Effects of FRB/HRB on Subsequent Wildfire Severity and Suppression – 2003 Vic Alpine Fire Case Study +

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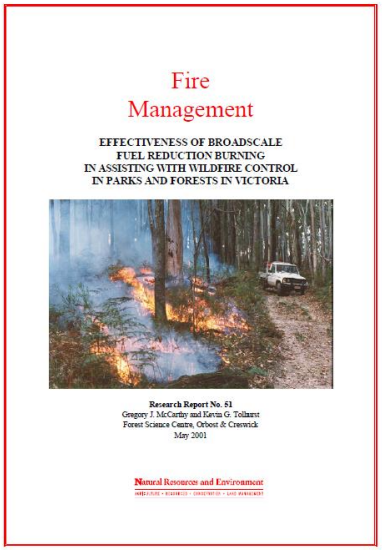
Effect of prescribed burning on wildfire severity: a landscape-scale case study from the 2003 fires in Victoria

Kevin G. Tolhurst & Greg McCarthy



Key Questions:

When are FRBs/HRBs likely to help with later suppression?

What makes FRBs/HRBs effective – and for how long?

What fuels elements do we need to remove to make FRBs/HRBs more effective?


Scoops Owl
Gaya Island
Borneo


Naturalist Iffah
Head scratching
Scoops Owl

Methods 2001 Study

114 wildfires across Victoria

1990/91 to 1996/97

Fuel Hazard,

Weather,

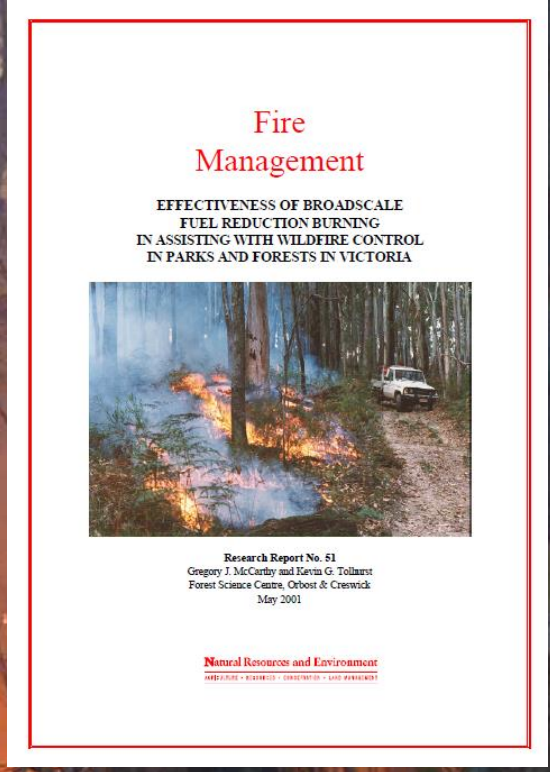
Topography,

Fire Behaviour,

Suppression Effort

FRB effects

Crunched numbers

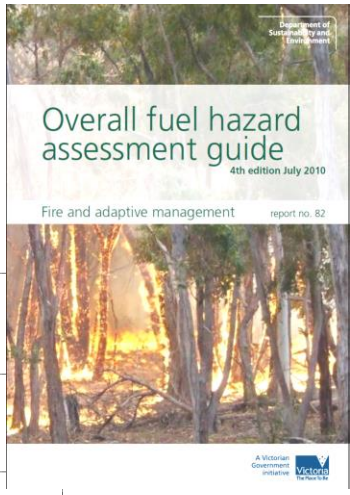

Fire
Management

EFFECTIVENESS OF BROADSCALE
FUEL REDUCTION BURNING
IN ASSISTING WITH WILDFIRE CONTROL
IN PARKS AND FORESTS IN VICTORIA

Research Report No. 51
Gregory J. McCarthy and Kevin G. Tolhurst
Forest Science Centre, Orbost & Creswick
May 2001

Natural Resources and Environment

Effect of weather (FDI) and Overall Fuel hazard on FRB effectiveness



Yes

Probability that previous FRB will assist with Suppression

No

1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0

Overall Fuel Hazard

Low

Mod

High

Very High

Extreme

0 25 50 75 100

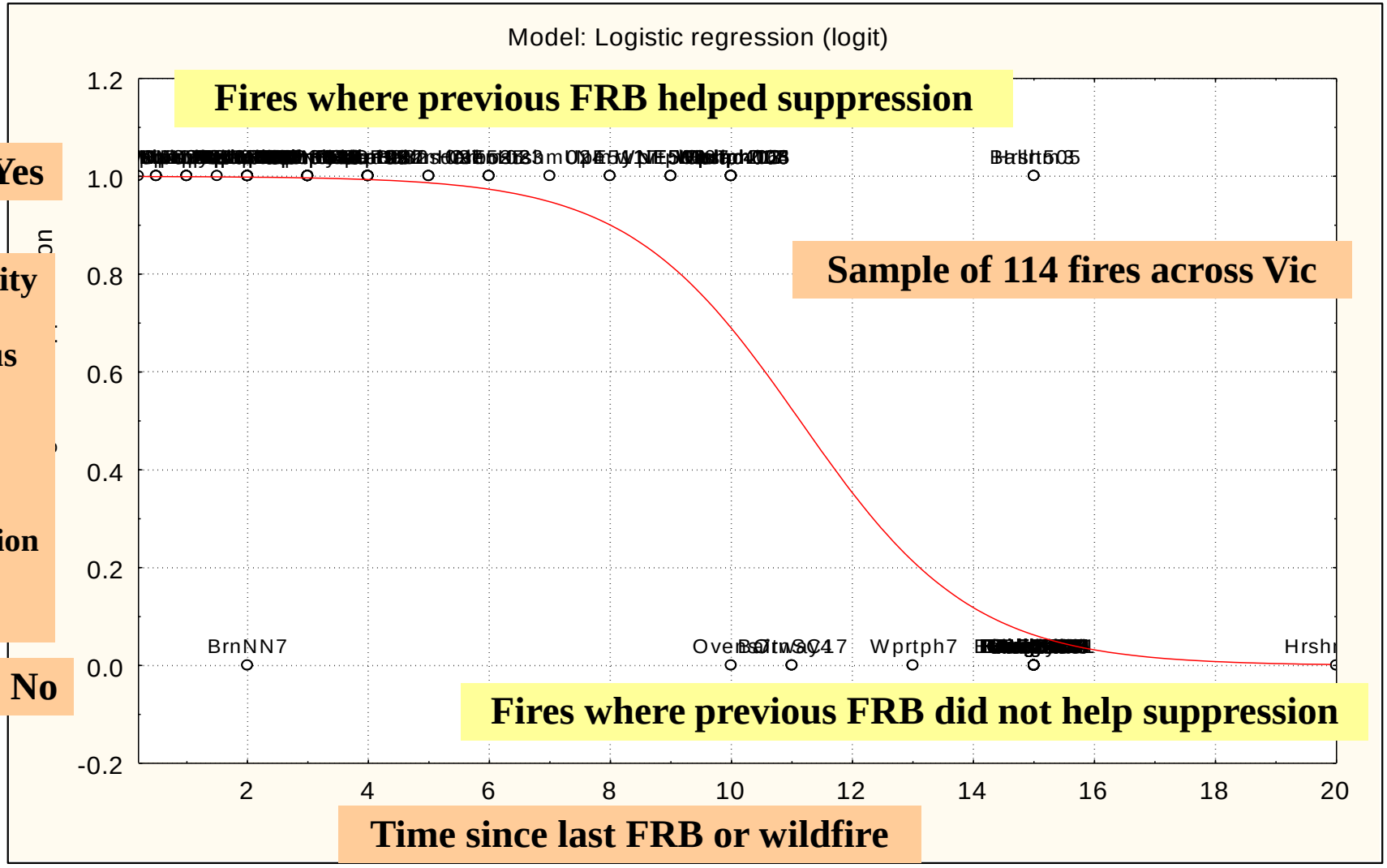
FDI

Fire Danger Index (weather)

Table 7 Mean values for Fuel Reduction Effect for all fires by Fuel Management Zone at the final control line

Fuel Reduction Effect	FMZ 1	FMZ 2	FMZ 3	FMZ 4	FMZ 5
% of Headfire which encountered a Fuel Reduction Burn (FRB)	**0.79**	**0.78**	0.30	0.27	0.16
Age of the FRB	**5.06**	**7.51**	11.66	13.00	13.40
Did the FRB Slow the Headfire	**0.79**	**0.68**	0.23	0.20	0.20
Did the FRB Assist Suppression	**0.80**	**0.78**	0.32	0.27	0.20

Effect of FRB diminishes rapidly after 10 years



2003 FRB Effectiveness

Methods

* Map Severity
* Compare Severity
  FRB with no FRB

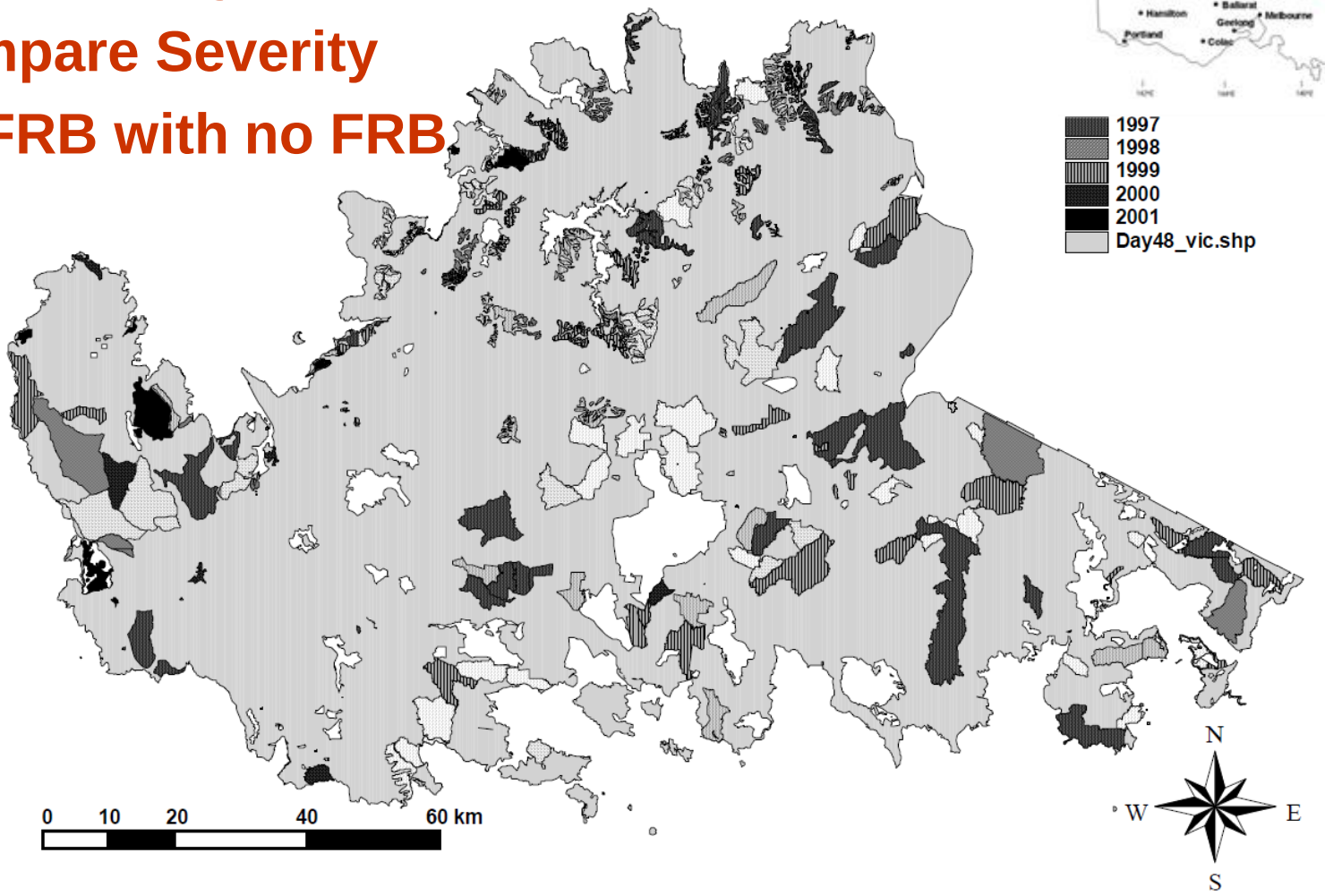
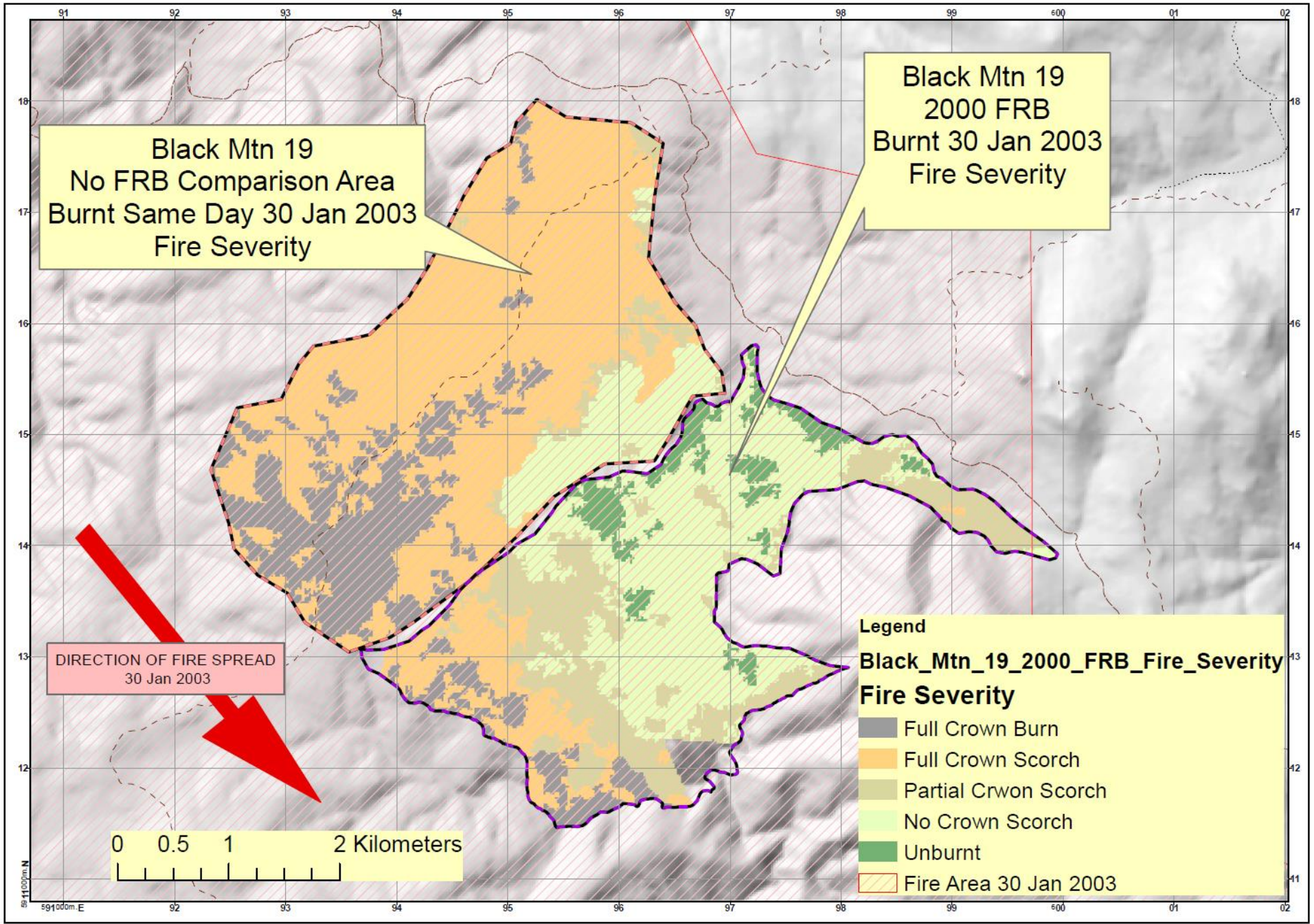


Figure 4. Extent and location of the prescribed and wildfires that had occurred in the 10 years prior to 2003 and within the Alpine fire area in Victoria.

2003 FRB Effectiveness Compare Severity FRB with no FRB



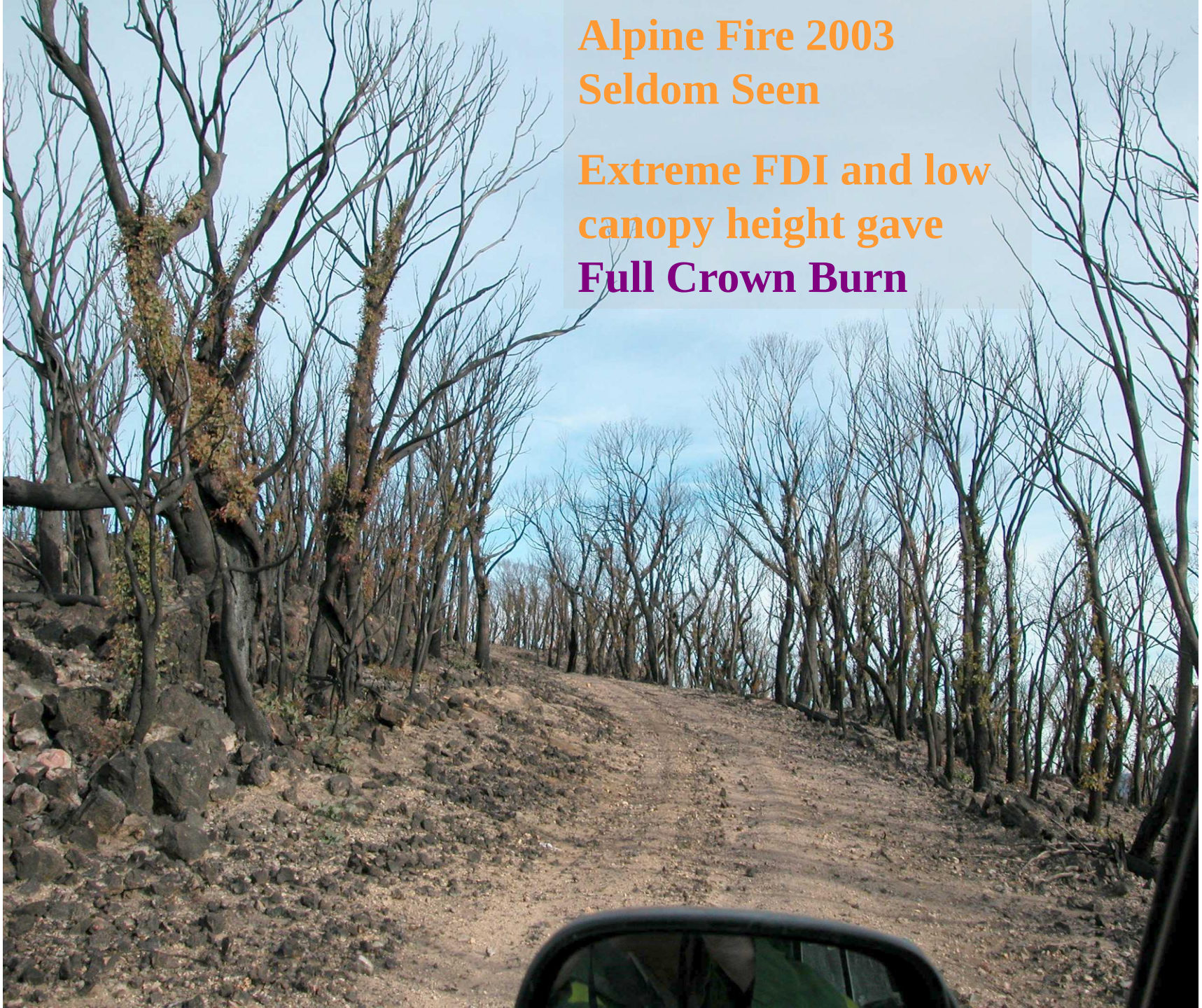
Alpine Fire 2003 Dartmouth Track

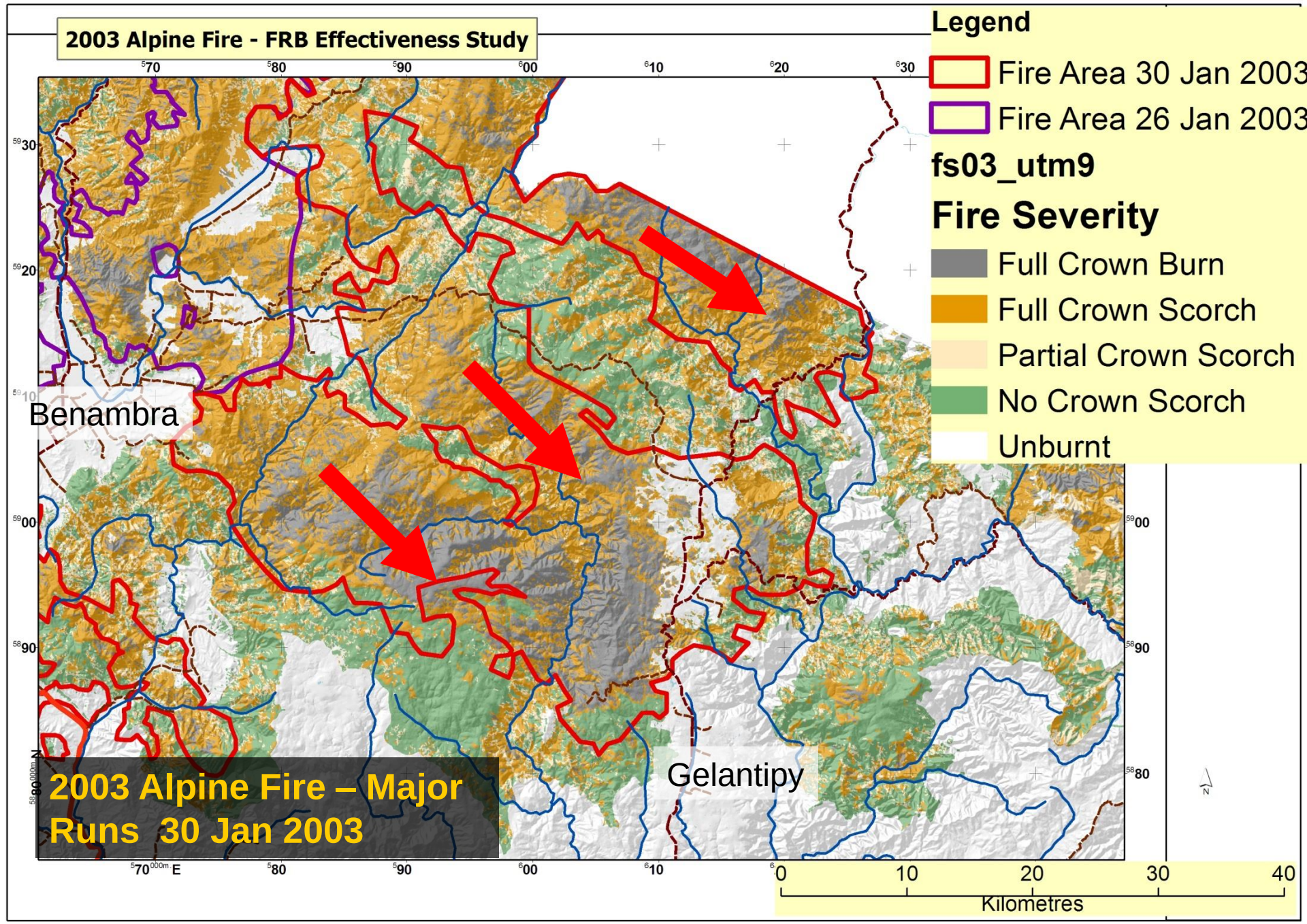
Recent FRB/HRB which burnt most of bark and elevated fuels slowed/stopped fire at Mod-High FDI

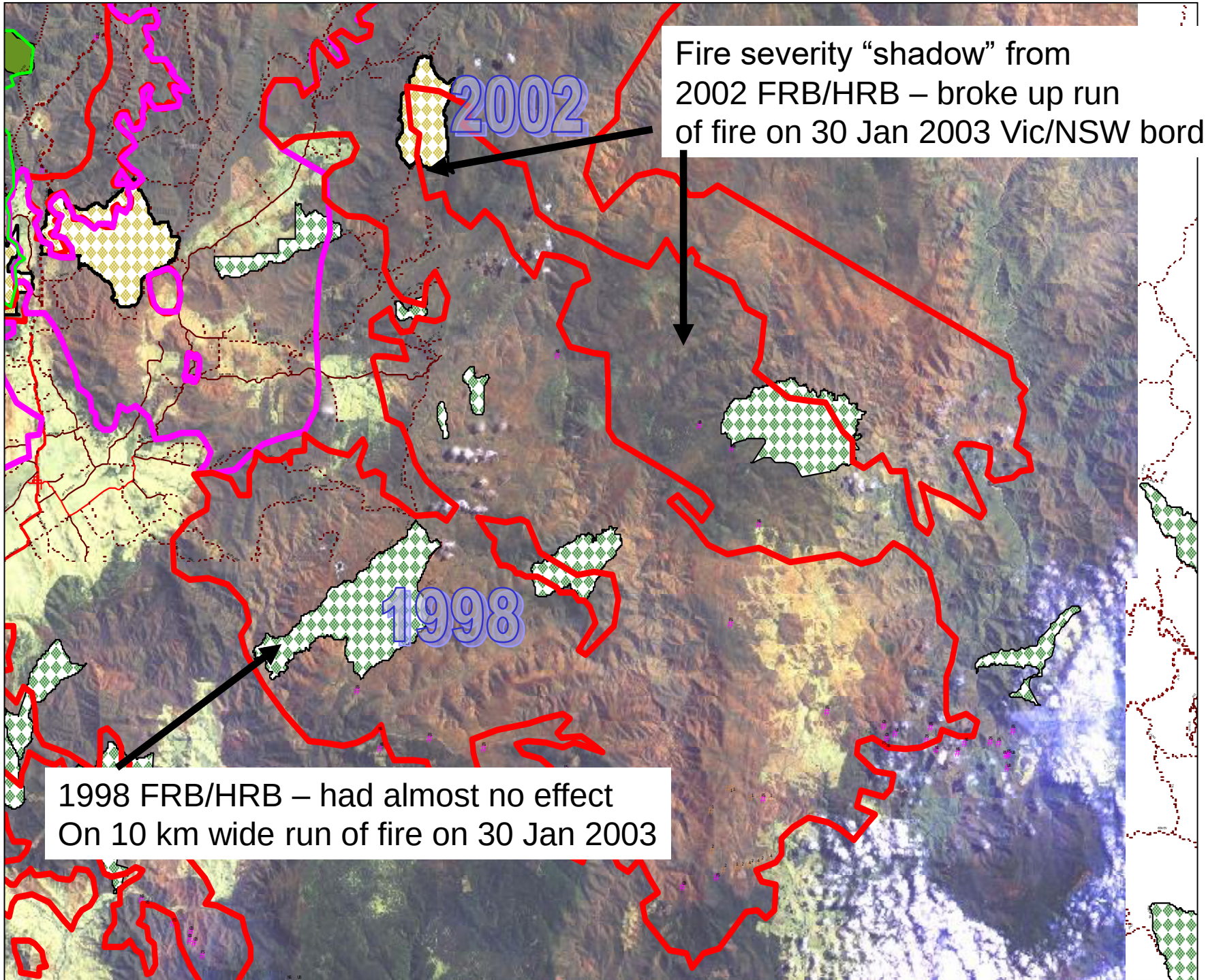
Alpine Fire 2003 Nunniong

Extreme FDI meant (natural) low fuel hazard had little effect in slowing headfire

(Full Crown Scorch)


Alpine Fire 2003
Seldom Seen
Extreme FDI and low canopy height gave
Full Crown Burn


2003 Alpine Fire - FRB Effectiveness Study
Legend
Fire Area 30 Jan 2003
Fire Area 26 Jan 2003
fs03_utm9
Fire Severity
Full Crown Burn
Full Crown Scorch
Partial Crown Scorch
No Crown Scorch
Unburnt
Benambra
Gelantipy
2003 Alpine Fire – Major Runs 30 Jan 2003
570
580
590
600
610
620
630
5930
5920
5910
5900
5890
5880
5870000m N
570000m E
0
10
20
30
40
Kilometres
N


2002
Fire severity “shadow” from
2002 FRB/HRB – broke up run
of fire on 30 Jan 2003 Vic/NSW border
1998
1998 FRB/HRB – had almost no effect
On 10 km wide run of fire on 30 Jan 2003

Fire Severity Project 2003 Alpine Fire Results:

Fire Severity Index (FSI) – 43% of variation in fire severity explained by:

$$FSI = 0.22 + 0.007 * FDIwt + 0.05 \ln FIREage - 0.12 * AspectNW$$

(n=142, p<0.001, $r^2 = 0.4343$)

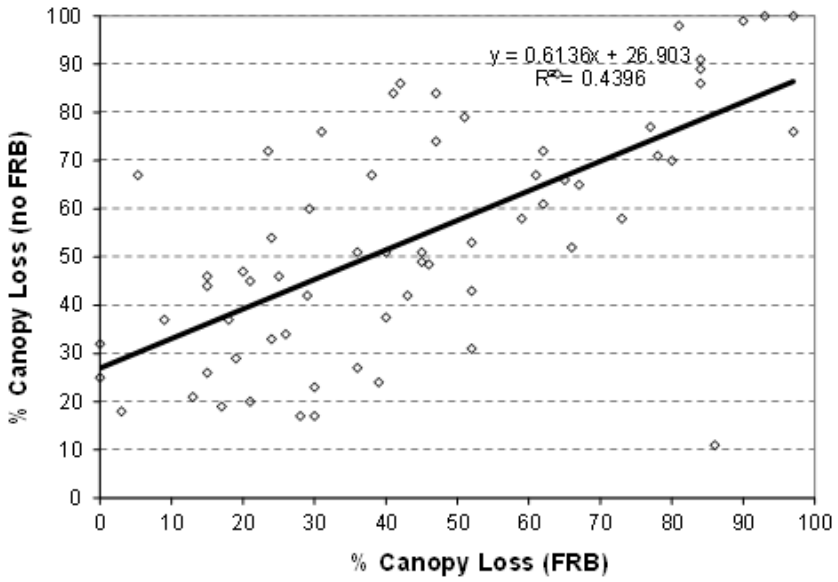
where: ***FSI*** = Fire Severity Index

FDIwt = weighted Forest Fire Danger Index

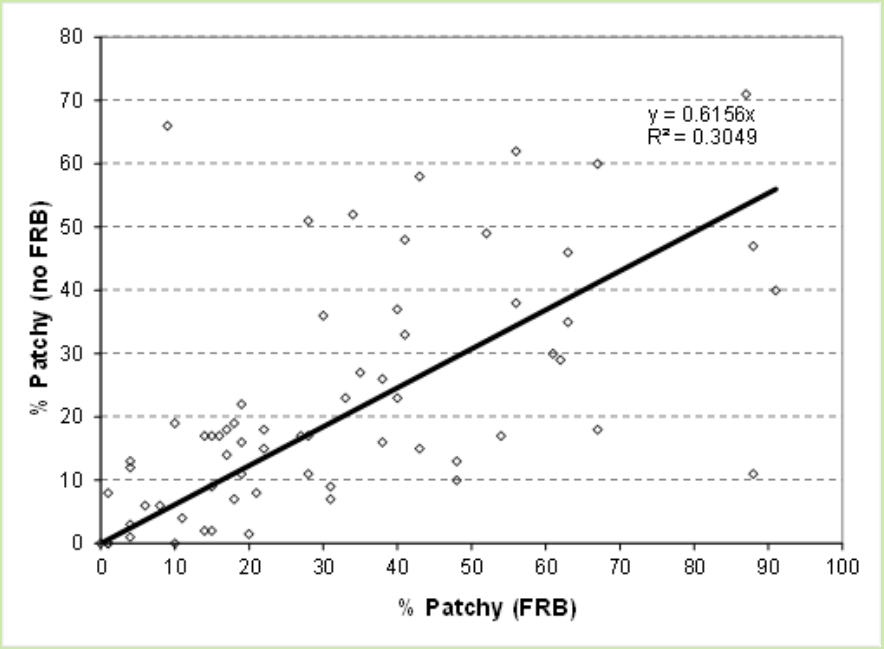
FIREage = time since last fire in area (yrs)

AspectNW = proportion of area with a northerly or westerly aspect

Ecological outcomes:
- Canopy Loss – less where FRB present



Ecological outcomes:
- Patchiness – greater where FRB present



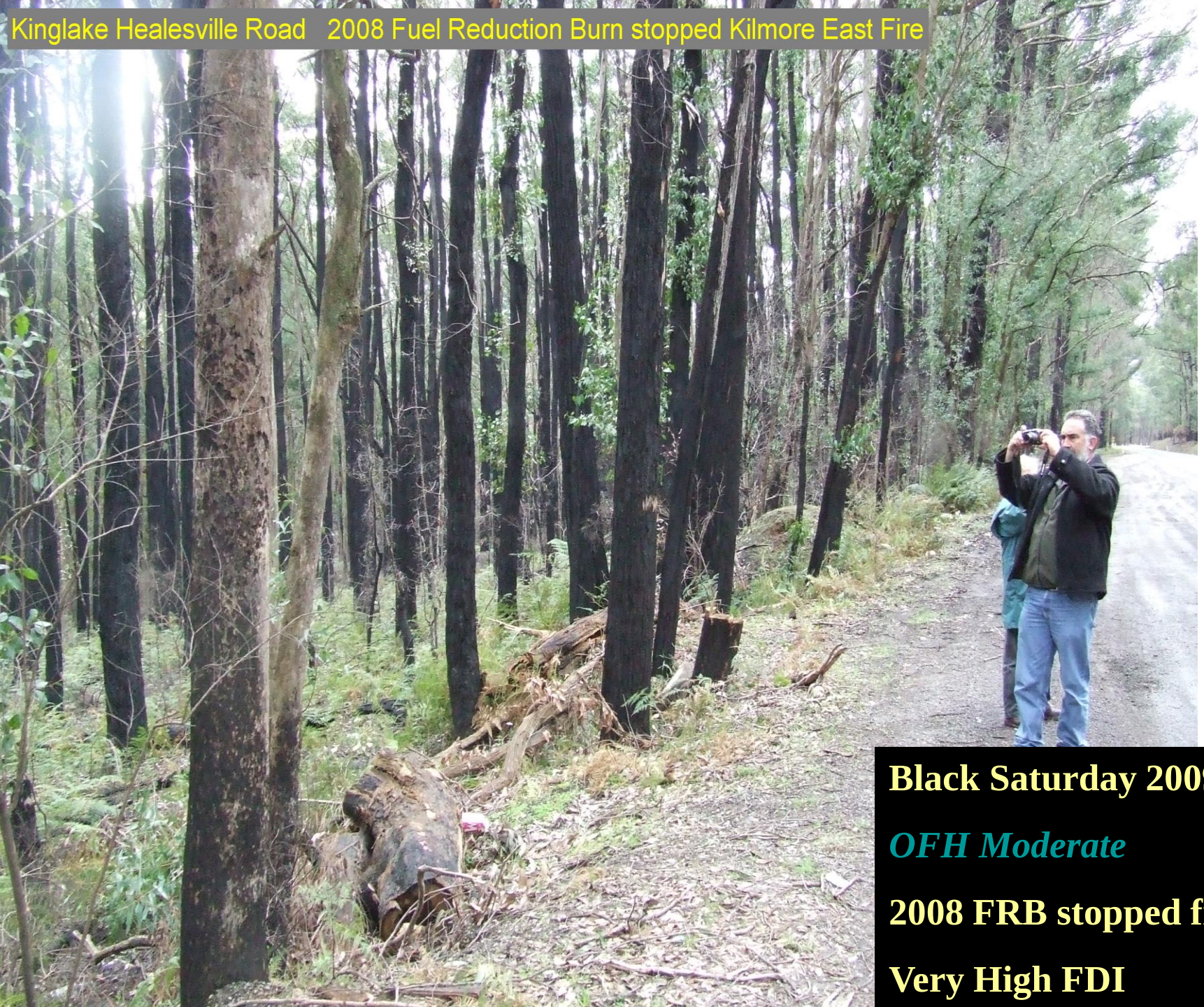
Fire Severity Project 2003 Alpine Fire

Results:

FRB most effective in *first three years*,
some effect to 9-10 years - Bark and Shrubs

FDI on burn day – big, bad days FDI 50+
fire is *"weather dominated"* –
fuel (FRBs) and topography much less important

FRB/HRB becomes most effective later during "Blow-up Day" when FDI drops (and following days)



Black Saturday 2009

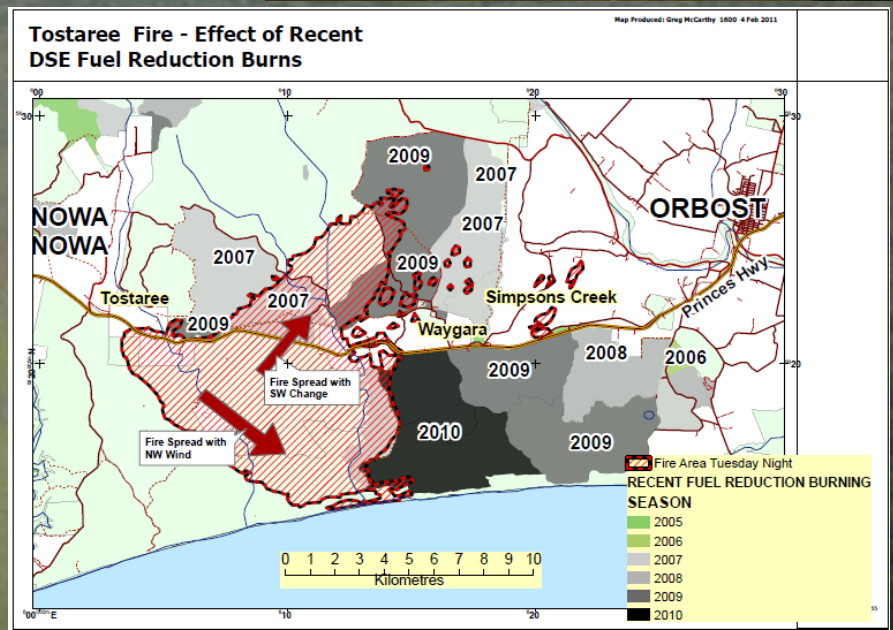
OFH Moderate

2008 FRB stopped fire at

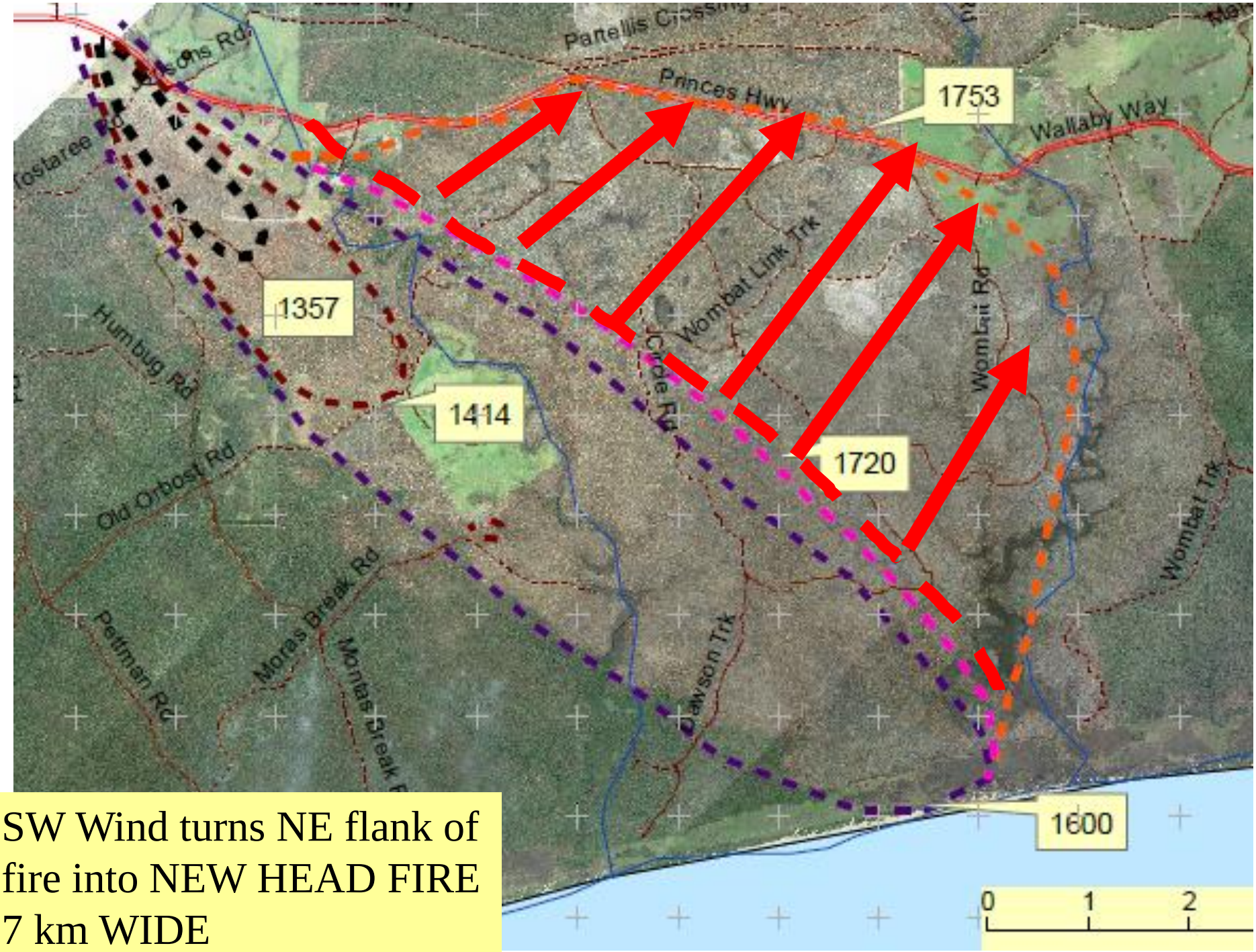
Very High FDI


Kinglake Healesville Road 2008 Fuel Reduction Burn stopped Kilmore East Fire
Black Saturday 2009
OFH Moderate
2008 FRB stopped fire at
Very High FDI

FAST FORWARD to 2011 – TOSTAREE FIRE Eastern Victoria



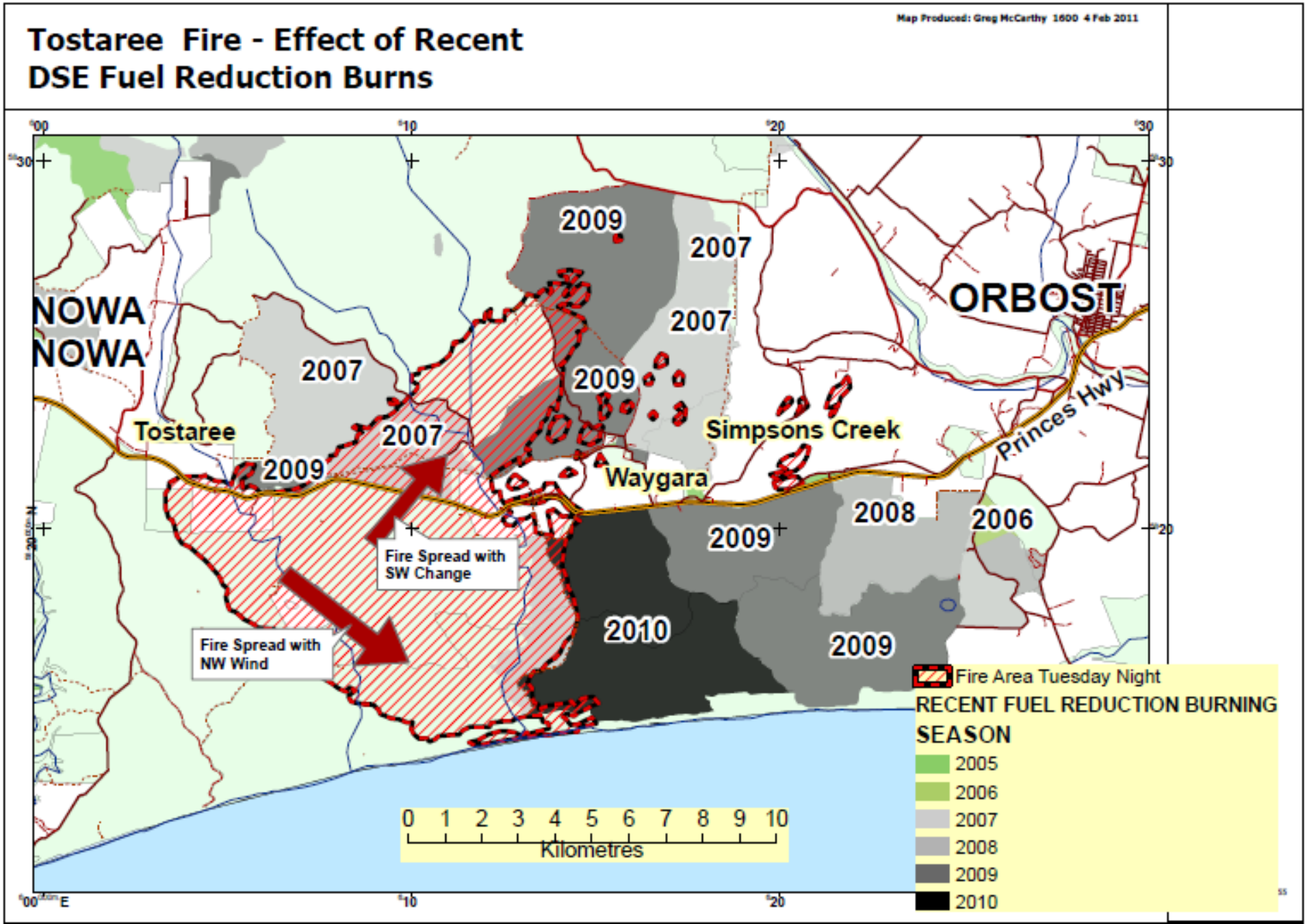
Fire has reached coast at 1610



SW Wind turns NE flank of fire into NEW HEAD FIRE 7 km WIDE

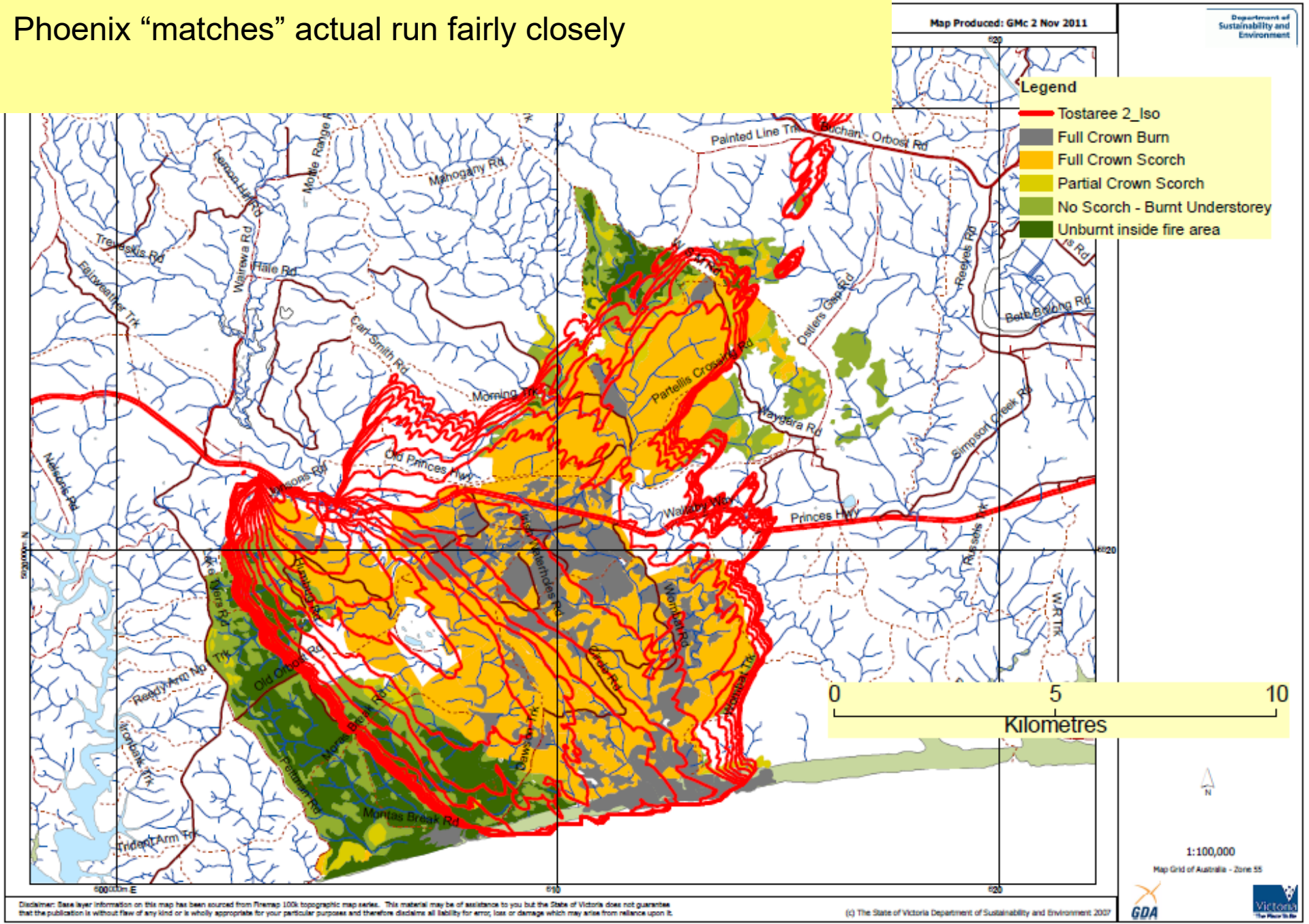

Tostaree Fire - 18:01 1 Feb 2011 Very strong convection developing above fire.
- Pyro-Cumulus - effect of moist air adding "latent heat of vapourisation" to convective uplift
Fire at surface has already run to NE out to Wombat Creek PP
Photo : Frank Flynn, Lake Tyers Beach
1/02/2011 18:01

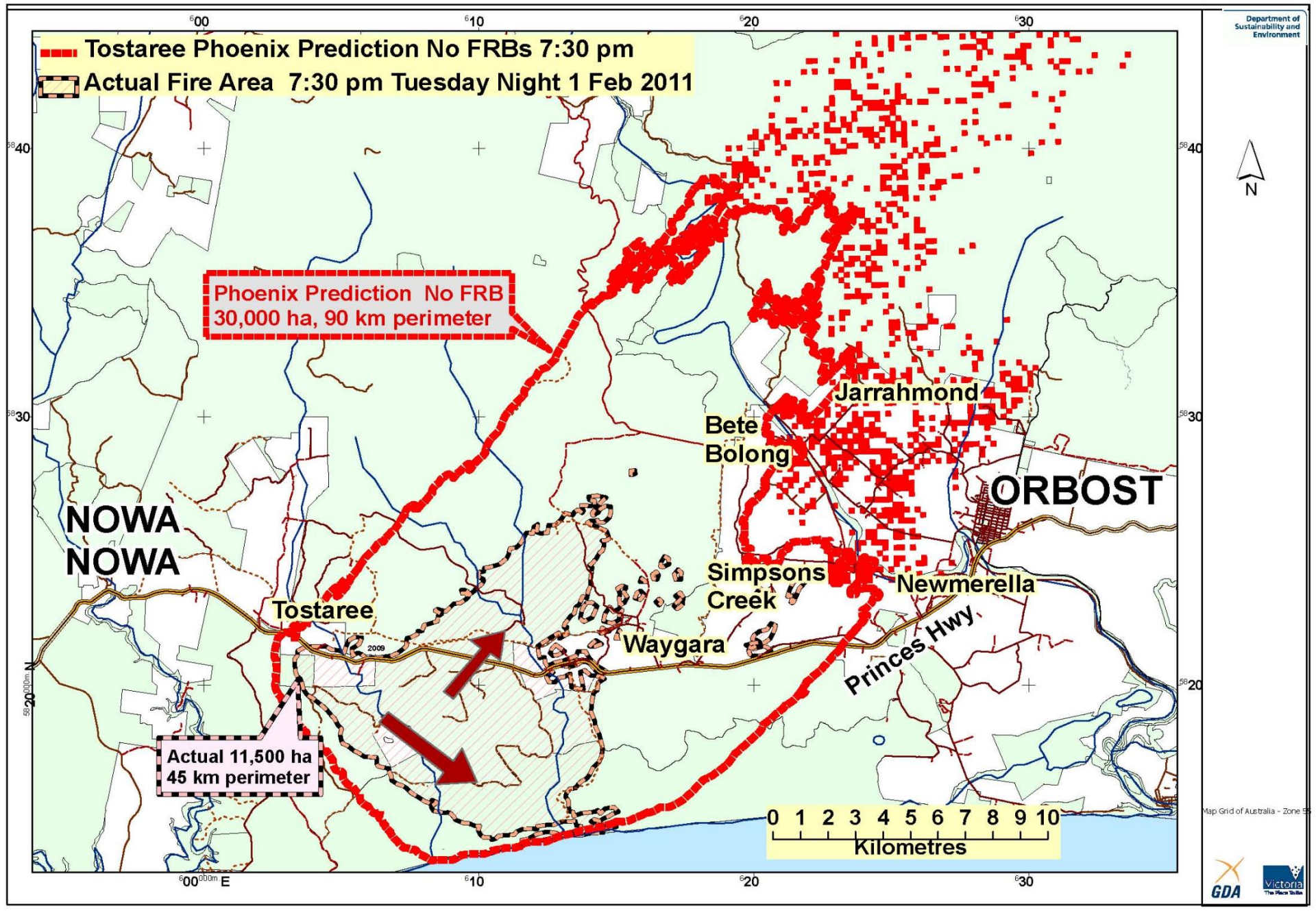
Tostaree Feb 2011



Phoenix Fire Behaviour Model Run – Nov 2011

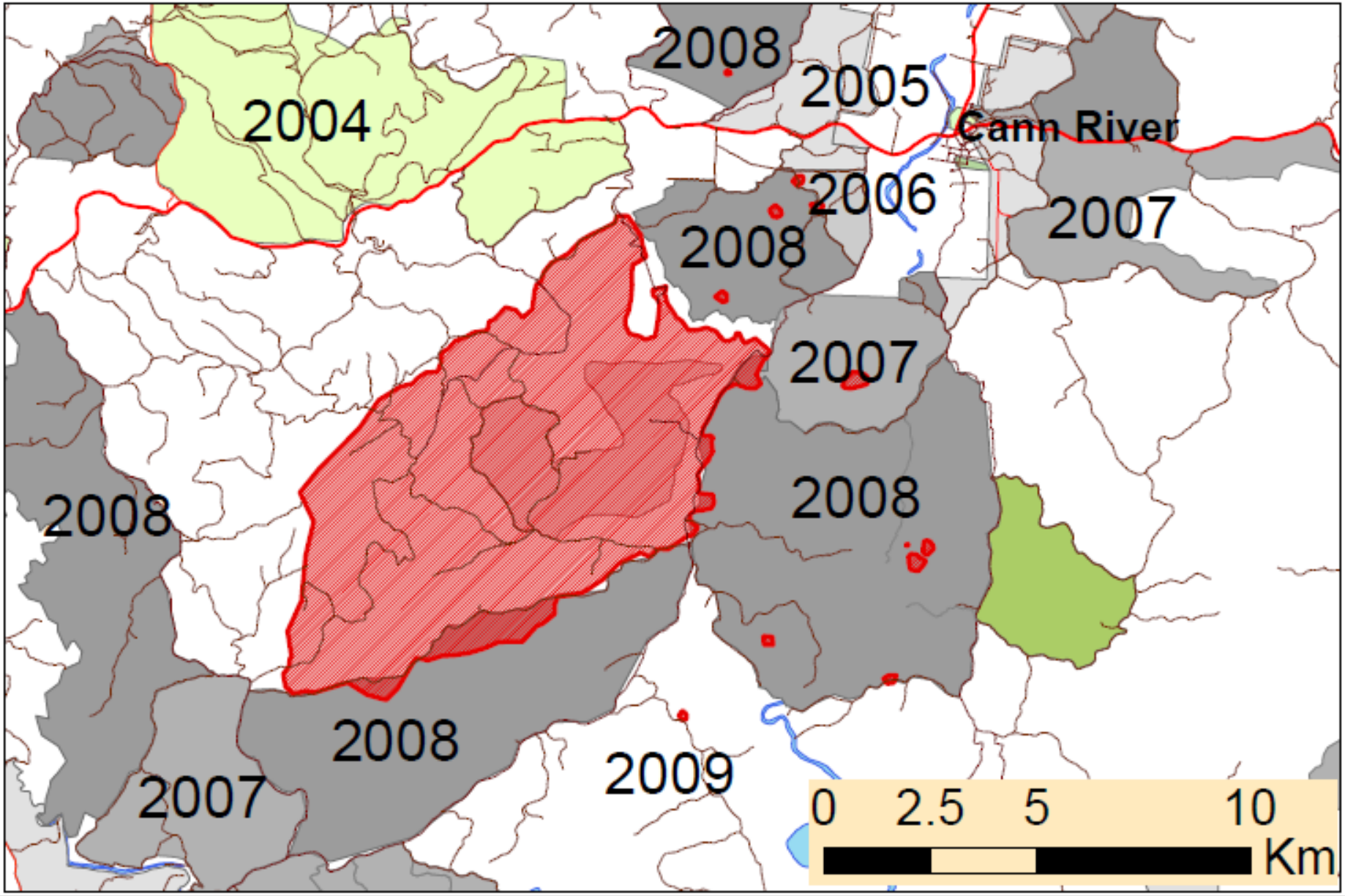
Phoenix “matches” actual run fairly closely

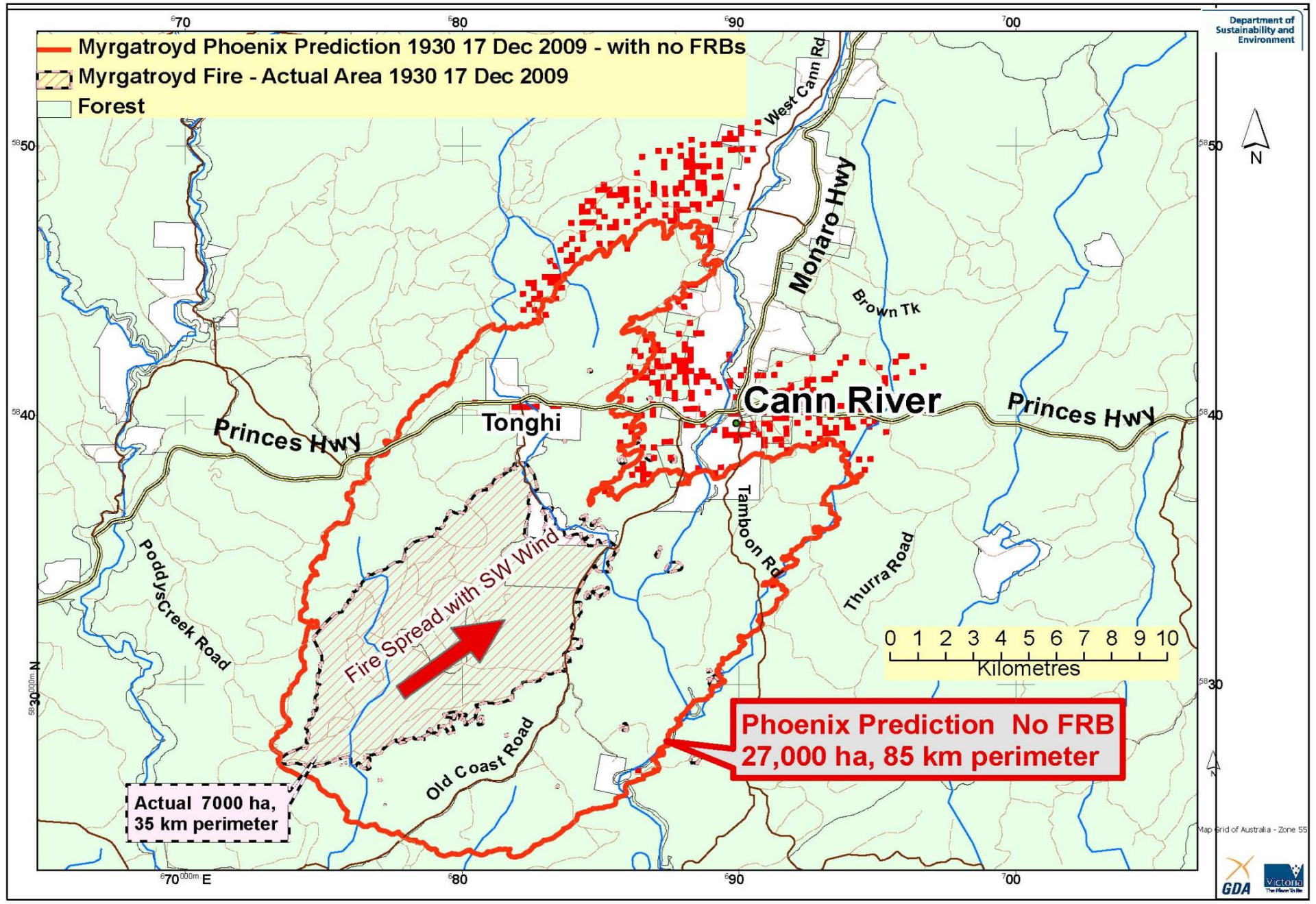



Tostaree Phoenix Prediction No FRBs 7:30 pm
Actual Fire Area 7:30 pm Tuesday Night 1 Feb 2011
Phoenix Prediction No FRB
30,000 ha, 90 km perimeter
Actual 11,500 ha
45 km perimeter
Jarrahmond
Bete
Bolong
ORBOST
NOWA
NOWA
Simpsons
Creek
Newmerella
Tostaree
Waygara
Princes Hwy
2009
0 1 2 3 4 5 6 7 8 9 10
Kilometres
N
Department of Sustainability and Environment
Map Grid of Australia - Zone 55
GDA
Victoria
The Place To Be

Fire 1354 SW wind pushing fire strongly to NE - upper cloud from SW change moving in – fuels still dry - 2-3 hours to react to RH change

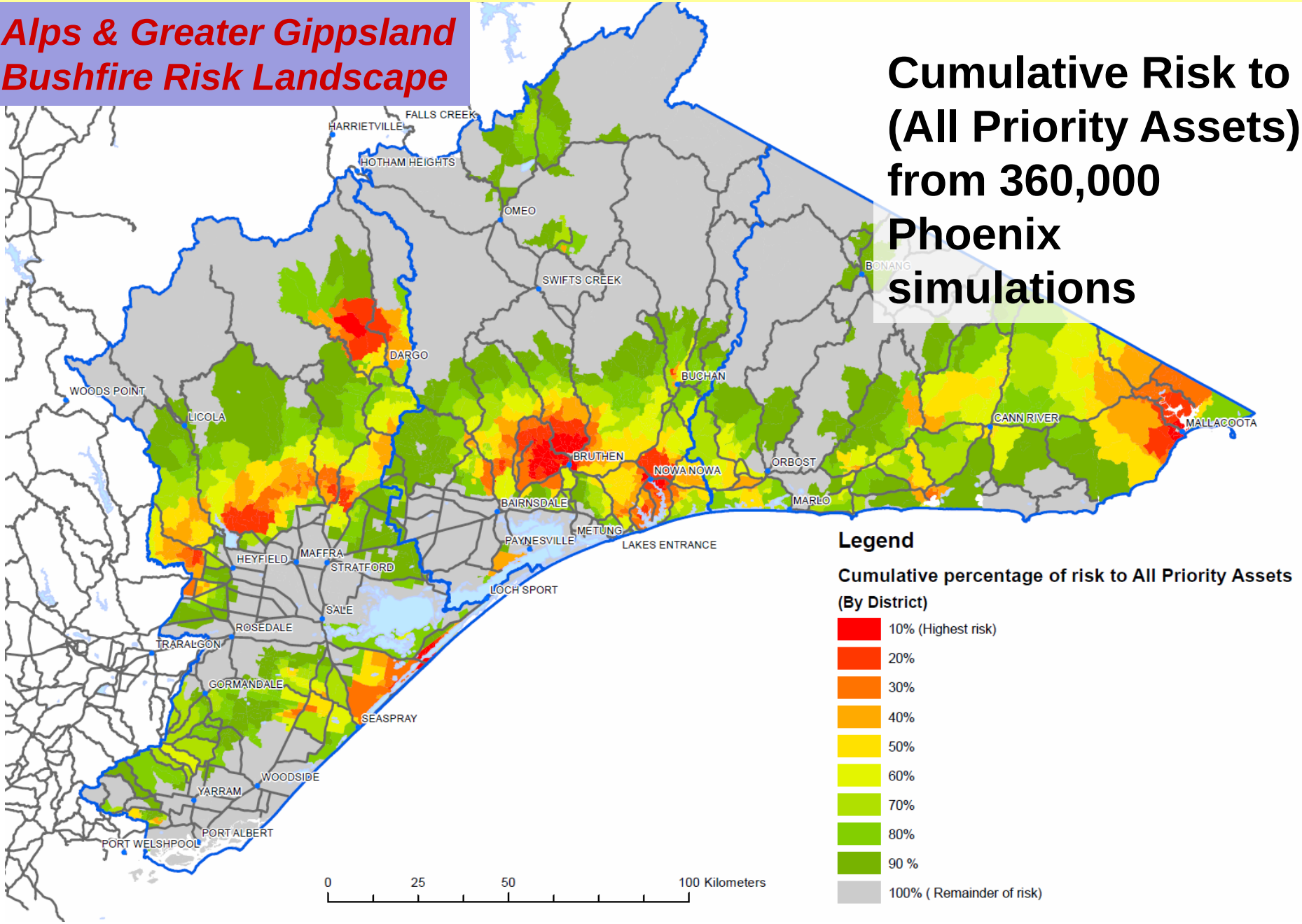
Cann River Fire 17 Myrgatroyd Tk - Fire Area and Recent Fuel Reduction Burns




Myrgatroyd Phoenix Prediction 1930 17 Dec 2009 - with no FRBs
Myrgatroyd Fire - Actual Area 1930 17 Dec 2009
Forest
Department of Sustainability and Environment
West Cann Rd
Monaro Hwy
Brown Tk
Cann River
Princes Hwy
Tonghi
Princes Hwy
Tamboon Rd
Thurra Road
Poddys Creek Road
Fire Spread with SW Wind
Old Coast Road
0 1 2 3 4 5 6 7 8 9 10
Kilometres
Phoenix Prediction No FRB
27,000 ha, 85 km perimeter
Actual 7000 ha,
35 km perimeter
N
Map Grid of Australia - Zone 55
GDA
Victoria

FAST FORWARD to 2016 – BRL Phoenix Simulations E.Victoria

Alps & Greater Gippsland Bushfire Risk Landscape



Cumulative Risk to (All Priority Assets) from 360,000 Phoenix simulations

FRB/HRB of low intensity/severity
only partially consuming surface and elevated fuels. Almost no consumption of bark fuels

Remaining surface fuel after low intensity/severity FRB/HRB

Same burn done properly 5 years later

- bark and shrub fuels burning

FAST FORWARD to 2016 – Bemm River Eastern Victoria

It doesn’t always have to be BURNING! – Mechanical Fuel Modification

Summary of FRB Effectiveness:

1) **FRB helps most at FDIs < 25**

(NB Most suppression happens at FDI 25 or less)

2) **MOST EFFECTIVE FRBs remove *shrubs* and *bark***

3) **Most effective in FMZ 1 (APZ) and FMZ 2 (SWMZ), where burn rotation < 7-8 years**

4) **Above FDI 50 - fires become "weather-dominated" – fuel and slope less important**

may run thru even recent FRBs

Recommendations

Don't "fluff about" with trickling FRBs/HRBs if you want them to be useful the next time "the bloody big fire" comes along (esp FMZ 1 or 2, APZ/SBMZ)

Very important under all conditions to:

***catch fires early at first attack* – and**

***attack later on "Blow-up Day" when FDI reduced**

- presence of FRB/HRB will assist this