools
Evidence
Data
Methodologies
PhD Students
Knowledge
Others
Institute Management
Direct to Community
Media, Web, YouTube, Videos, Conferences, Seminars
AFAC Channel
Positions; Validations, Resolutions
Regional or like agency groupings
SME Engagement
Seminars, Expos, Training, data, access, etc.
Education channel
International Channel
Individual agency adoption
Specific agency adoption
Regional / agencies adoption
SME adoption
Education Bodies
Inter-national partners
Individuals, Community, Economy and Environment
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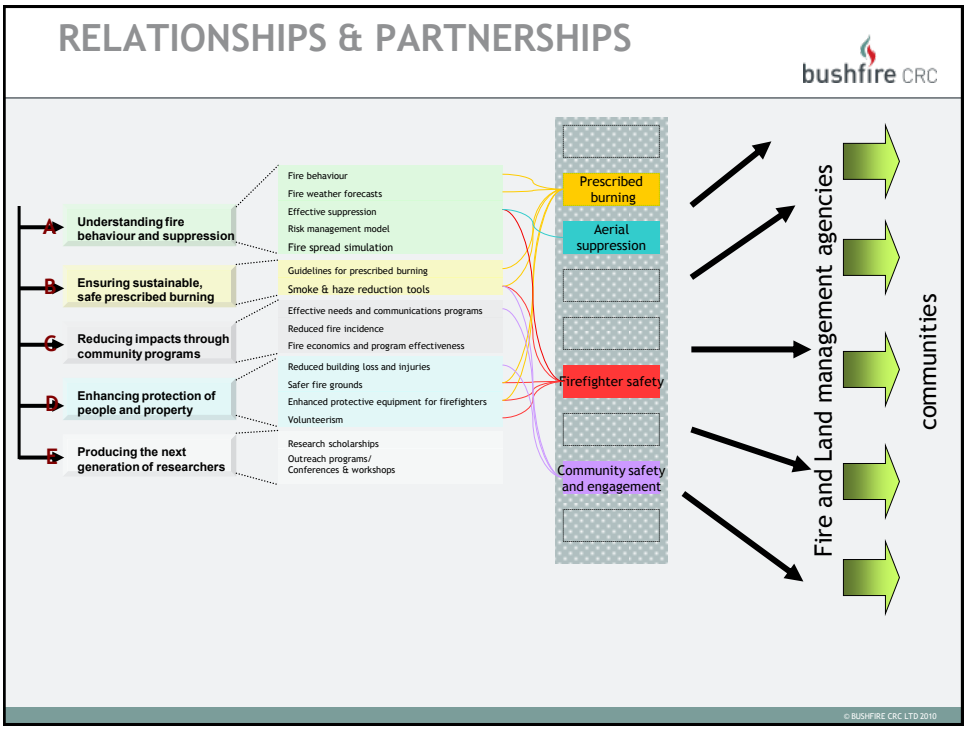

RELATIONSHIPS & PARTNERSHIPS
bushfire CRC
A
Understanding fire behaviour and suppression
B
Ensuring sustainable, safe prescribed burning
C
Reducing impacts through community programs
D
Enhancing protection of people and property
E
Producing the next generation of researchers
Fire behaviour
Fire weather forecasts
Effective suppression
Risk management model
Fire spread simulation
Guidelines for prescribed burning
Smoke & haze reduction tools
Effective needs and communications programs
Reduced fire incidence
Fire economics and program effectiveness
Reduced building loss and injuries
Safer fire grounds
Enhanced protective equipment for firefighters
Volunteerism
Research scholarships
Outreach programs/ Conferences & workshops
Prescribed burning
Aerial suppression
Firefighter safety
Community safety and engagement
Fire and Land management agencies
communities
© BUSHFIRE CRC LTD 2010

bushfire CRC

RELATIONSHIPS & PARTNERSHIPS

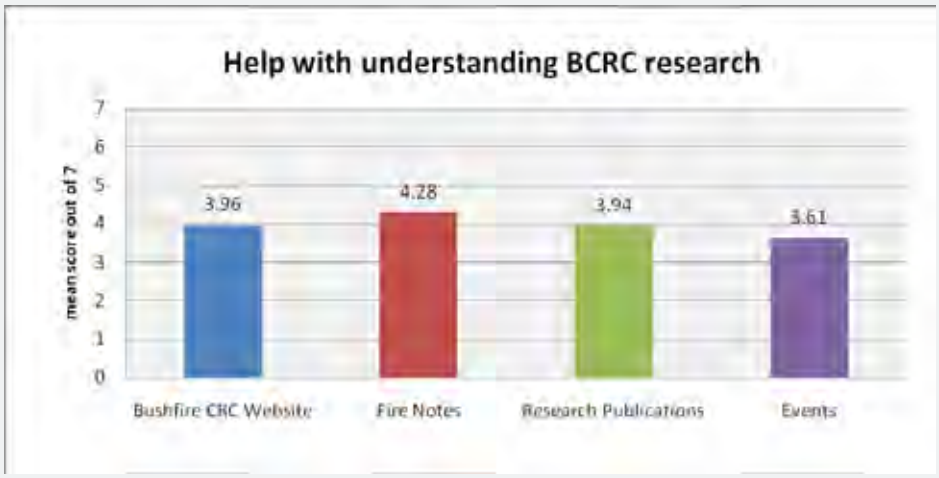
bushfire CRC

- Sharing ideas
- Invite people to see what 'we' do
- Bring people together in meaningful ways
- Create a community of practice – blogs etc
- Show people what has been achieved
- Practitioners speak on behalf of researchers – could researchers speak on behalf of practitioners?

ENGAGEMENT AND ACTIVE INVOLVEMENT

bushfire CRC

- Relative success with information and awareness
- Less so with opportunities for active involvement



ENGAGEMENT AND ACTIVE INVOLVEMENT

bushfire CRC

- **Encourage & support high quality interactive events**

WHAT IS YOUR APPROACH?

bushfire CRC

Or...

RESEARCH UTILISATION WITHIN AGENCIES

bushfire CRC

FINDING: ...there is moderate alignment between the agency's strategic plan and the research outputs of the CRC...

RESEARCH UTILISATION WITHIN AGENCIES

bushfire CRC

"established a dedicated CRC adoption working group to facilitate CRC research outcome integration into agency where applicable"

"a communication plan to ensure all senior staff remains informed about the research conducted by the CRC"

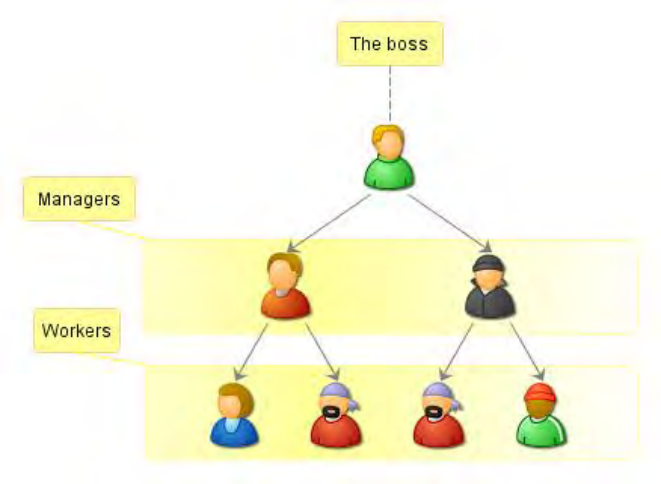
"The formation of working groups to discuss and assess this research and its implications for the organization"

"I don't believe there are any"

RESEARCH UTILISATION WITHIN AGENCIES

bushfire CRC

People in senior positions are more satisfied....that these research transfer strategies are working well.

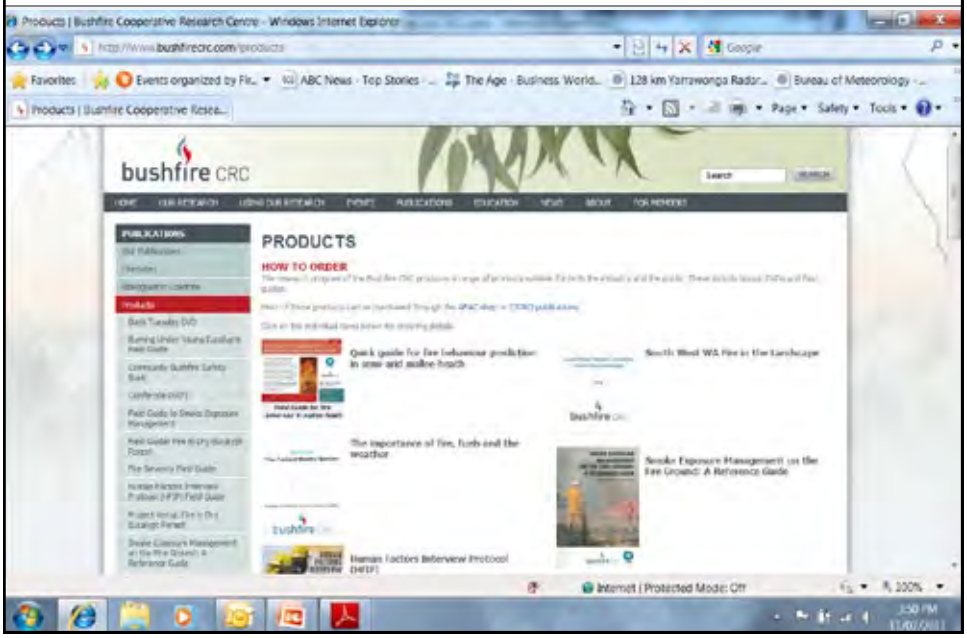


HIGH QUALITY PRODUCTS

bushfire CRC

HIGH QUALITY PRODUCTS

bushfire CRC



MAKE RESEARCH MEANINGFUL

bushfire CRC


"...research adoption is a process, not an event..."

Abstract

Click here to return back to the contents page

Fire management

Murray Dudfield (National Rural Fire Officer)

Presentation title: Fire management decision making

Murray's presentation will provide an overview of the need for research in fire management decision making.

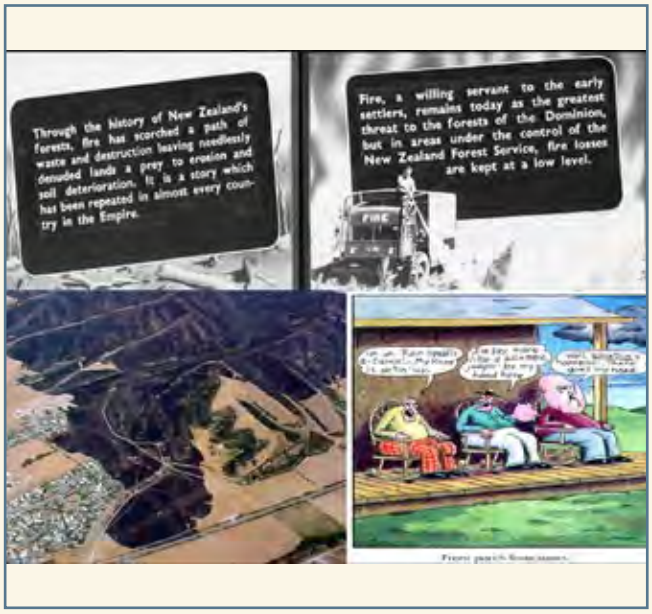
A frequent challenge for communities, agencies and individuals responsible for making decisions relating to rural land use and forests and wildfire lies in testing the effectiveness of such decisions.

Decisions need to take account of uncertainties and risks, and opportunities that may be the consequence of decisions.

Risk management is an effective tool for making the connection between possible actions and likely consequences.

It can assist with prioritising and selecting the most appropriate management approach to guide sound rural land and forest management objectives.

Research outputs are a key input into these future challenges.



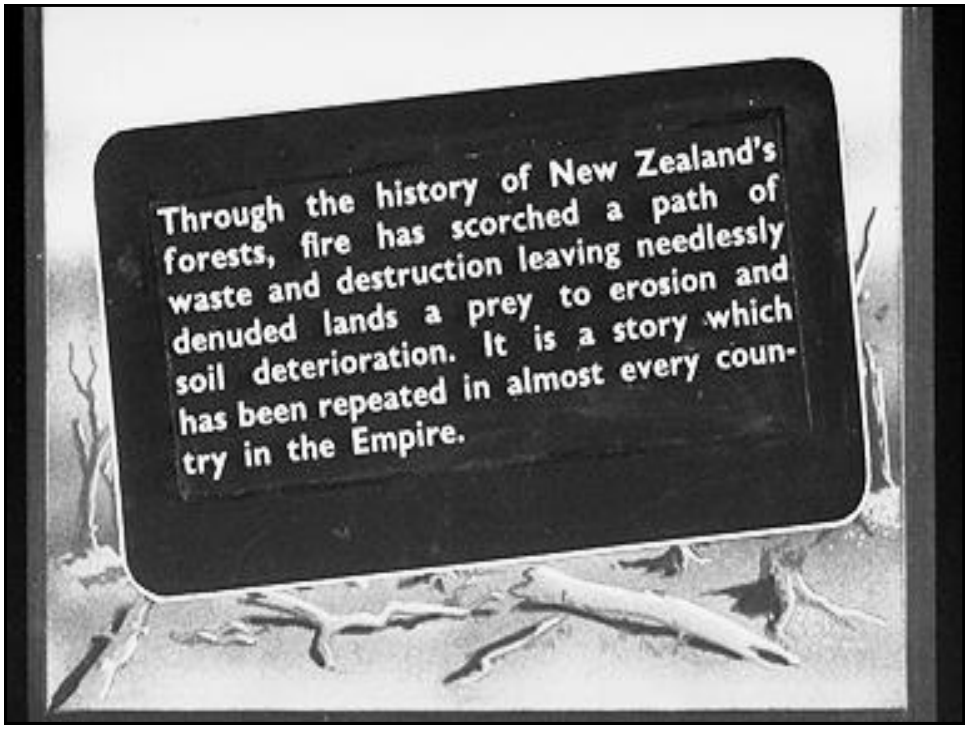
Want to know more?
CONTACT: murray.dudfield@fire.org.nz

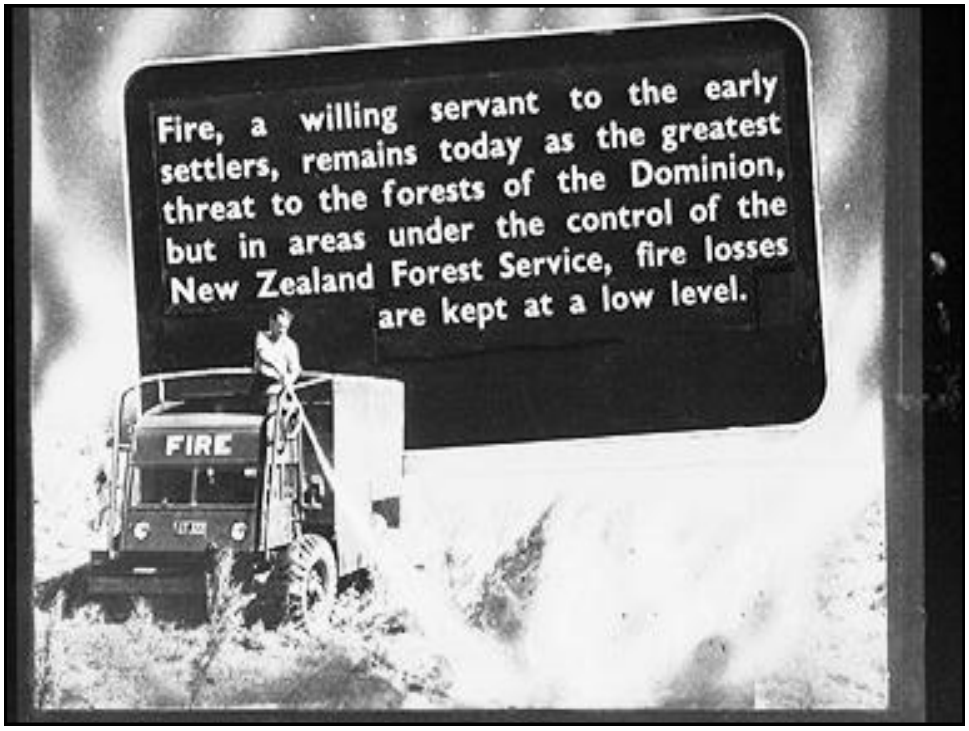
FIRE MANAGEMENT

NATIONAL RURAL FIRE AUTHORITY

Murray Dudfield
NATIONAL RURAL FIRE OFFICER

2012 Rural Fire Research Workshop
ROTORUA






Blenhiem wildfire 26th Dec 2000

2003 Deployment to Victoria, Australia

Scale and causes of wildfires

Global vegetation fires: 300 – 350 million ha per year



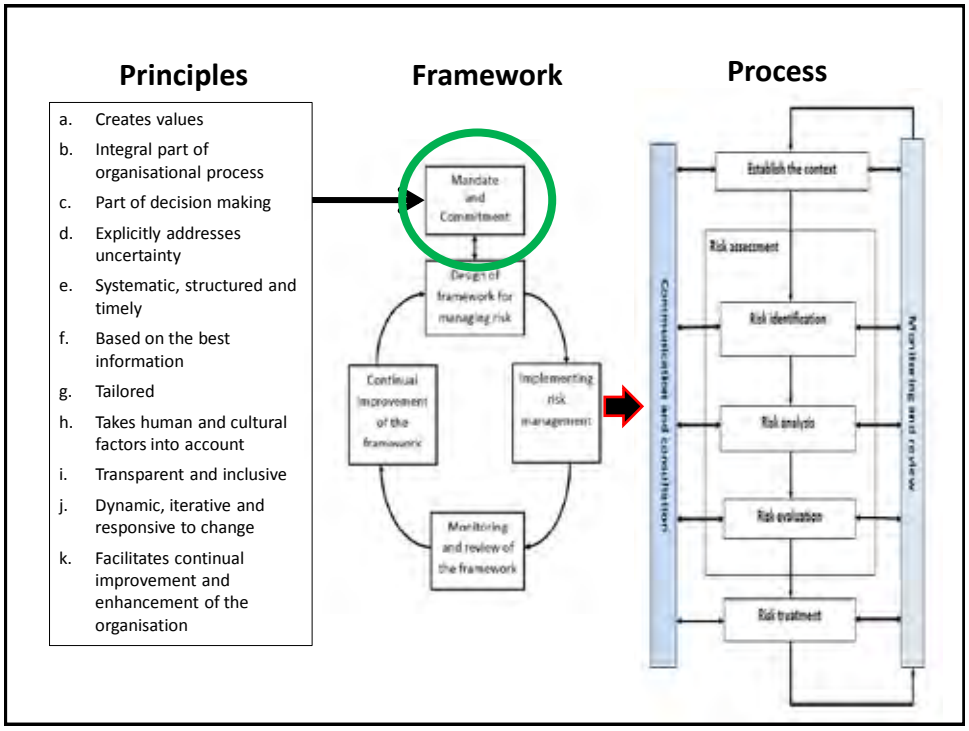
People are the main cause of fires

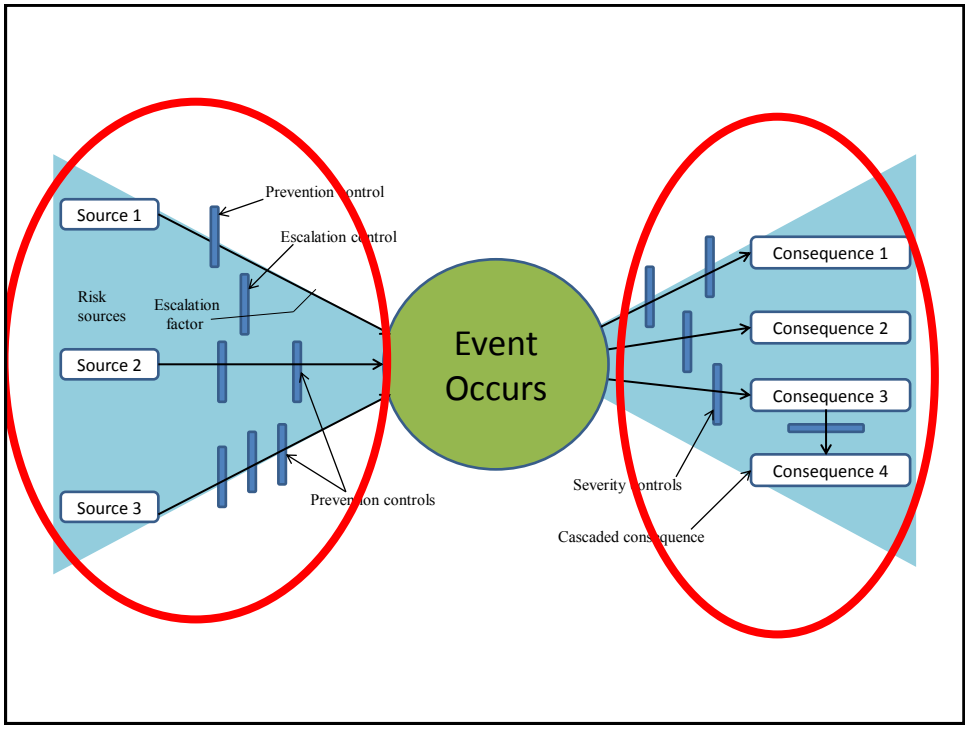

Forest and rural land owners face internal and external factors and influences that make it uncertain whether, when and the extent to which they will achieve or exceed their objectives. Like any sector the effect of this uncertainty is called “risk".

The practice of risk management has been developed over time and within many sectors to meet diverse needs.

The adoption of consistent processes within a comprehensive framework helps ensure that risk in managed effectively, efficiently and coherently.

The ISO Risk Management Standard has a place in the management of fire in the forest and rural hazardscape.


Principles
a. Creates values
b. Integral part of organisational process
c. Part of decision making
d. Explicitly addresses uncertainty
e. Systematic, structured and timely
f. Based on the best information
g. Tailored
h. Takes human and cultural factors into account
i. Transparent and inclusive
j. Dynamic, iterative and responsive to change
k. Facilitates continual improvement and enhancement of the organisation
Framework
Mandate and Commitment
Design of framework for managing risk
Implementing risk management
Monitoring and review of the framework
Continual improvement of the framework
Process
Establish the context
Risk assessment
Risk identification
Risk analysis
Risk evaluation
Risk treatment
Communication and consultation
Monitoring and review


Source 1
Source 2
Source 3
Risk sources
Escalation factor
Prevention control
Escalation control
Prevention controls
Event Occurs
Consequence 1
Consequence 2
Consequence 3
Consequence 4
Severity controls
Cascaded consequence

FAO LEGISLATIVE STUDY
99

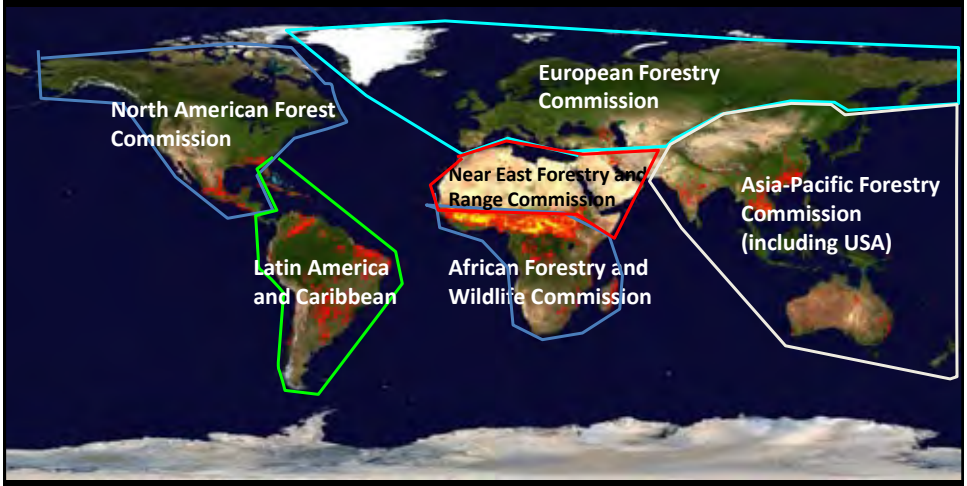
Forest fires and the law
A guide for national drafters based on the Fire Management Voluntary Guidelines
by
Elisa Morgera
Maria Teresa Cirelli

for the
Development Law Service - FAO Legal Office

The FAO *Fire Management Voluntary Guidelines* support the formulation of legal and regulatory conditions for a holistic approach to fire management. Specifically, Principle 8 of the *Guidelines* clearly recognises the role of legislation in supporting and institutionalizing forest and rural fire management. This is because observation leads to the conclusion that fire prevention and suppression are often **hampered by unclear lines of institutional responsibilities and by conflicting policies and legislation**.

In light of the specific – and often complex– structure of the legal framework on forest and rural fires in a given country, this report identified that it is critical to ensure the consistency and coherence of the legal discipline emerging from the multiplicity of legal instruments. Thus, before proposing any reform, it is essential that legislators **analyse carefully the existing legal framework related to forest and rural fire management.**

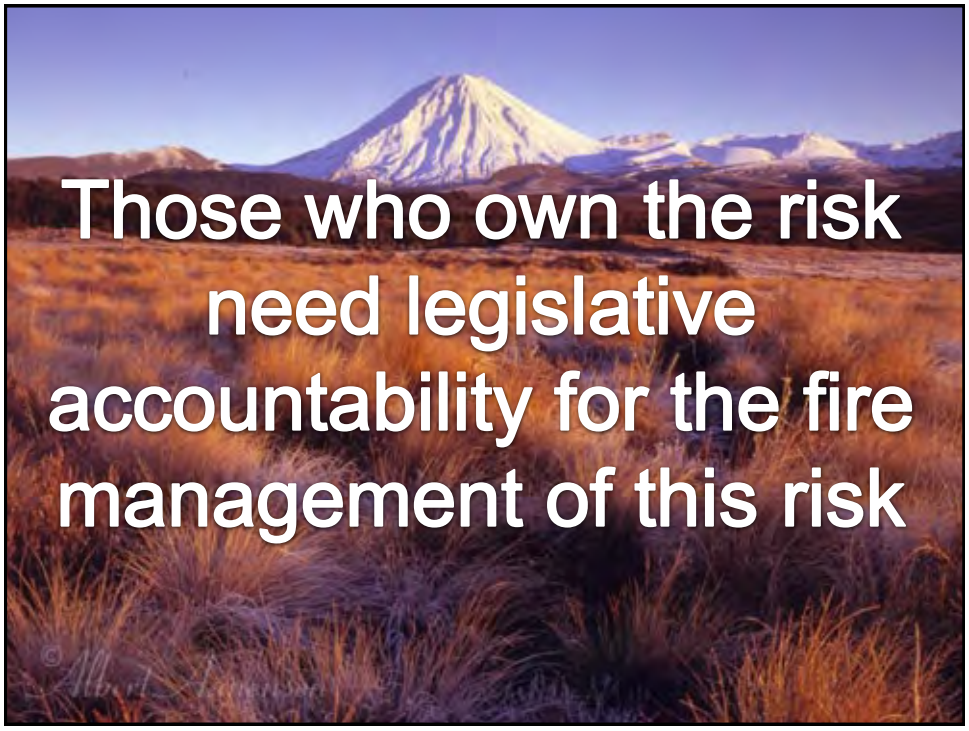
The six FAO Forestry Commission Regions



MODIS Rapid Response System Global Fire Maps
Latest fire map available: 12/27/10 - 12/31/10 (2010361-2010365)

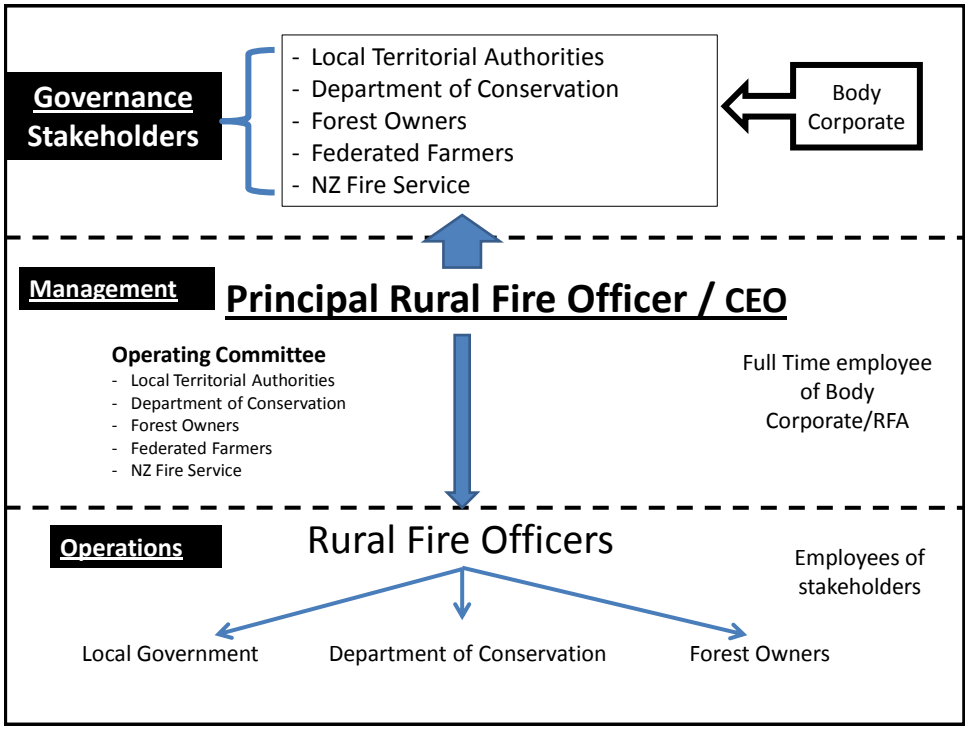
Recent FAO COFO meetings discussion was held on:

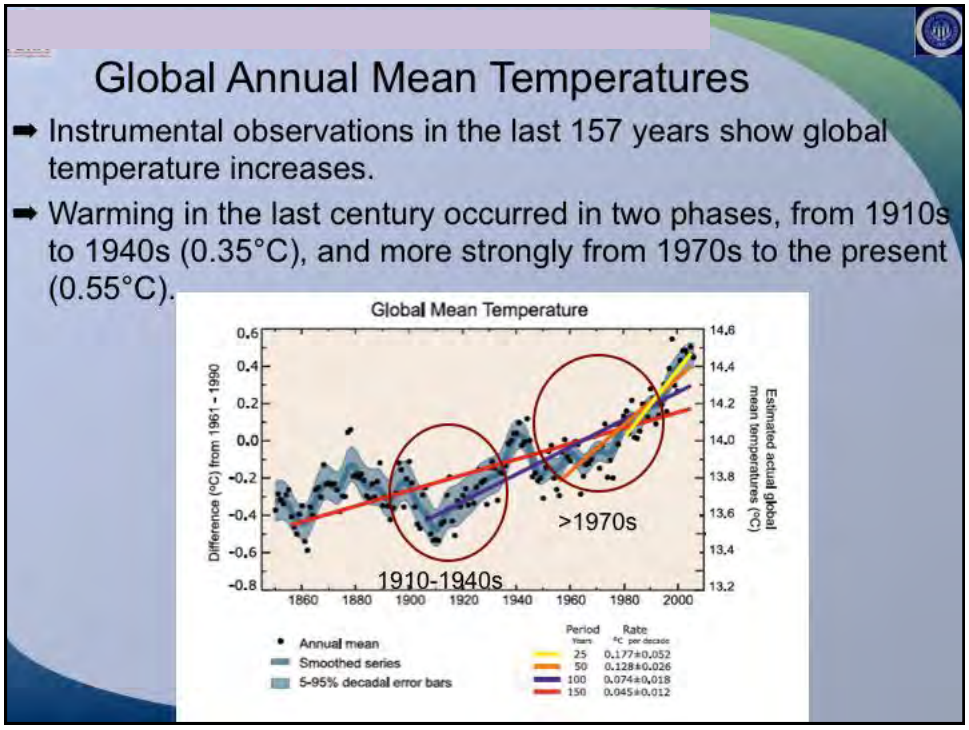
- Enhancing its role in fire management
- Support improved fire management through the implementation of the guidelines and community-based approaches
- Develop actions at (sub)regional levels through regional and national networks as well as the Regional Forestry Commissions and their **fire management working groups**
- Assist in capacity building to develop and implement climate change mitigation and adaptation measures, including to reduce emissions from deforestation

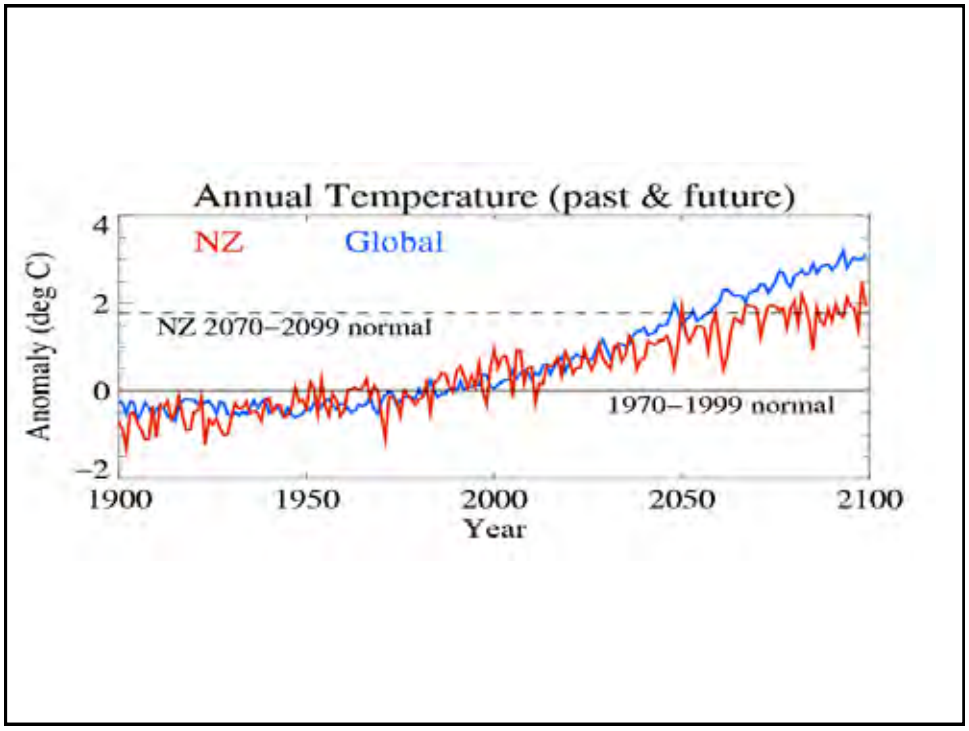


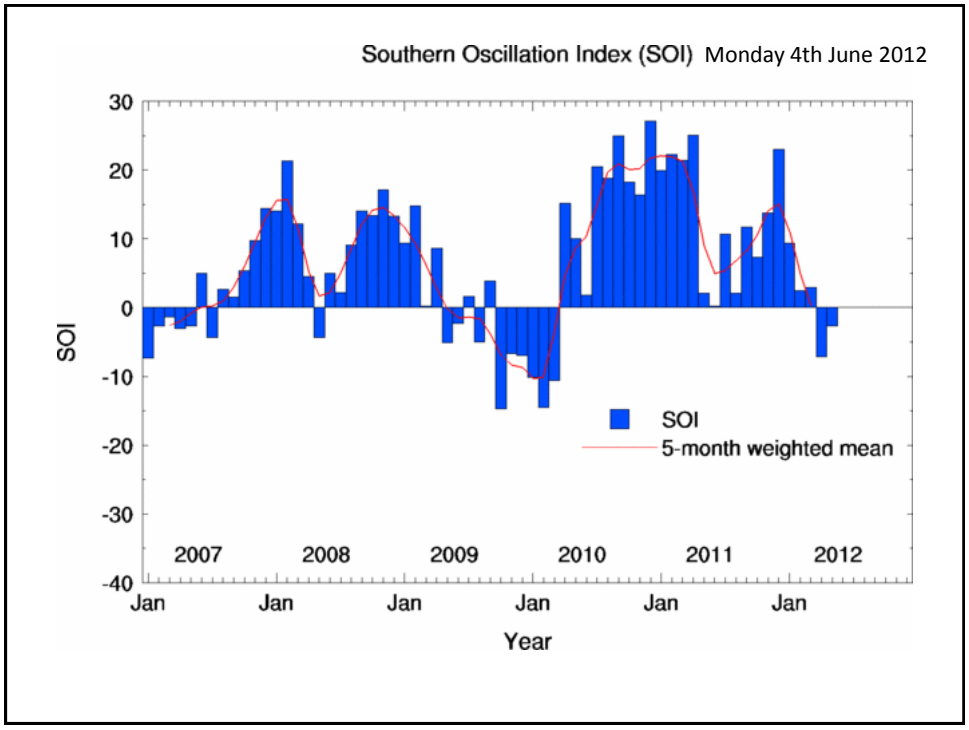
Integrating risk management with Land/Forest management

- A **risk management approach** allows for testing of all consequences (positive and negative) against defined actions.
- An effective tool to assist **land managers take ownership** and actually manage the land for all the diverse outcomes.
- Provides a clear and consistent mandate for land managers to have a **fully integrated approach** to the use of fire and protection from fire.


Governance Stakeholders
- Local Territorial Authorities
- Department of Conservation
- Forest Owners
- Federated Farmers
- NZ Fire Service
Body Corporate
Management
Principal Rural Fire Officer / CEO
Operating Committee
- Local Territorial Authorities
- Department of Conservation
- Forest Owners
- Federated Farmers
- NZ Fire Service
Full Time employee of Body Corporate/RFA
Operations
Rural Fire Officers
Employees of stakeholders
Local Government
Department of Conservation
Forest Owners


Global Annual Mean Temperatures
➡ Instrumental observations in the last 157 years show global temperature increases.
➡ Warming in the last century occurred in two phases, from 1910s to 1940s (0.35°C), and more strongly from 1970s to the present (0.55°C).
Global Mean Temperature
Difference (°C) from 1961 - 1990
Estimated actual global mean temperatures (°C)
>1970s
1910-1940s
Annual mean
Smoothed series
5-95% decadal error bars
Period
Rate


Annual Temperature (past & future)
NZ
Global
NZ 2070–2099 normal
1970–1999 normal
Anomaly (deg C)
4
2
0
−2
1900
1950
2000
2050
2100
Year

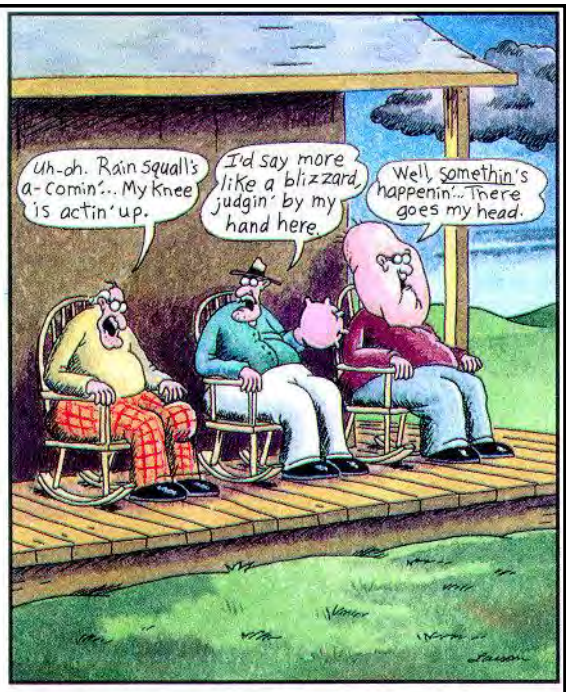

Southern Oscillation Index (SOI) Monday 4th June 2012
SOI
30
20
10
0
-10
-20
-30
-40
SOI
5-month weighted mean
2007
2008
2009
2010
2011
2012
Jan
Jan
Jan
Jan
Jan
Jan
Year

Fire Weather Monitoring:

"Out with the old in with the new

1 [illegible] 02"

1st October 2013

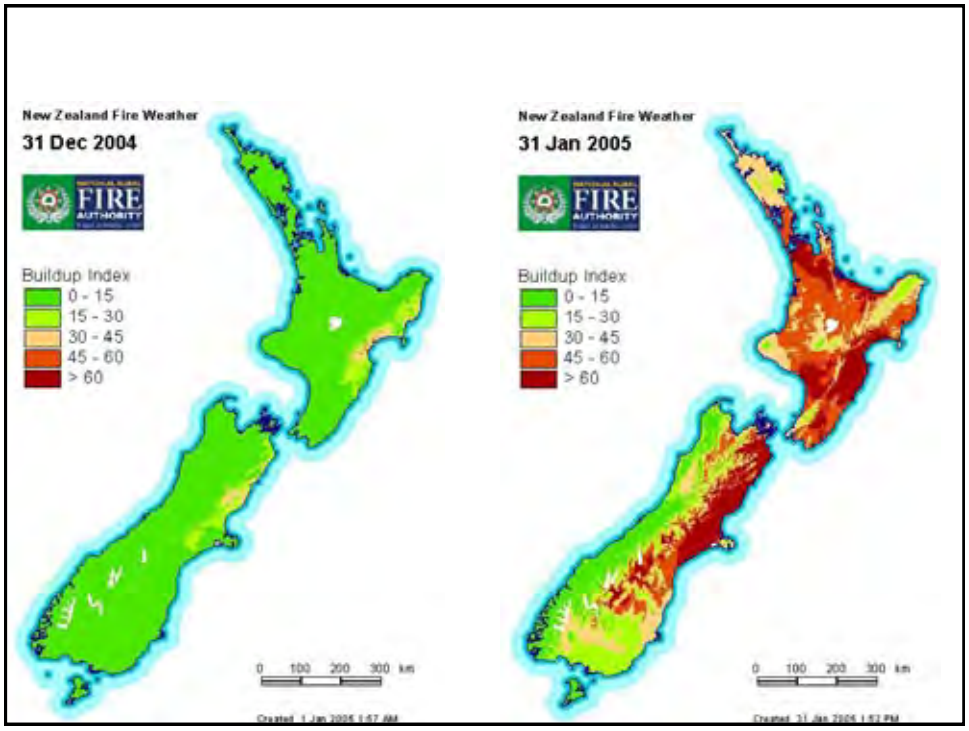


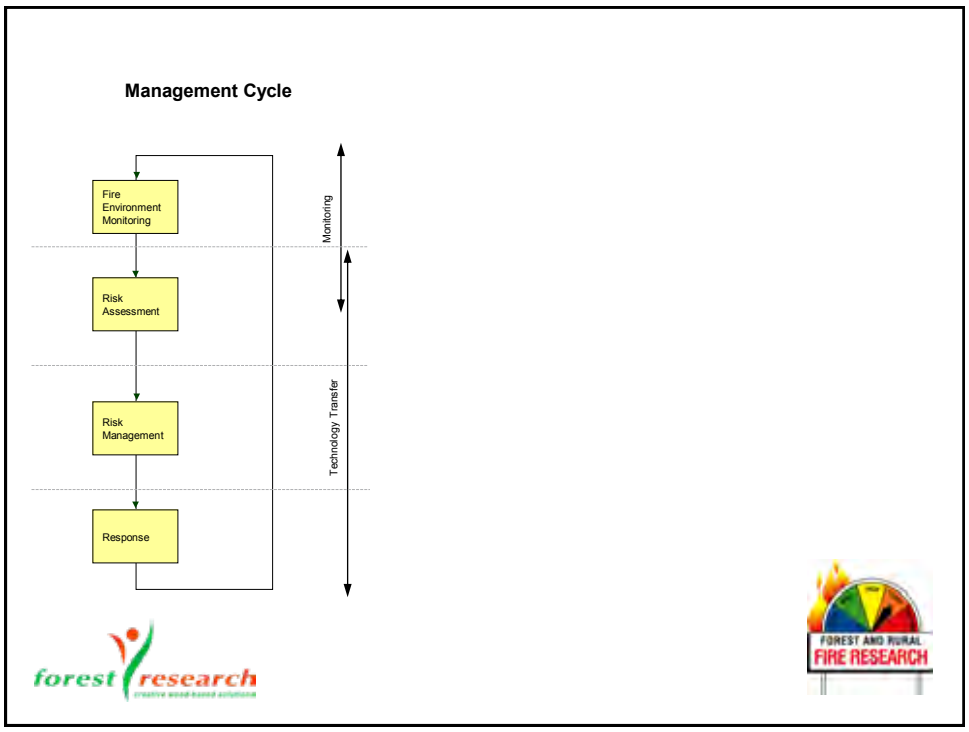
Front porch forecasters

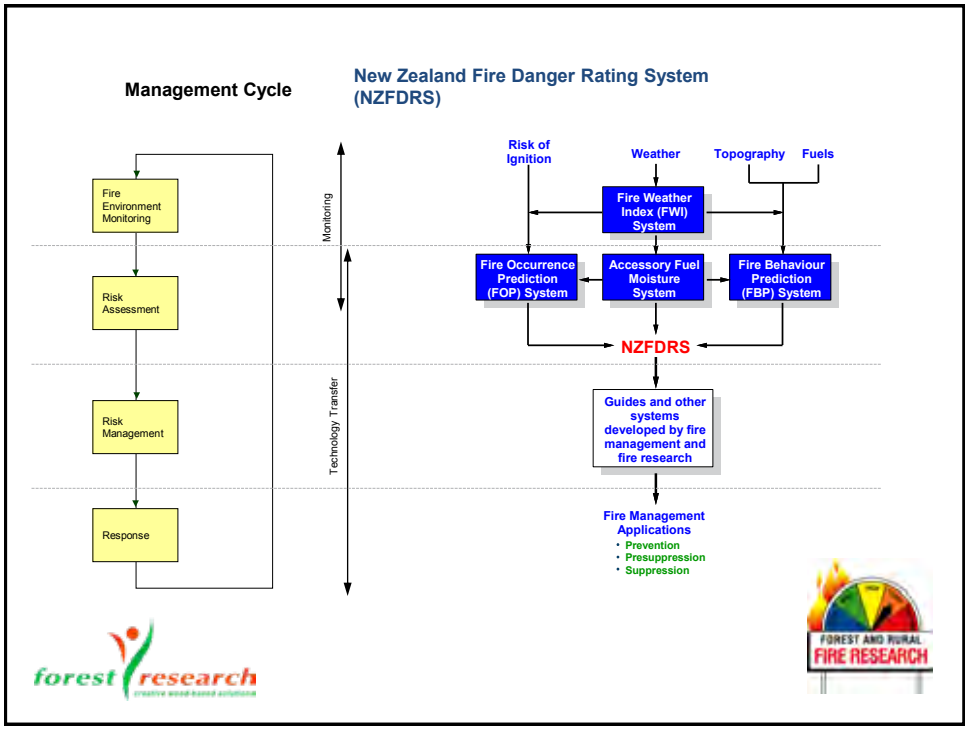
Two examples of Remote Automatic Weather Stations

Location of Remote Automatic Weather Stations for monitoring the fire weather throughout New Zealand

NRFA RAWS Network

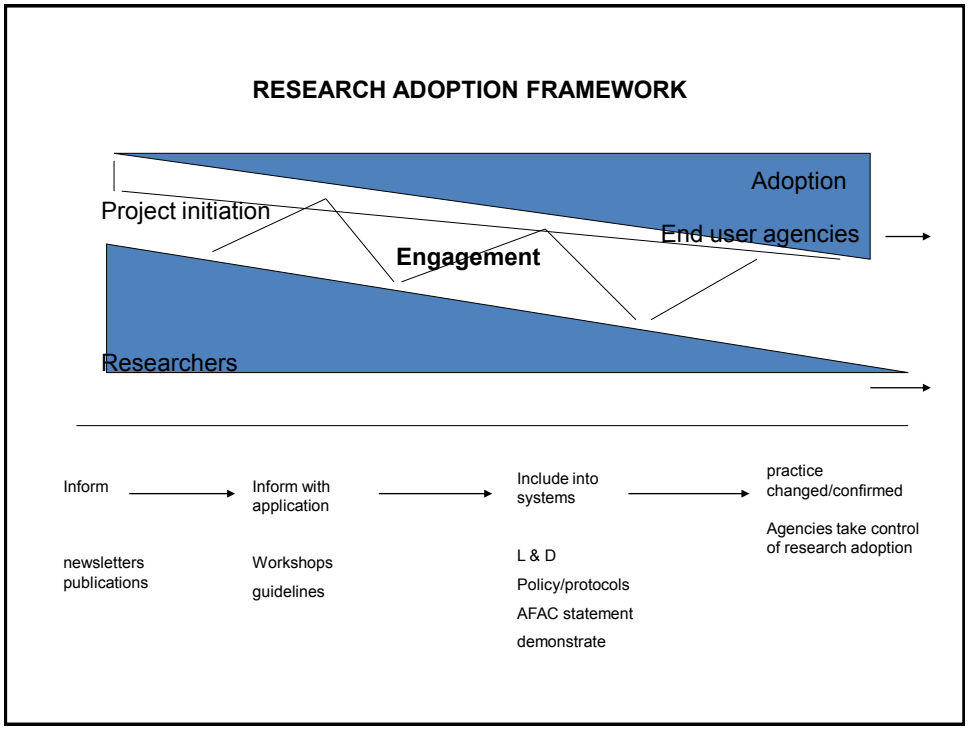

New Zealand Fire Weather
31 Dec 2004
Buildup Index
0 - 15
15 - 30
30 - 45
45 - 60
> 60
0 100 200 300 km
New Zealand Fire Weather
31 Jan 2005
Buildup Index
0 - 15
15 - 30
30 - 45
45 - 60
> 60
0 100 200 300 km

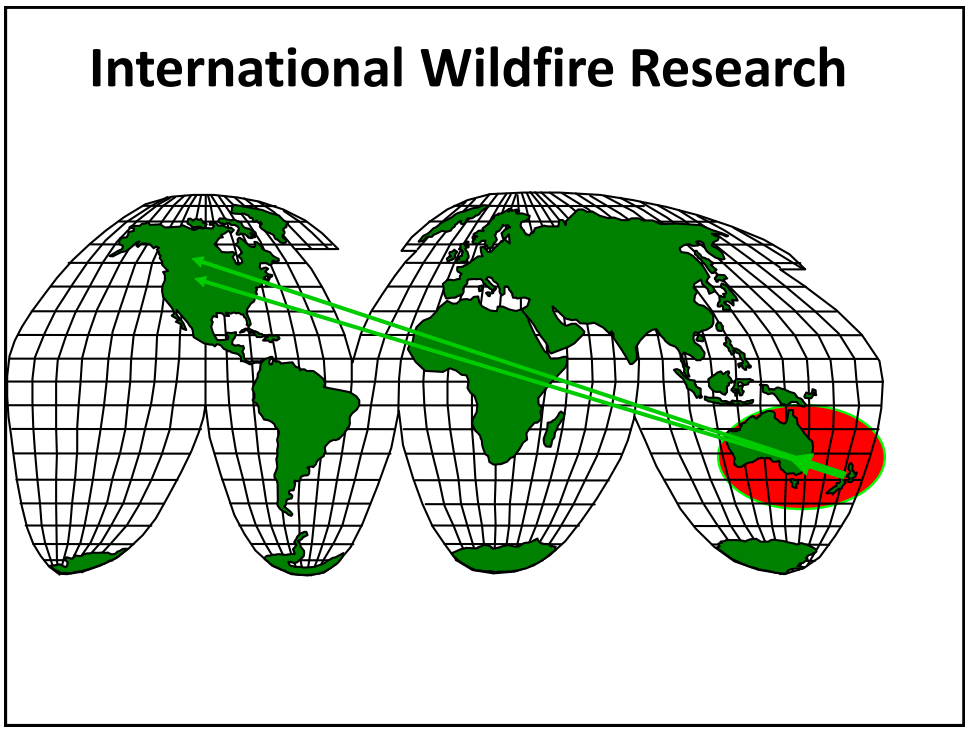

Management Cycle
Fire Environment Monitoring
Risk Assessment
Risk Management
Response
Monitoring
Technology Transfer
forest research
FOREST AND RURAL FIRE RESEARCH



New Zealand Rural Fire Research

- July 2003 – Wake up call given
  - ☹ FRST Funding Stream dried up
- Sept 2003 – New bid made into a new FRST funding stream
- ☺ April 2004 – Advice received that our new FRST bid was successful - $527K pa
- ☺ 2012 Securing the next period of funding


RESEARCH ADOPTION FRAMEWORK
Adoption
Project initiation
End user agencies
Engagement
Researchers
Inform
Inform with application
Include into systems
practice changed/confirmed
Agencies take control of research adoption
newsletters
publications
Workshops
guidelines
L & D
Policy/protocols
AFAC statement
demonstrate


International Wildfire Research

Abstract

Click here to return back to the contents page

New emerging risks

Grant Pearce (Scion)

Presentation title: Protecting New Zealand from emerging rural fire risks

Grant will present an overview of Scion's rural fire research programme, including the linkages between the research conducted to date and that proposed within the new MSI programme research themes:

- Managing new and emerging fire risks
- Enhanced community resilience
- Use of fire as a land management tool
- Improving safety and productivity

He will also summarise the presentations and discussions from this 4th NZ Rural Fire Research Workshop.

Want to know more?
CONTACT: grant.pearce@scionresearch.com

Image: Closeburn fire, DOC

Content

1. Research programme history & focus
2. Proposed research programme
3. Workshop summary

Fire research pre-1987

Research to support fire management operations, esp. controlled burning

- fuel hazard
- fuel moisture content
- fire danger rating
- land preparation
- ignition devices
- aerial suppression

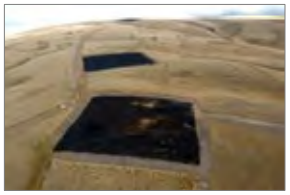
- primarily NZ Forest Service, forestry focus

Fire research 1992-2000

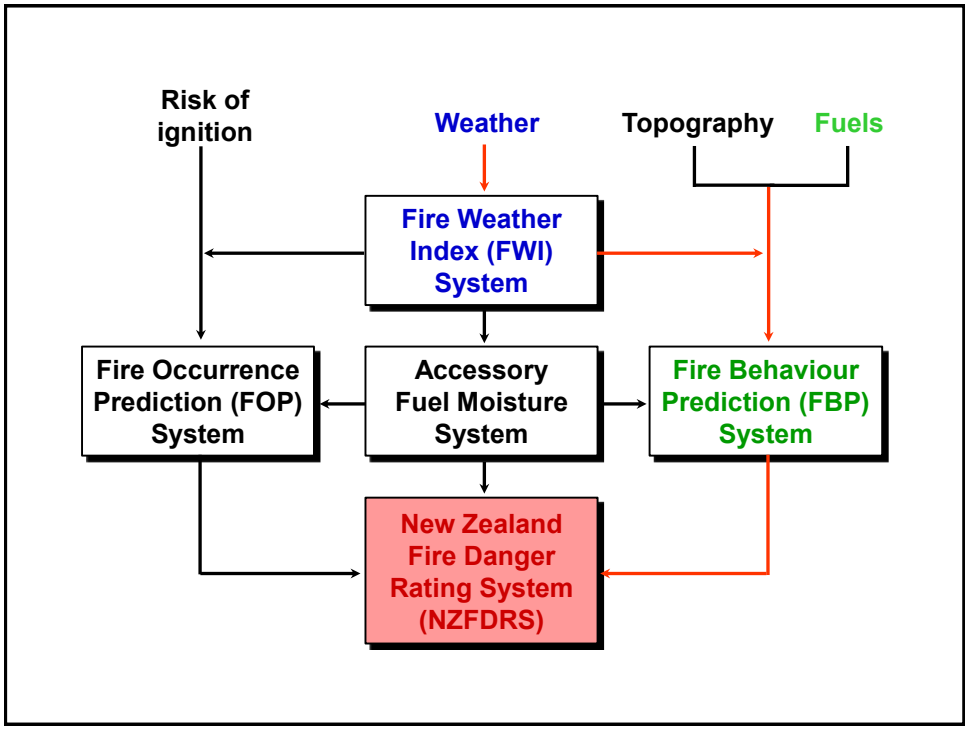
Fire danger rating and fire behaviour prediction

- Experimental burning
- Wildfire documentation
- Fire behaviour modelling – validation & new models
- Technology transfer – newsletters, Bulletins, training

- **Focus on underlying models & systems**



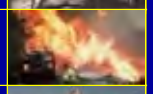

Forest and rural fire research
Aims of the research:
• describe/quantify the NZ fire environment
• quantify fire behaviour in the NZ fire environment
• describe productivity and effectiveness of suppression resources
• improve NZ fire danger rating system
FOREST AND RURAL
FIRE RESEARCH



Fire Danger Class Criteria (FDCC)

- principal use for notifying the public
- provides assessment on broad area basis only
- fire danger classes based on headfire intensity (HFI)
- related to suppression effectiveness
- FDCC defined for Forests and Grasslands based on models within FBP System

Fire Danger Class Limits

Fire Danger Class	Fire Intensity (kW/m)	Control Requirements	
L	< 10	Ground crews with hand tools	
M	10-500	Ground crews with back-pack pumps	
H	500-2000	Water under pressure and/or heavy machinery	
VH	2000-4000	Aircraft using chemical fire retardants	
E	> 4000	Very difficult if not impossible to control	

Fire research 2000-2012

Research to support fire risk management
- based around "4 Rs" of emergency management

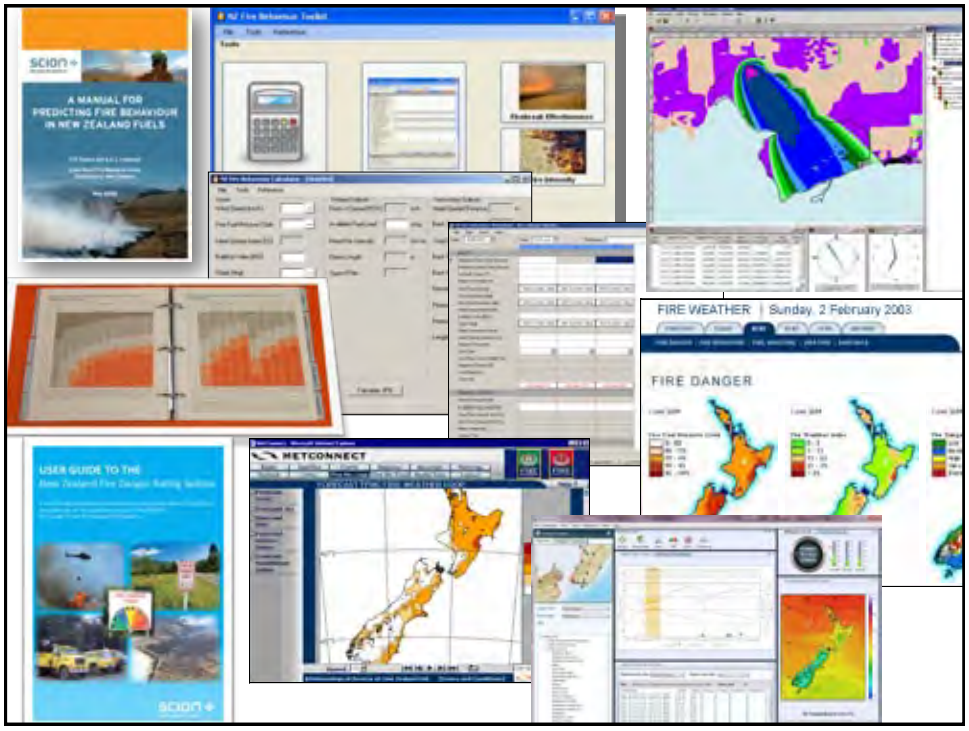
Reduction – describing rural fire hazardscape

Readiness – improving NZ Fire Danger Rating System, including NZFBP System

Response – developing tools & guidelines for safe & effective decision making

Recovery – understanding community resilience to & recovery from wildfires

- **Focus on tools & guides development**


A MANUAL FOR PREDICTING FIRE BEHAVIOUR IN NEW ZEALAND FUELS
FIRE WEATHER | Sunday, 2 February 2003
FIRE DANGER
METCONNECT


Video camera
Video recorder
CO monitor
GPS
Heart rate monitor
Skin temperature
Breathing rate

Proposed Research 2012-2016

New research themes:

1. Managing emerging risks to NZ's fire hazardscape
   – new/emerging fuel types, climate change, extreme fire behaviour
2. Enhanced community resilience
   – strategies to educate at-risk communities to improve fire readiness

3. Use of fire as a land management tool
   – issues/benefits of fire use, impacts on NZ ecosystems
4. Improving safety & productivity
   – production rates for firefighting resources, new suppression technologies

1. Managing emerging risks

New/improved models for predicting fire behaviour with land use/cover & climate changes:

- Wilding pine fire hazard
- Scrub fuel moisture
- Extreme fire behaviour potential
- Fire-atmosphere linkages, including evaluation of coupled fire-atmosphere models
- Updating of fire behaviour tools (incl. NZFDRS & WTA)

2. Enhanced community resilience

Improved community preparedness through more effective communication:

- Case studies on effective communication for NZ communities (BFCRC project)
- Lessons from other natural hazards
- Workshop with fire & CDEM managers
- Strategies to inform and educate at-risk communities
- Engagement/involvement of communities in fire protection planning

3. Fire as a land management tool

Risks & benefits of using fire:

- Survey key stakeholders on how & why fire is used, and risks/benefits
- Quantify extent of prescribed burning
- Review policies & guidelines on fire use
- Review effects of fire on ecosystems
- State-of-knowledge summary

Smoke management tools:

- Review suitability of smoke models
- Case studies for NZ wildfires/burns

4. Improving safety & productivity

Develop resource productivity guidelines:

- Continued data collection on firefighter workload and productivity
- Impacts of CO on workload
- Productivity & effectiveness of aircraft and ground resources

Evaluation of new technologies:

- eg. unmanned aerial vehicles (UAVs)

Research programme – purpose

- Develop the science and technology needed to protect life and property and manage fire in the landscape
- Provide fire and land management agencies with greater capacity to:
  - enhance firefighter safety
  - better understand fire behaviour
  - allow for safe & effective use of fire as a land management tool
  - deploy effective suppression resources
  - manage fire in different landscapes

Technology Transfer

Workshop summary

Day 1

- Keynote – fire research's *raison d'être*
- Fire-atmosphere links
- Role of science in supporting fire management
- Safe & effective fire suppression
- History of NZ fire management & research
- 20 yr celebration!

Workshop summary

Day 2

- Fire in the landscape
- Improving community resilience
- Future of Bushfire CRC
- Research adoption
- Summary

Thank You!

- Research team – past & present
- Scion management & support
- End-users – RFRAC + fire managers
- FRST/MSI funding
- User direct & inkind support

- Workshop speakers + attendees

- Future outlook for NZ fire research very bright!