Fire Impact & Risk Evaluation Decision Support Tool

FireDST: Probabilistic Simulation of Fire Spread and Impact

AFAC Science Day 2/9/2013

Ian French Australian Government, Geoscience Australia

CRC Australia

THE UNIVERSITY OF MELBOURNE

Australian Government Bureau of Meteorology

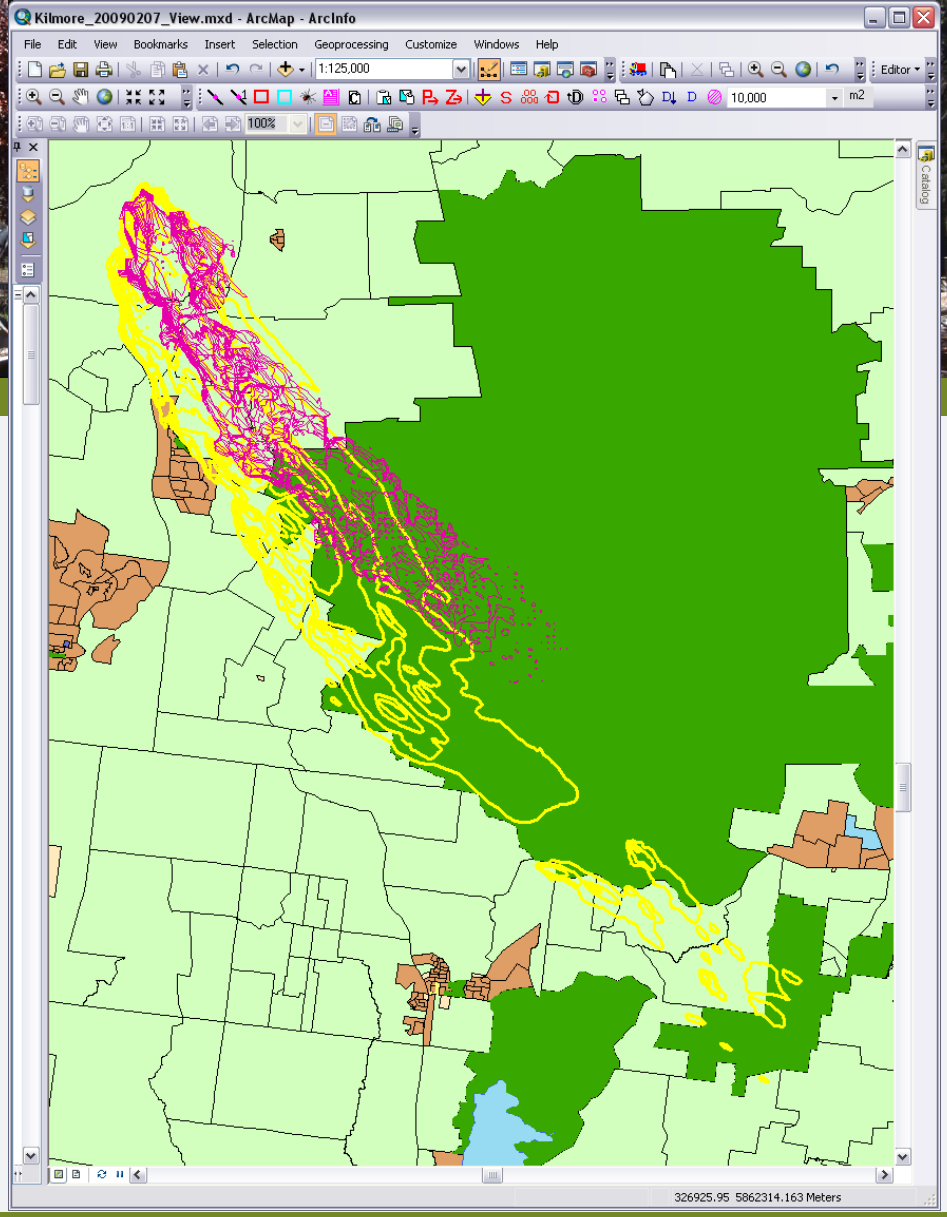
CSIRO

Australian Government Geoscience Australia

Single deterministic simulation of fire spread

Phoenix fire simulator
Purple:
ACCESS 3600m horizontal weather Model with Time step 15 minutes
Bias corrected 10 meter wind speed
Simulation to 16:45

Yellow: Kilmore fire Reconstruction to 16:45



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FireDST Data Model

Components by participant

Bureau of Met. new numerical interpolated weather model – 3 horizontal res & vertical dimension

Uni Melbourne –improved Phoenix

Geoscience Australia conversion of landscape fire spread to local fire spread information

Geoscience Australia Probabilistic fire spread model (BFIM)

Geoscience Australia Weather time steps, Bias correction (wind strength) and weather scenarios

Geoscience Australia M3 wind modification for local wind speed based on high-res terrain and veg.

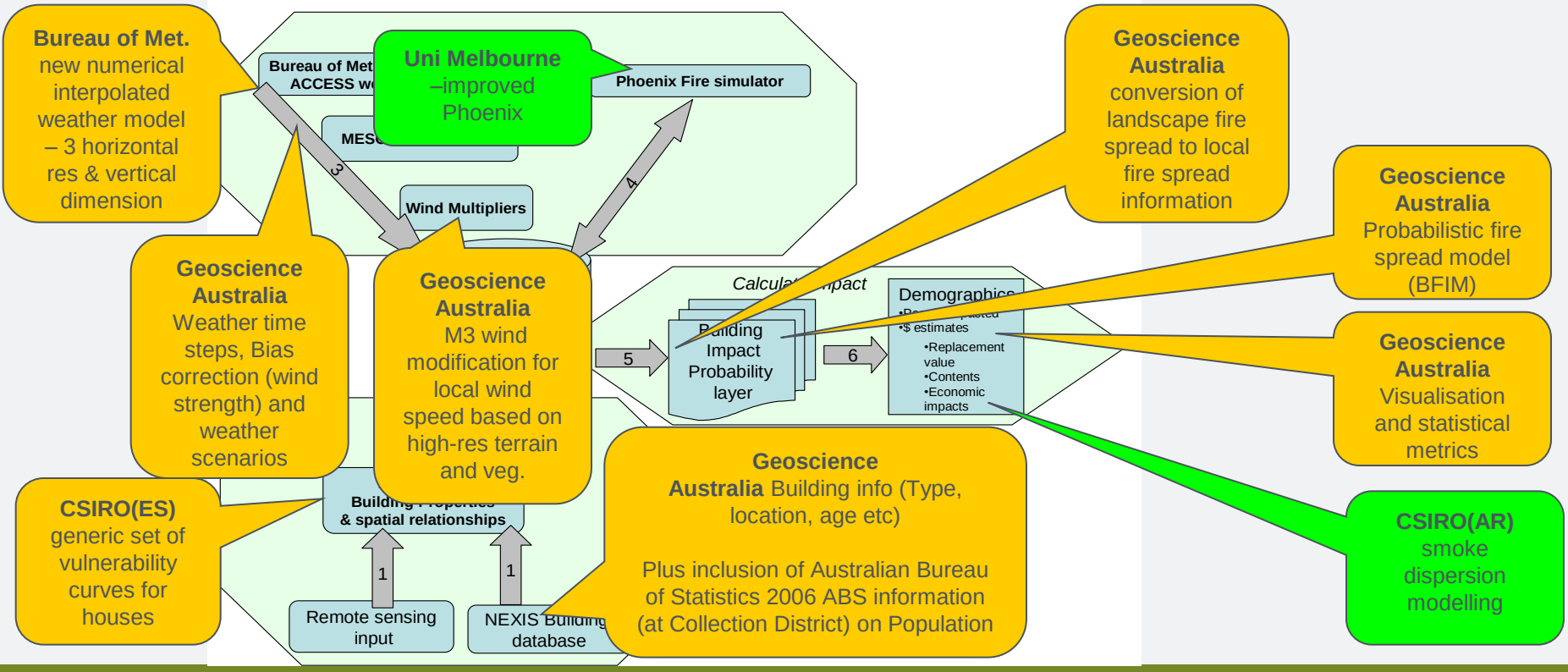
Geoscience Australia Visualisation and statistical metrics

CSIRO(ES) generic set of vulnerability curves for houses

Geoscience Australia Building info (Type, location, age etc)

Plus inclusion of Australian Bureau of Statistics 2006 ABS information (at Collection District) on Population

CSIRO(AR) smoke dispersion modelling



Animation of Kilmore Temperature Provided by ACCESS model running at

400m grid and 4 minute time steps

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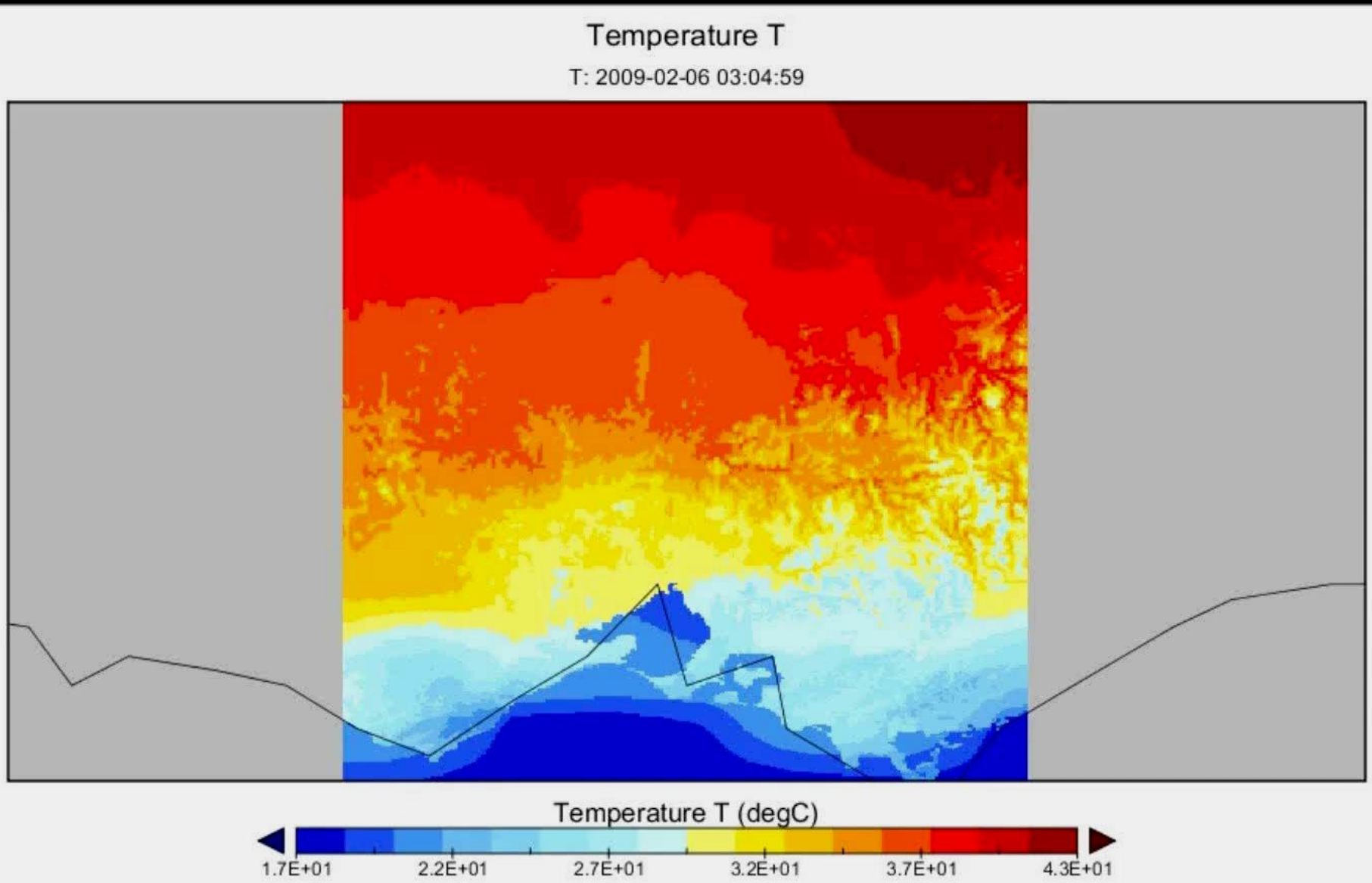
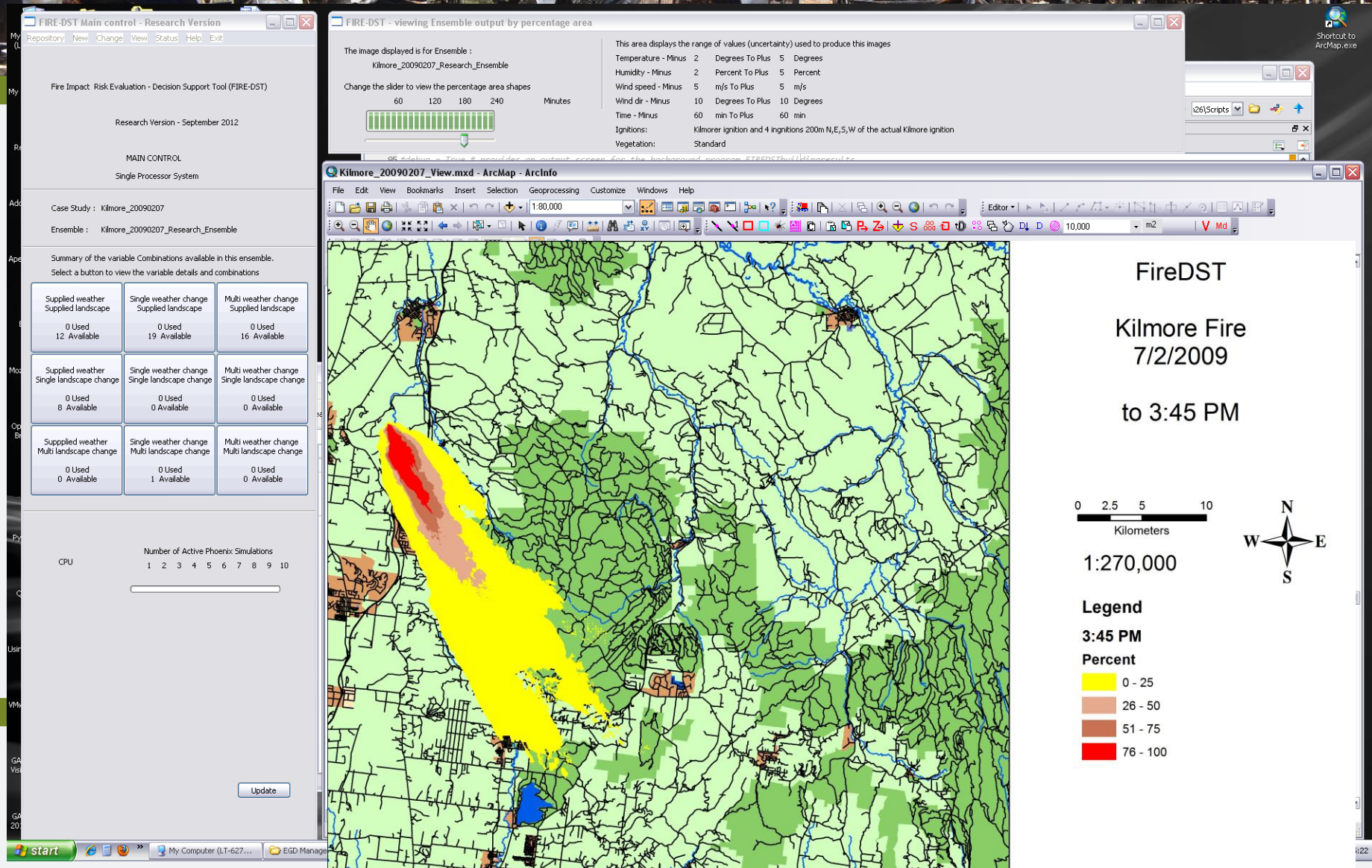
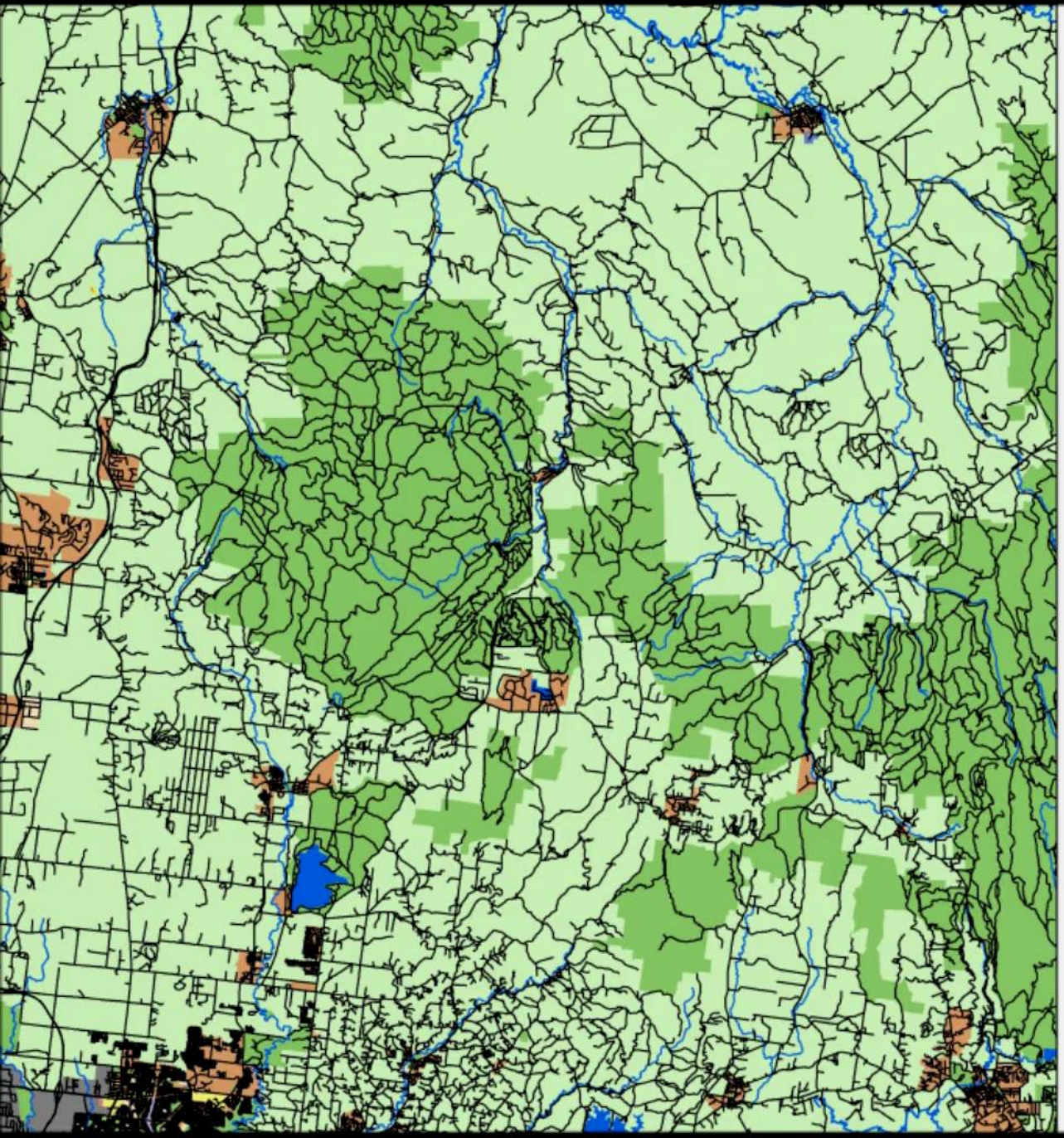

Temperature T
T: 2009-02-06 03:04:59
Temperature T (degC)
1.7E+01
2.2E+01
2.7E+01
3.2E+01
3.7E+01
4.3E+01

FireDST

Probabilistic view of the Kilmore ensemble for 4 hours after ignition



Animation of Kilmore Fire



FireDST

Kilmore Fire
7/2/2009

to 12:00 Noon

0 2.5 5 10

Kilometers

1:270,000

N

W E

S

Legend

12:00 NOON

Percent

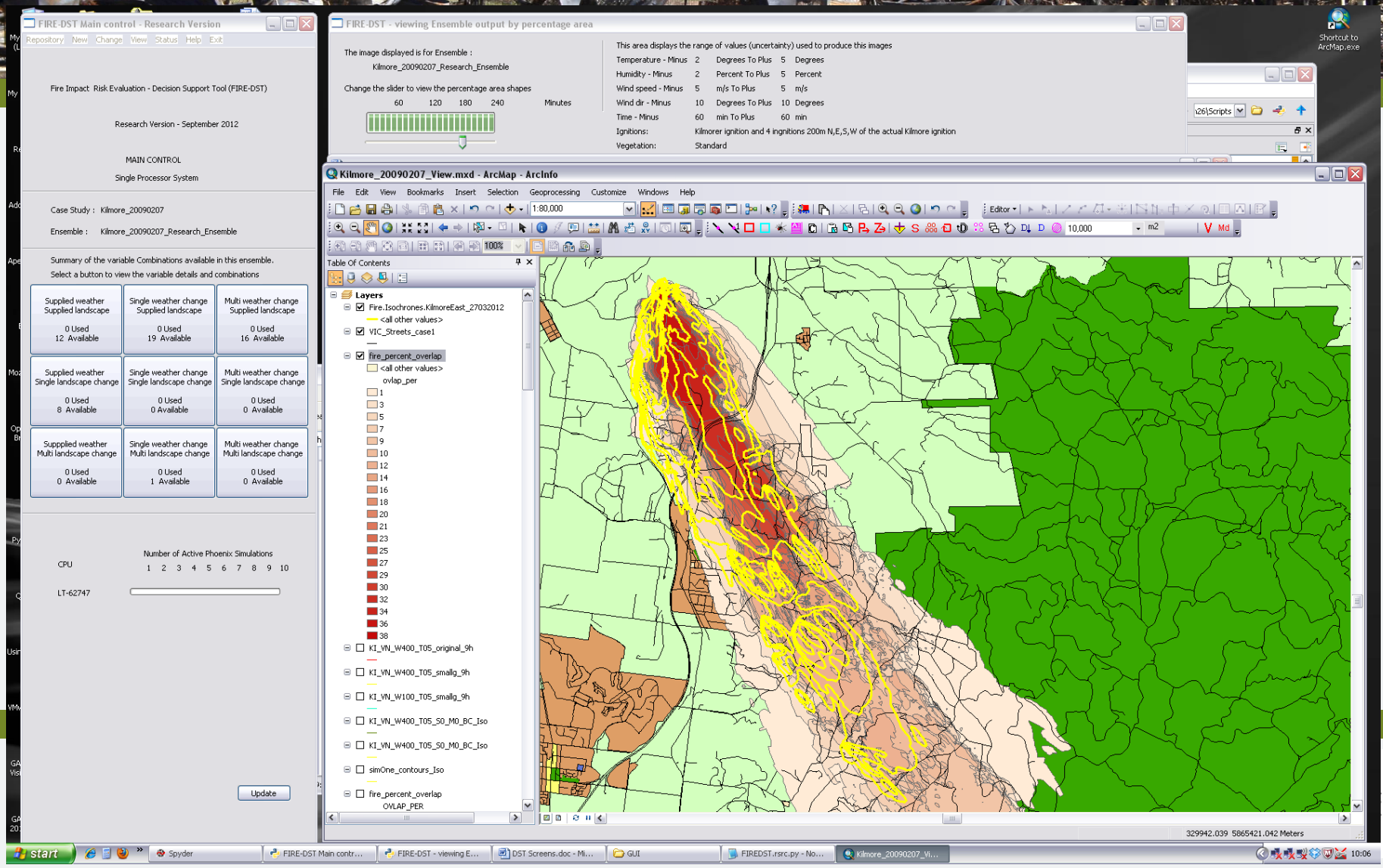
- 0 - 25
- 26 - 50
- 51 - 75
- 76 - 100

Uses
30 member Active Fire Ensemble

Map produced by:
Geoscience Australia

FireDST

Comparison of ensemble at 4 Hours with reconstruction fire isochrones



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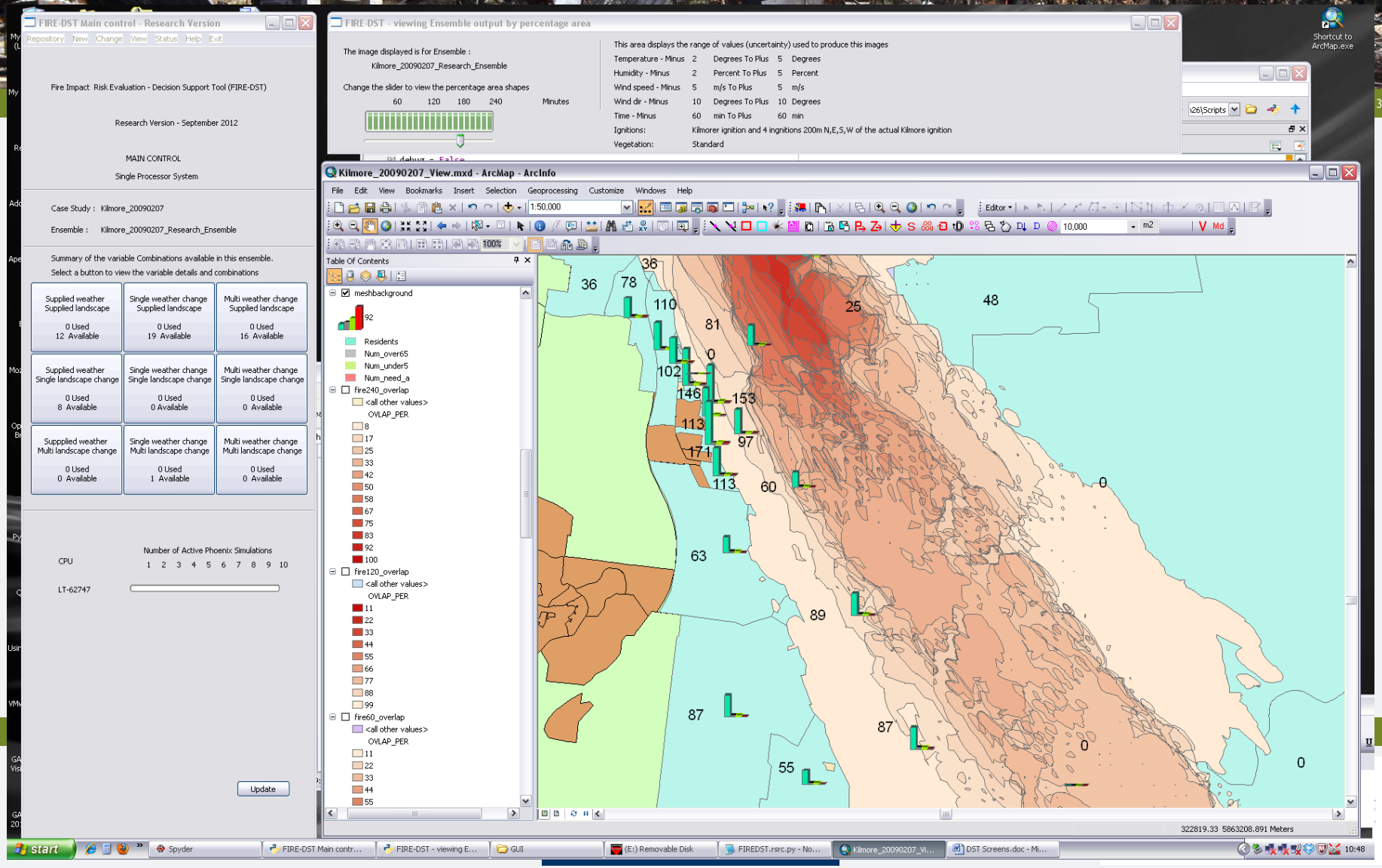
Impact Estimate: people, people over 65, under 5 and in need of assistance



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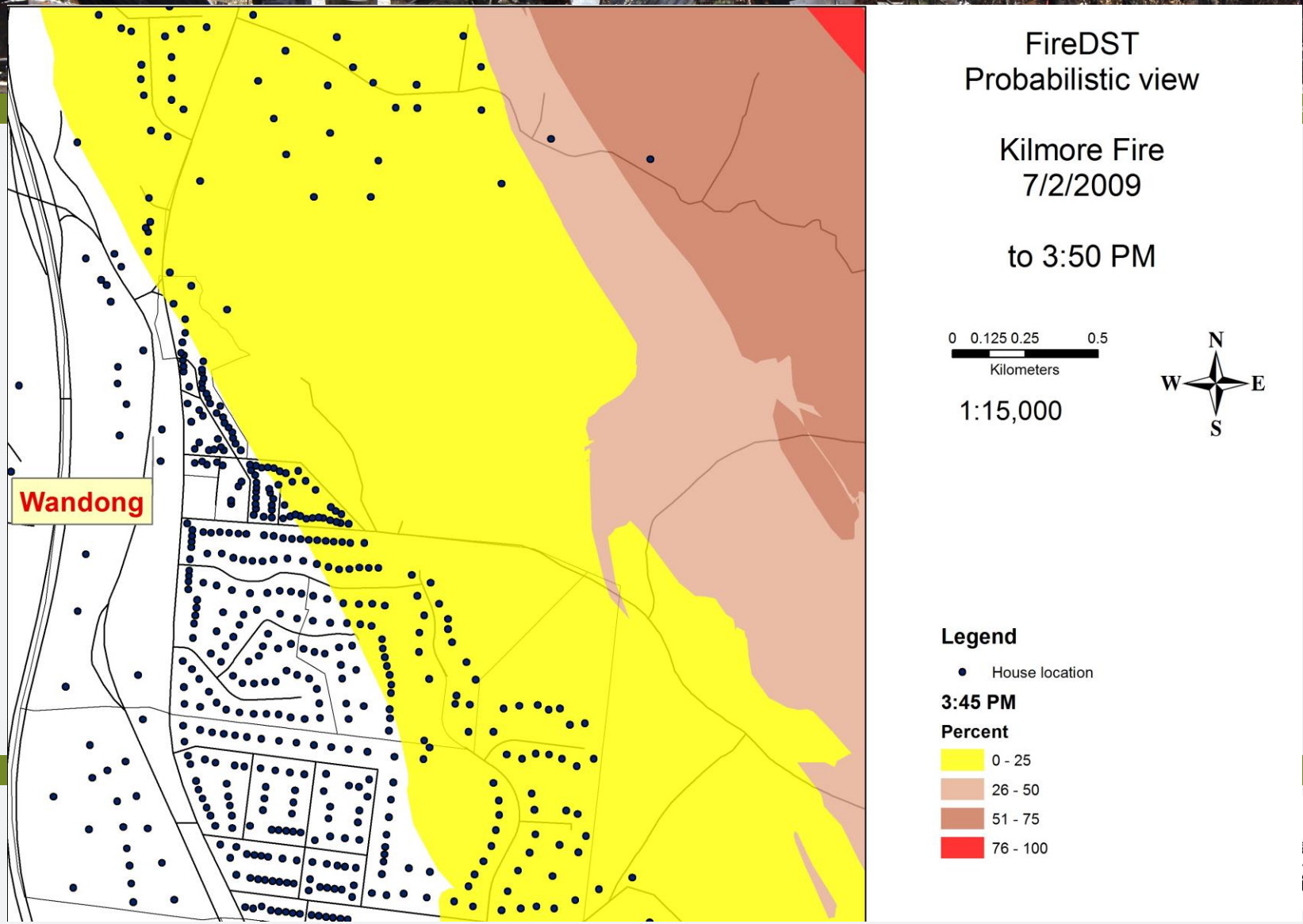
Impact Estimate: Potential House Impact



FireDST

Impact Estimate: Exposure statistics

FIRE-DST - viewing Ensemble EXPOSURE Statistics

These EXPOSURE Statistics are for Ensemble:

Kilmore_20090207_Active_Fire_Ensemble

to 07/02/2009 at 15:45

Impact Area Likelihood %	Houses	People	Building Replacement Value $	Contents Replacement Value $	People Over 65	People Under 5	People Needing Assistance
80-100	3	6	894,736	379,048	0	0	0
60-80	1	3	429,811	182,086	0	0	0
40-60	3	8	1,280,978	542,676	1	1	0
20-40	24	57	9,165,252	3,824,227	4	4	1
<20	455	1243	175,558,054	73,002,033	75	80	36

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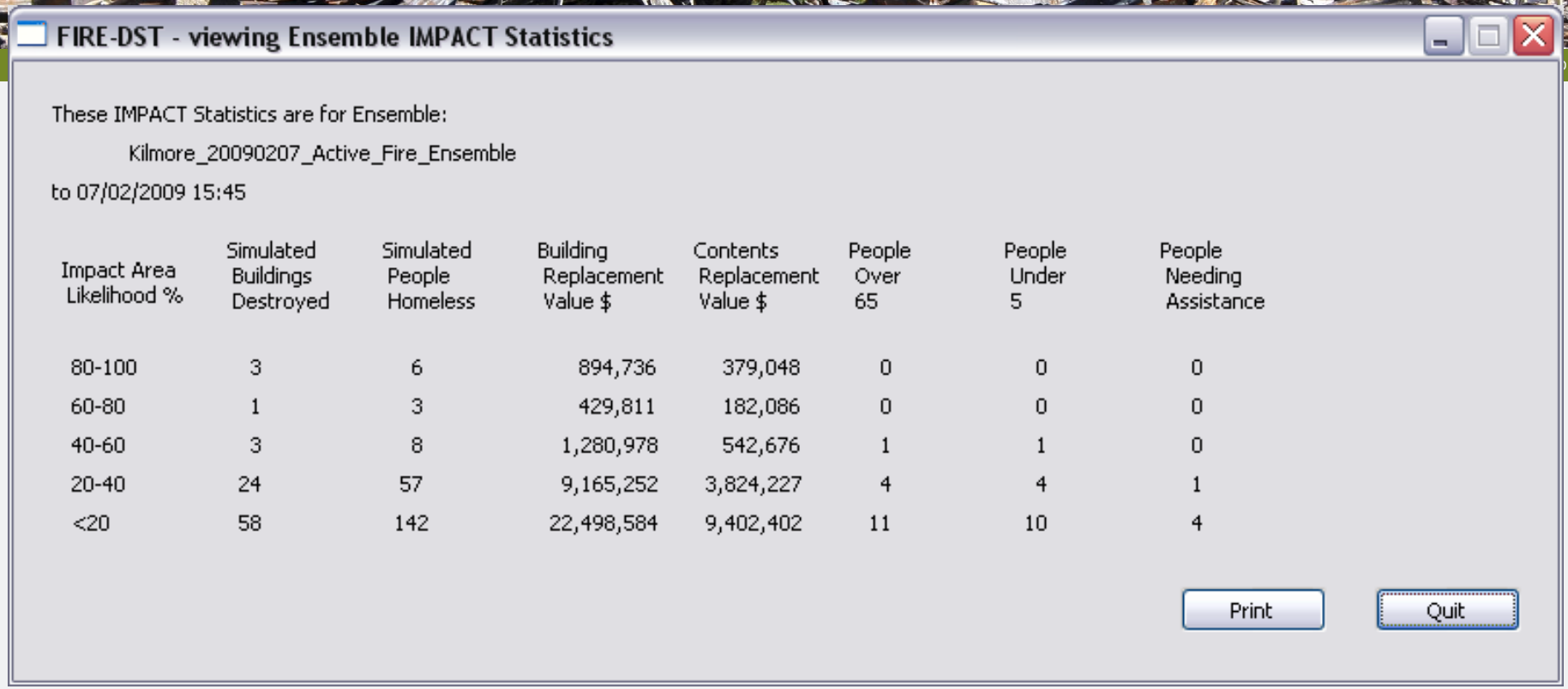
FireDST

Impact Estimate: Simulated Impact statistics



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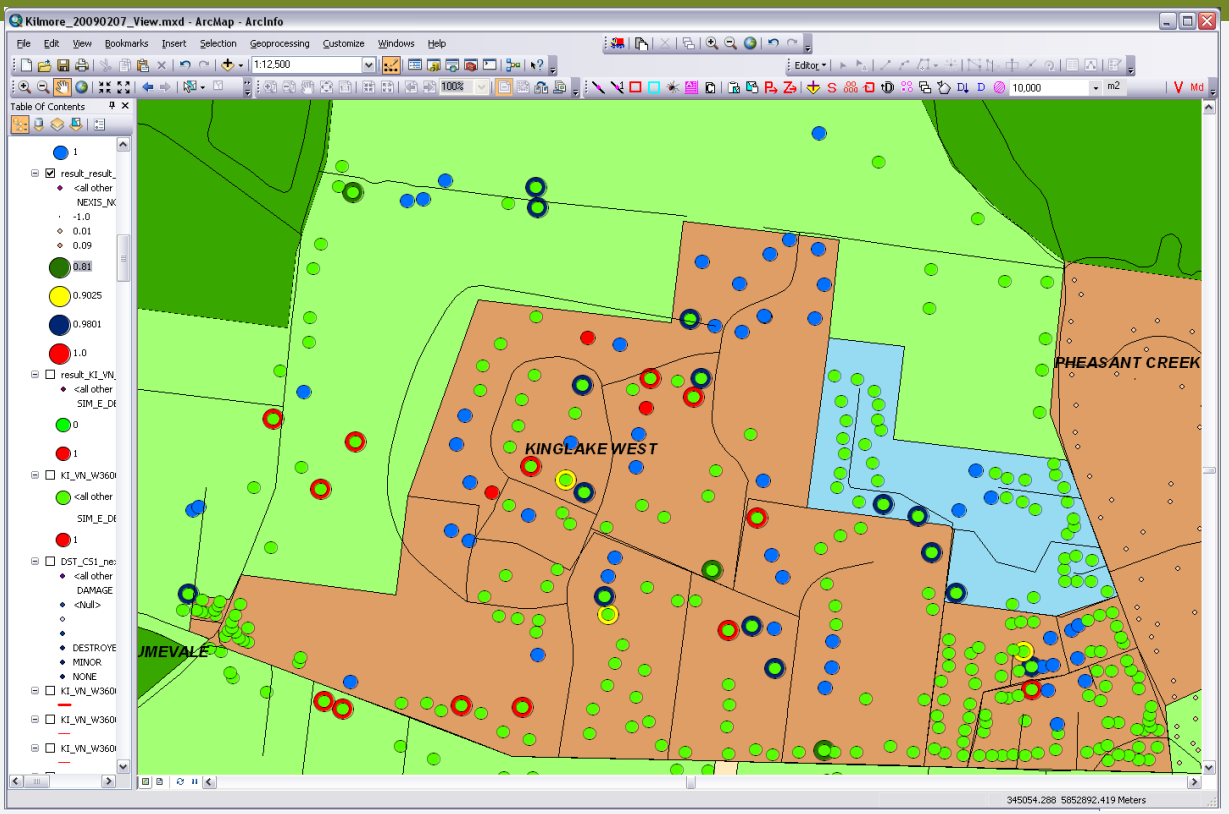
Building Fire Impact Model



Legend

- Undamaged
- Destroyed by Embers
- Destroyed by Radiation

Probable building to building Spread

- 81 %
- 90 %
- 98 %
- 100 %

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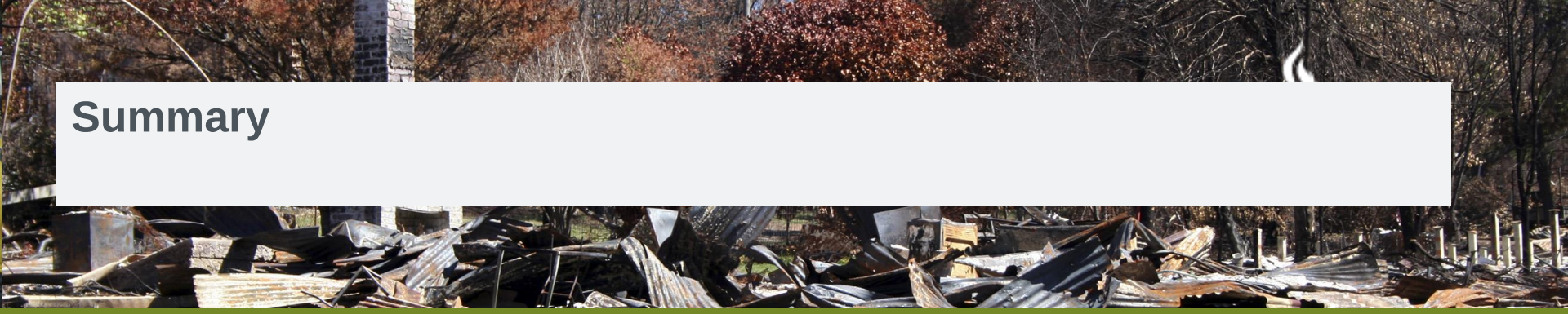
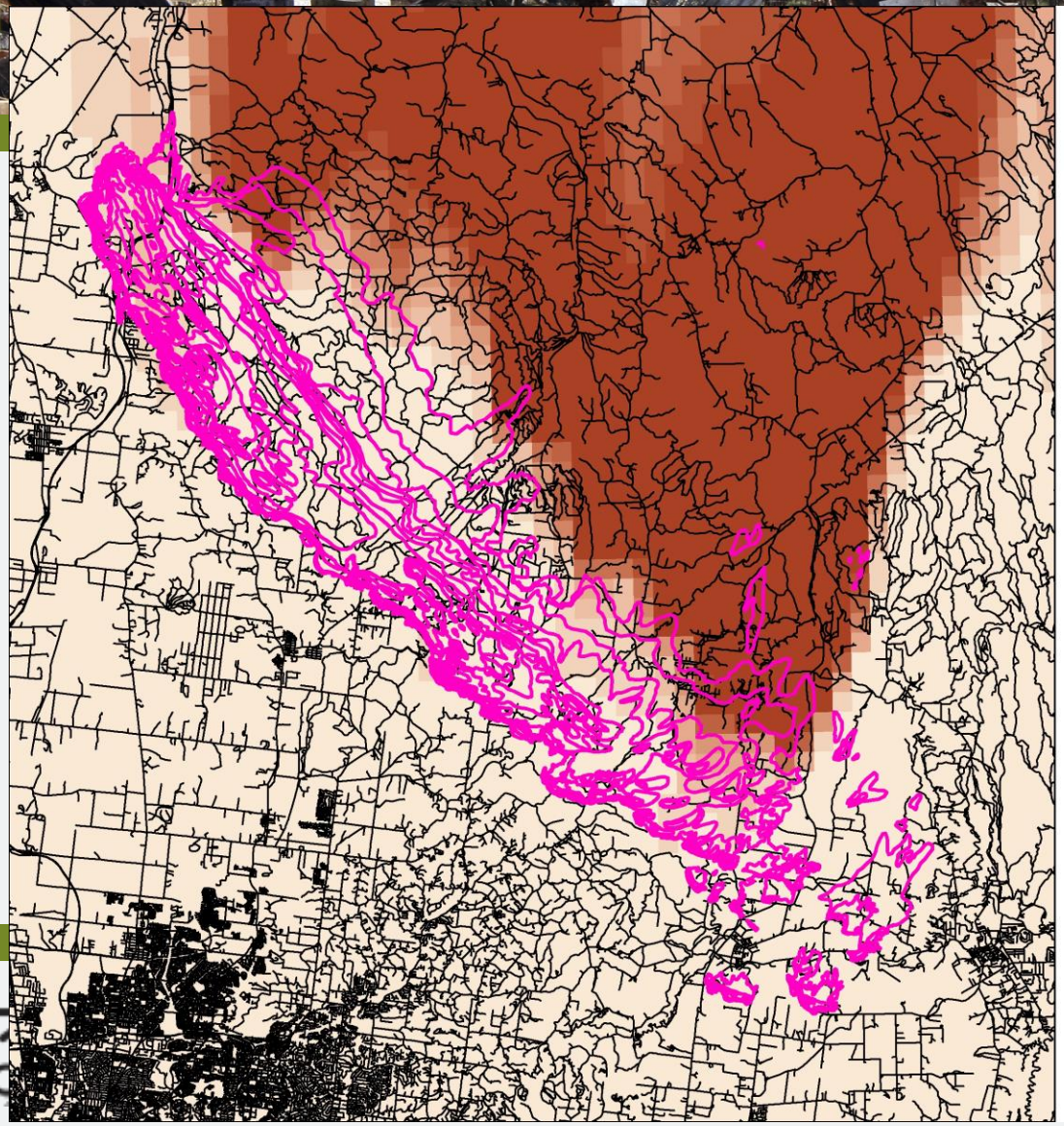


Summary

- Ensemble (scenario) weather modelling to assist in understanding uncertainty associated with extreme events
- Ensemble (scenario) fire spread modelling to aid emergency management resource allocation
- Ensemble (scenario) exposure & “likely impact” modelling to aid emergency management resource prioritisation
- Smoke modelling to aid visibility (fire-fighting) and evacuation considerations for operational logistics

FireDST
Smoke Impact



FireDST
Smoke dispersion
Simulation

Kilmore Fire

7/2/2009

for 7:00 PM

0 2.5 5 10
Kilometers

1:270,000

N
W E
S

Legend

PM25_2009020719.img

<VALUE>

- 7.98- 92.23
- 92.24 - 176.48
- 176.49 - 260.73
- 260.74 - 344.98
- 344.99 - 429.23
- 429.24 - 513.48
- 513.49 - 597.72
- 597.73 - 681.97
- 681.98 - 766.23
- 766.24 - 850.47

Produced by:
Geoscience Australia and CSIRO-AR

End of Presentation

Thankyou