THINK LONG TERM
The costs and benefits of prescribed burning in the south-west of Western Australia

Veronique Florec
University of Western Australia
Or how on Earth did I get to do a PhD on the economics of prescribed burning?
MYSELF

Kinglake Area
120 Deaths

Bendigo
1 Death

Beechworth
2 Deaths

Marysville Area
39 Deaths

West Gippsland
11 Deaths

Mildura
Swan Hill

Ballarat
Geelong

Portland
Weerite

Horsham
Coleraine

Redesdale

Dandenong Ranges
Bunyip SP

Wodonga
Dargo

Bass Strait

Morwell
Wilson's Prom
MYSELF
MYSELF

I’m an economist
Bushfire CRC
Economics applied to bushfire management
(focus: prescribed burning)

Perth
FINDINGS AND IMPLICATIONS (3 things)

- Substantial benefits long-term prescribed burning program
  - Short-term analysis provides unreliable information
- Residual risk
- Best value for money
  - Need more information
THE PROBLEM

- Large, intense wildfires
- Significant social, economic and environmental impacts
- Suppression expenditures increasing
THE PROBLEM

- Debate on prescribed burning
- What level of investment?
- Economic analysis still rare
THE PROBLEM
(from an economic perspective)

- Resource allocation
- How to maximise the benefits to society?
- Highest returns
WHAT’S OUT THERE ALREADY

- Prescribed burning
  - Estimating costs of PB  (US)
  - What influences these costs  (US)
  - Estimating the benefits of PB  (US)

- Suppression
  - Estimating costs of suppression  (US)
  - What influences these costs  (US)

- Damages
  - Total damages of individual fire events  (US, Canada, Australia)
  - Impact of bushfires on intangible things  (US, Canada)
# WHAT’S OUT THERE ALREADY

- **Prescribed burning**
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  - What influences these costs
  - Estimating the benefits of PB

- **Suppression**
  - Estimating costs of suppression
  - What influences these costs

- **Damages**
  - Total damages of individual fire events
  - Impact of bushfires on intangible things
THE QUESTION

- Prescribed burning
  - Estimating costs of PB
  - What influences these costs
  - Estimating the benefits of PB

- Suppression
  - Estimating costs of suppression
  - What influences these costs

- Damages
  - Total damages of individual fire events
  - Impact of bushfires on intangible things
THE QUESTION

- Prescribed burning
  - Estimating costs of PB
  - What influences these costs
  - Estimating the benefits of PB

- Suppression
  - Estimating costs of suppression
  - What influences these costs

- Damages
  - Total damages of individual fire events
  - Impact of bushfires on intangible things
RESEARCH QUESTIONS

What level of prescribed burning minimises the sum of management costs and damages?

Minimise

Prescribed burning costs + Suppression costs + Damages
RESEARCH QUESTIONS

➢ Is the optimal level clear-cut, or is there a range of levels that are close to the optimal point?
What difference does it make to plan for the short-term or for the long-term?
METHODS

➢ Modified an existing economic model
  - Different values for different assets in the landscape
  - Varying prescribed burning costs/ha

➢ AUSTRALIS bushfire simulator

➢ Geographic Information Systems (GIS)
Hectares
100x100m
LAND USE

People
Human assets

Forests = Flammable vegetation

Biodiversity

Land use WA
Category
- Nature conservation
- Grazing
- Mining
- Water
- Crops
- Horticulture
- Ocean
- Plantation forestry
- Urban areas
WHERE PRESCRIBED BURNING IS APPLIED

DPaW managed land
FIRE IGNITIONS

Roads and towns
METHODS

Inputs:
- Prescribed burning strategy
- How many bushfires
- When and where to fires ignite
- Weather conditions
- When to stop the fires

Outputs:
- Area burned
- Intensity

AUSTRALIS Simulator:
George Milne and Joel Kelso
Computer Science and Software Engineering, UWA

Simulated 121,000 fires
RESULTS
BRAIN RESET

5 – 7 minutes
12 – 15 minutes
A decade ago
BRAIN RESET

DON’T WORRY

BE HAPPY
WHAT THE RESULTS LOOK LIKE

- Prescribed burning
- Suppression
- Damages

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Management costs
SHORT-TERM ANALYSIS

Percentage of DPaW managed area prescribed burned in the South West forest region

- Prescribed burning costs
- Suppression costs
- Damages
SHORT-TERM ANALYSIS

Percentage of DPaW managed area prescribed burned in the South West forest region

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SHORT-TERM ANALYSIS

Annual investment = Average annual benefit

AU$1 = AU$1 to AU$2

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LONG-TERM ANALYSIS

Percentage of DPaW managed area prescribed burned in the South West forest region

Dollars (Millions)

- Prescribed burning costs
- Suppression costs
- Damages

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LONG-TERM ANALYSIS

Annual investment

Compared to doing nothing

AU$10

Compared to current levels

AU$6

Average annual benefit

to

AU$47

AU$16
COMPARISON

Long-term analysis

Short-term analysis

Dollars (Millions)

Percentage of DPaW managed area prescribed burned in the South West forest region

Long-term analysis

Short-term analysis

Dollars (Millions)

Percentage of DPaW managed area prescribed burned in the South West forest region

Prescribed burning costs
Suppression costs
Damages

Prescribed burning costs
Suppression costs
Damages
RESULTS

1) Areas burned most often: forested areas
2) Highest damages: urban areas
RANGE OF THE RESULTS

![Graph showing the range of results for C+NVC (millions of dollars) and the percentage of DPaW-managed land prescribed burned. The graph includes a mean marker for each data point.](image-url)
CUMULATIVE DISTRIBUTION

Cost plus Net Value Change (millions)

Cumulative distribution

PBR 0%  PBR 5%  PBR 10%  PBR 15%  PBR 20%
DISTRIBUTION OF DAMAGES

0%

5%

10%

15%

20%
SO WHAT DOES THIS MEAN?
IMPLICATIONS

- Long-term dynamics are very important
  - Strategic decision making must adopt a long-term perspective
  - Short-term evaluations of prescribed burning investments in the South West forest region do not provide reliable information

- In the long-term, it becomes important to maintain a minimum level of prescribed burning
  - Optimal prescribed burning rates derived from the model are high
What can you do with this information?

SO HOW DOES THIS HELP YOU?
WHAT TO DO WITH THIS INFORMATION

➢ Identify options where we get the best value for money
  ▪ For prescribed burning
  ▪ Also for other fire management activities

➢ Clear-cut best option or wide range of options close to the optimum

➢ What are the results sensitive to?
  ▪ Identify areas where we need better information to improve decision making
  ▪ Identify tipping points (when do we change a decision?)
Lots to do...

WHAT NEXT?
WHAT NEXT

- Different spatial arrangement of the treatments (including prescribed burning in private land)
- Evaluate other management options
- Policy and fire events impact on people’s behaviour
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WHAT NEXT

Different spatial arrangement of the treatments

- Generates different benefits (and also different costs)
- Damages decrease more rapidly...
- ...but prescribed burning costs increase more rapidly
- Need better information on prescribed burning costs per ha in different locations
- Results are sensitive to prescribed burning costs per ha
- Importance of developing risk based approaches to prescribed burning

(including prescribed burning in private land)

- Mount Lofty Ranges, South Australia
- South-west Western Australia (second PhD)
WHAT NEXT

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WHAT NEXT

➢ Evaluate other management options
  ▪ Example: Economic analysis bushfire management options in 2 contrasting areas in WA
  ▪ Development restrictions ➔ for areas where there is a large wildland-urban interface
  ▪ Prescribed burning ➔ areas with less development
WHAT NEXT

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WHAT NEXT

➤ Policy and fire events impact on people’s behaviour
  ▪ Fire events and the housing market
  ▪ Policy and people’s behaviour (designated bushfire-prone areas)
  ▪ Cost and benefits of education programs
    ▪ Problem, many of the benefits are intangible
    ▪ Important to include them
  ▪ What is the value of intangibles (specifically for natural hazards)
WHAT CAN YOU DO NOW?
WHAT CAN YOU DO NOW?

Get in touch

veronique.florenc@uwa.edu.au
WHAT CAN YOU DO NOW?

Visit the project page

Visit the project page

WHAT CAN YOU DO NOW?

Come and visit
WHAT CAN YOU DO NOW?

Lets chat later

(I’ll pay for coffee)
THANK YOU

veronique.florec@uwa.edu.au