Economic Analysis of Bushfire Management Programs: A Western Australian Perspective

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The University of Western Australia

CRC

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Diverse country. Common ground.

Outline

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Why apply economics to fire management?

Bushfire economics literature

Economic model

Application to a synthetic landscape

Results

Sensitivity Analysis

Conclusion

Why apply economics to fire management

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Why economics?

Why apply economics to fire management

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What are the implications of different uses of limited human and financial resources?

How do we maximise social welfare?

Why economics?

What proportion of our efforts should be allocated to different fire management activities?

Bushfire economics

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The bushfire economics literature

Bushfire economics

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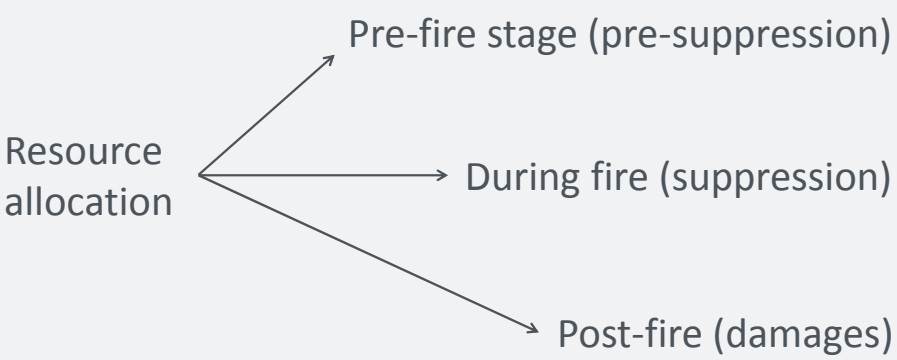

Bushfire economics

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United States

Australia

Spain

Chile

Bushfire economics

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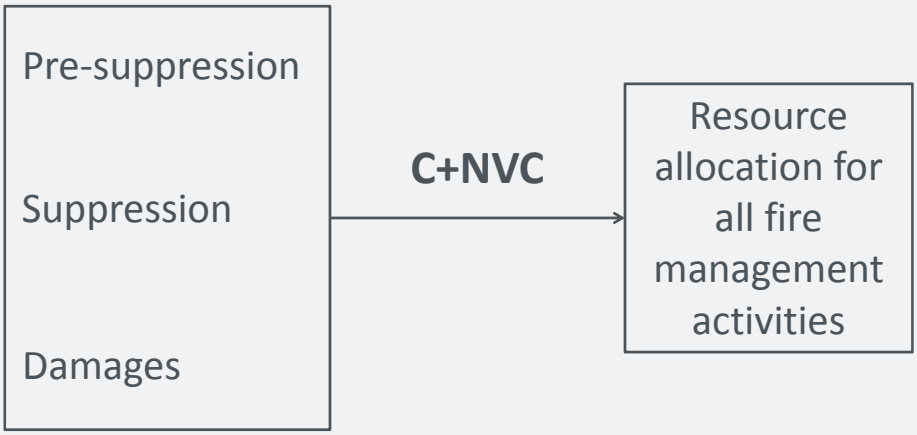
Pre-suppression	• Costs of prescribed burning ($/ha) • Costs of other fuel reduction treatments • Cost effectiveness of prescribed
Suppression	• Resource allocation for different fire-fighting equipment • Use of new technologies • Effect of the wildland-urban
Damages	• Costs of bushfires (financial) • Costs of bushfires (intangibles) • Compare costs of bushfires with costs of other natural disasters

Bushfire economics



The economic model

The Cost plus Net Value Change

The economic model

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The Cost plus Net Value Change

- Cost-benefit analysis
- The most efficient level of pre-suppression effort
- Minimise sum of costs plus net damages
- For a given year

The economic model

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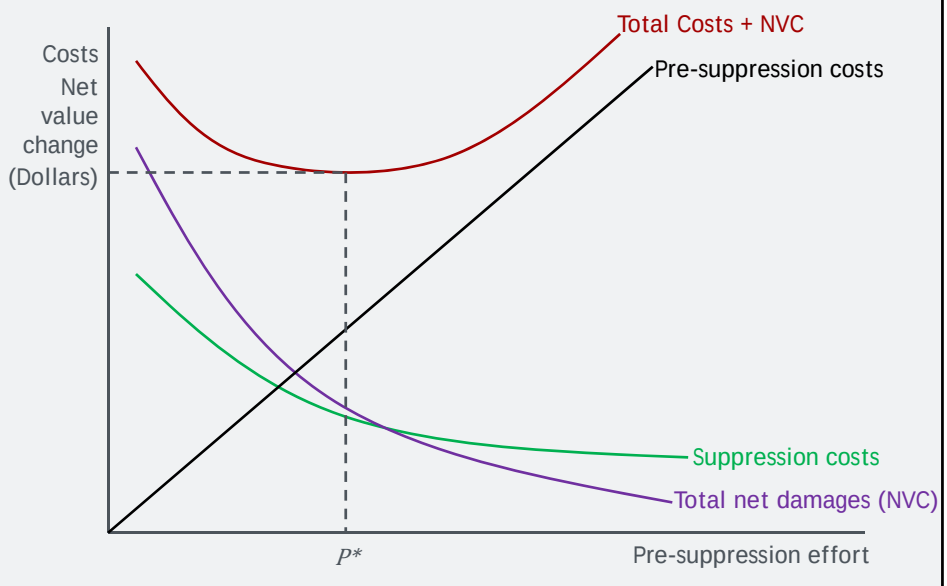

Application to a synthetic landscape

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Application of the Cost plus Net Value Change to a synthetic landscape

Application to a synthetic landscape

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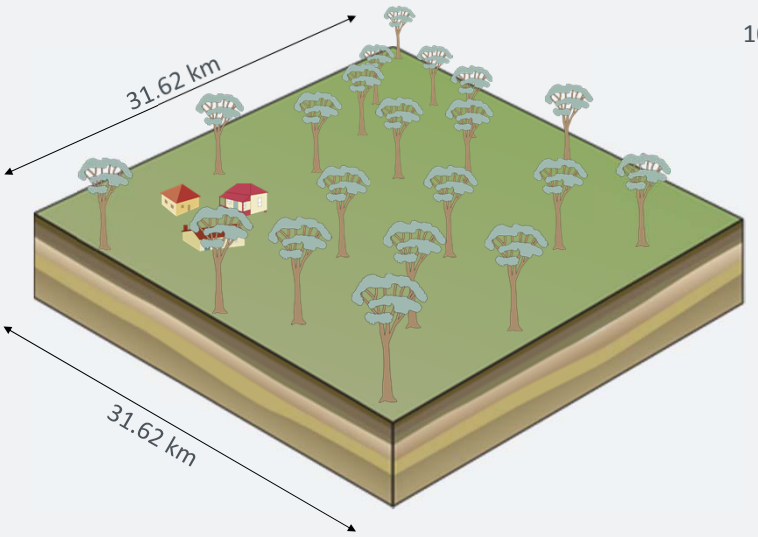

100,000 ha

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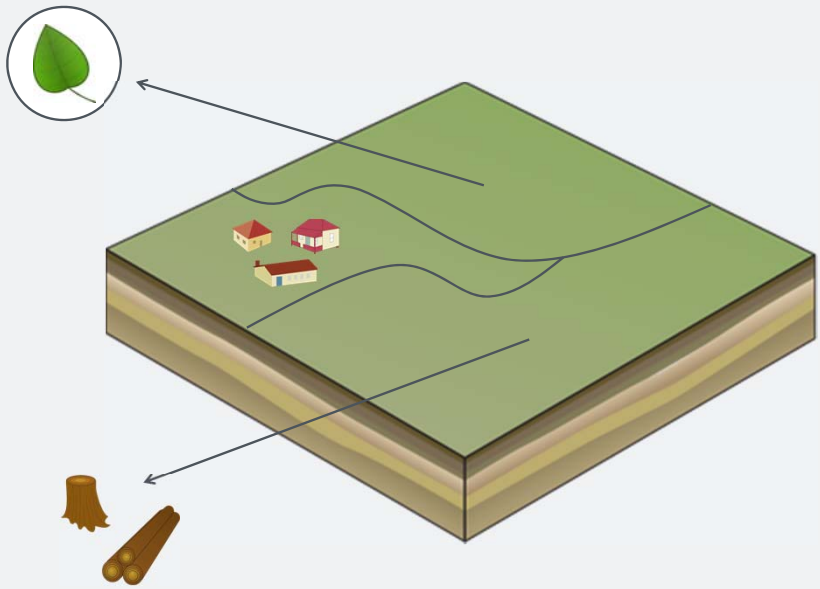

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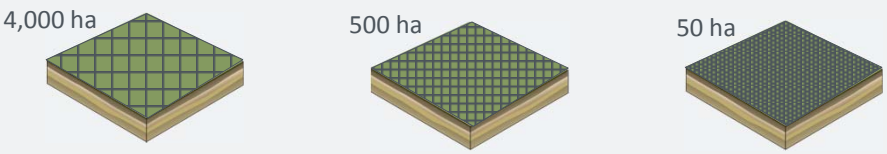
Size of treatment areas



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Rotation cycles

Every 20 years

Every 10 years

Every 5 years

Fuel age uniformly set at 15 years across the entire landscape

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Weather conditions

High

Very high

Extreme

Catastrophic

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Size of treatment areas	Rotation cycles	Weather conditions
4,000 ha 500 ha 50 ha	20 years 10 years 5 years Fuel age uniformly set at 15 years	High Very high Extreme Catastrophic

3 sizes treatment area × 3 rotation cycles = 9 combinations

(9 + 1 uniform fuel age) x 4 weather conditions = 40 scenarios

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AUSTRALIS Wildfire Simulator

Rate of spread of fires:
"McArthur Mk V" forest fire meter

Fuel load as a function of fuel age:
Fuel accumulation table for Jarrah forest
(Sneeuwjagt and Peet, 1998)

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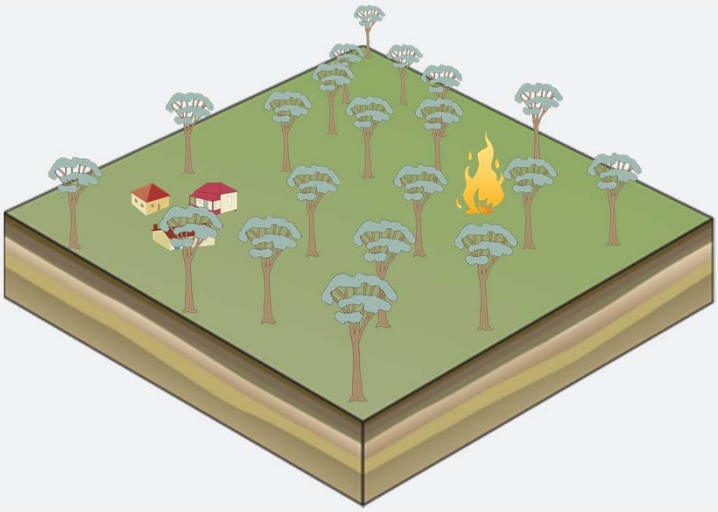

40 scenarios x 30 random ignitions: 1,200 simulations

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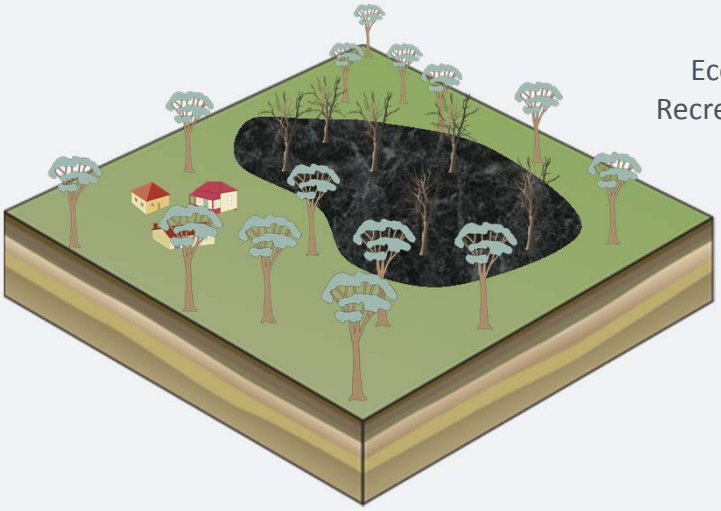

Timber
Ecological
Recreational
Urban

Results

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Results

Results

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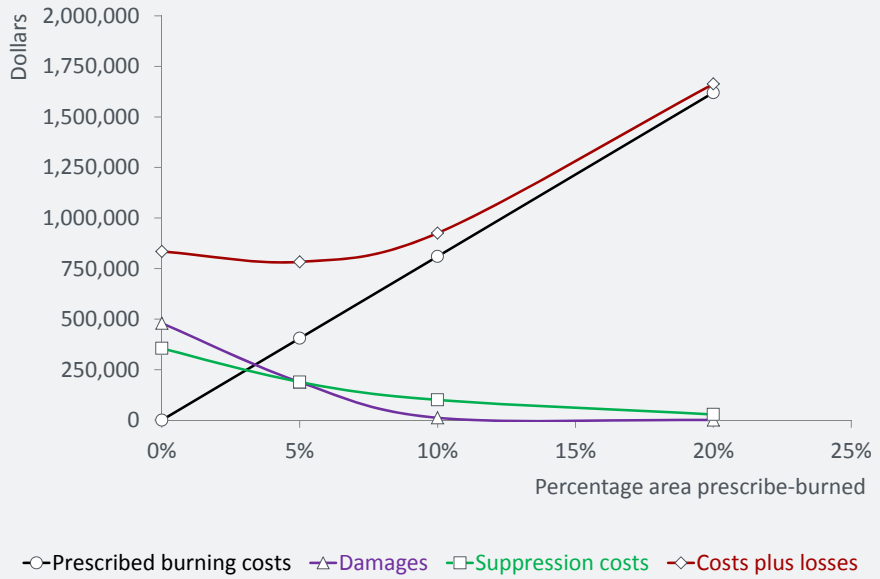

Sensitivity Analysis

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Sensitivity Analysis

50% reduction in prescribed burning costs

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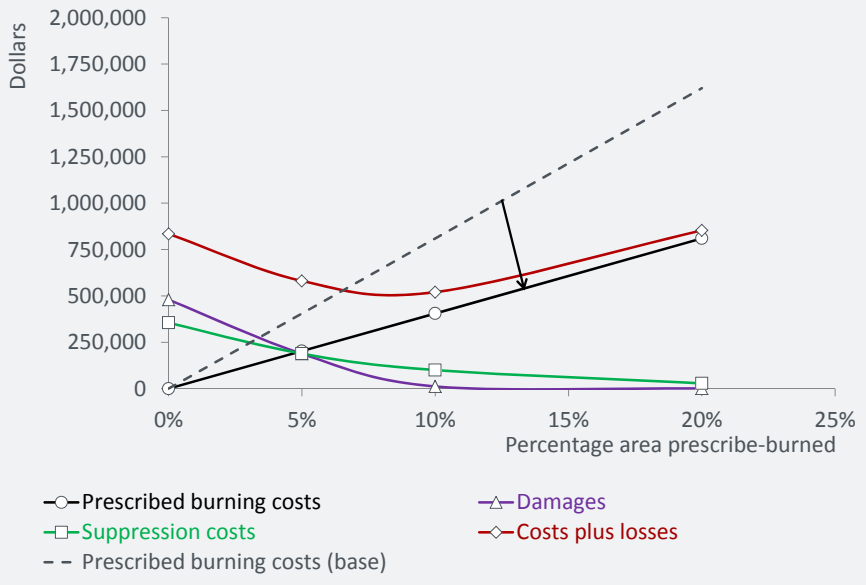
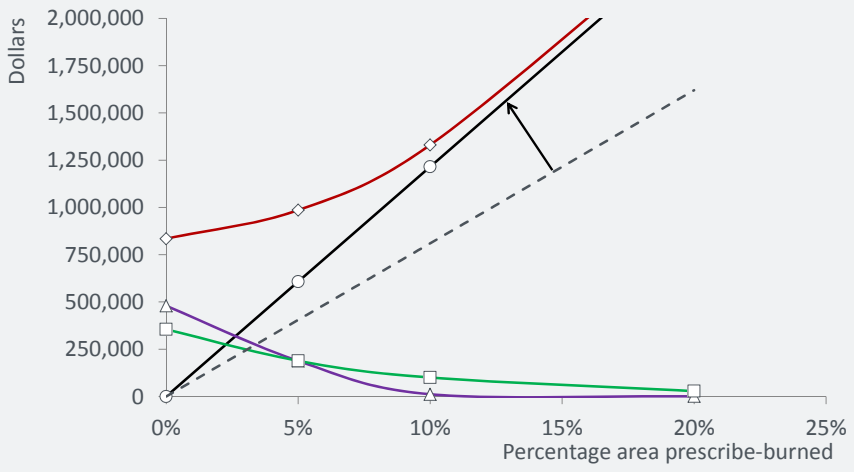
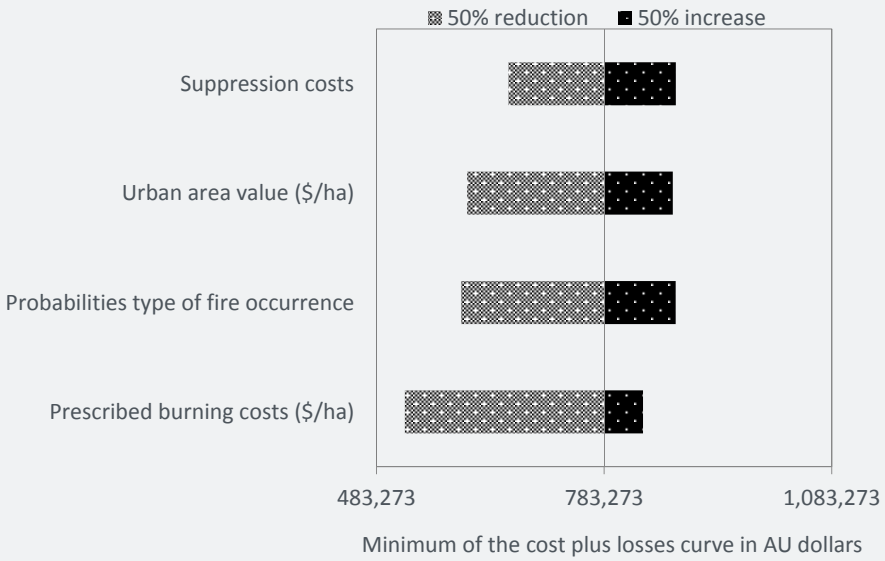


50% increase in prescribed burning costs



Sensitivity analysis



Sensitivity analysis

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Most efficient prescribed burning strategy (% of landscape prescribed burned)			
	Initial estimation	50% reduction	50% increase
Prescribed burning costs ($/ha)	5%	>5% and <10%	0%
Probabilities type of fire occurrence	5%	0%	>5% and <10%
Urban area value ($/ha)	5%	0%	>5% and <10%
Suppression costs	5%	0%	>5% and <10%

Conclusion

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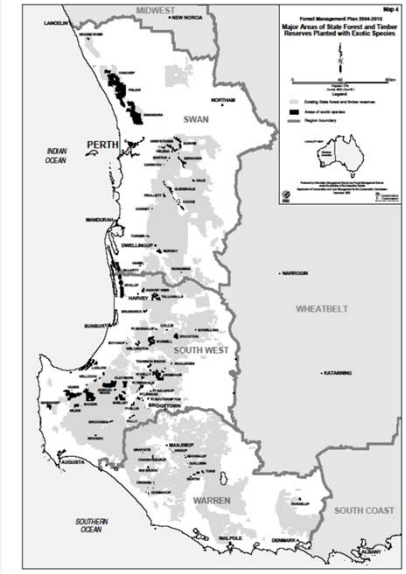
Integration of all fire management activities

Decisions for optimal levels of different strategies

Implications of changing a prescribed-burning strategy

Factors that most affect the results

Next step



Application to a real landscape in the Forest regions of the south-west of WA

- Risk
- Long-run dynamics

Thank you!

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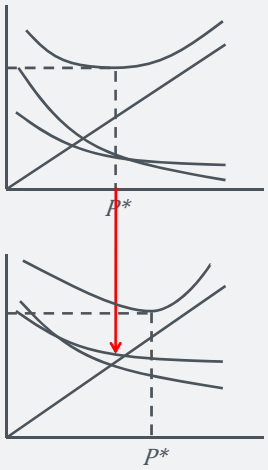
Multi-period cost plus net value change



Period one

Period two

Fire management: a dynamic problem