



Reducing fire risk to Naseby

An integrated economic assessment of management actions

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Background

- Many policies used to reduce fire risk to life and property
 - ❖ Education campaigns
 - ❖ Regulation
 - ❖ Prescribed burning
- All deliver different risk reductions, all cost money
- How can decision makers pick the strategy that's the best value for money?



www.bushfirecrc.com/education



Case study: New Zealand

- Workshops in November 2011 and May 2012 in Central Otago to define the decision problem
- Participants: farmers, NRFA, DOC, councils, scientists
- Agreement on a case study site



Case study: Naseby

- Naseby is a small town in Central Otago, New Zealand
 - ❖ 100 permanent residents
 - ❖ Large tourist population
- High fire risk
 - ❖ Surrounded by a forest
 - ❖ Town characterised by large trees and overgrown vegetation
- Variety of land uses and management
 - ❖ Conservation
 - ❖ Farming and forestry
 - ❖ Urban and recreation



Modelling approach

- Decision support model
- Assess the cost-effectiveness of strategies to reduce fire risk to Naseby town and forest
- Accounts for different aspects in calculating a Benefit Cost Ratio (BCR) of various strategies:
 - ❖ Probabilities of fire escapes and spread, in different weather conditions
 - ❖ Benefits as avoided loss of assets
 - ❖ Costs of the management regime
 - ❖ Behaviour change and strategy risk

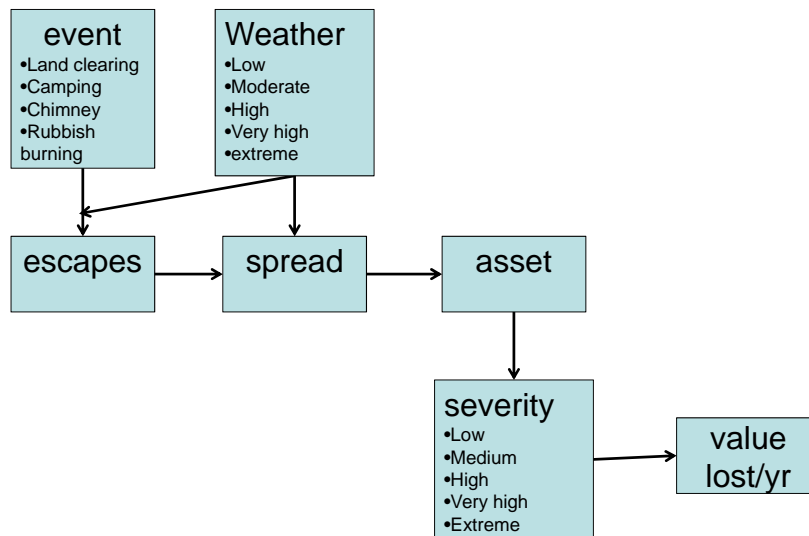


Some terms used

- Escapes: the number of ignited fires that requires a fire crew for their control. These fires are officially 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 caused by an escaped fire.



Current fire risk and expected loss

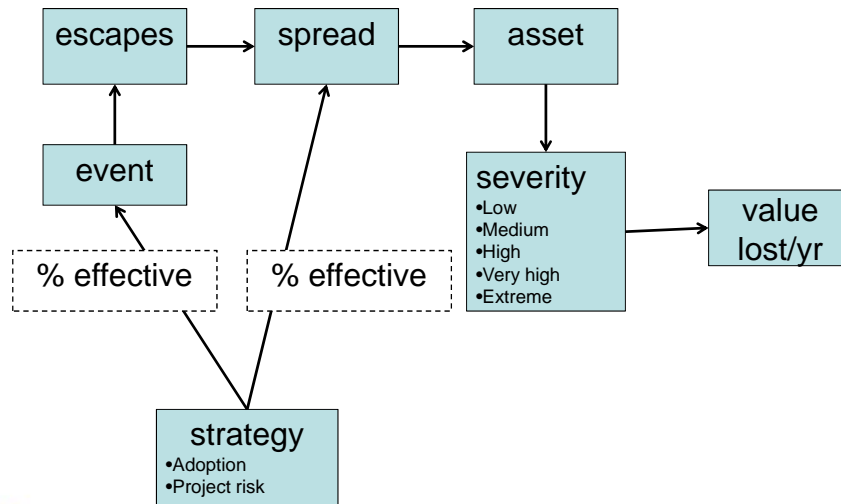


Management and policy strategies

- Current: Regulation and suppression
- Model tested strategies came from the workshops
- Preventative strategies not currently in place
 - ❖ Stricter regulation and payments for management
 - ❖ Education and training
 - ❖ On-ground support
 - ❖ Fire breaks
 - ❖ Prescribed burning



Future fire risk and expected loss

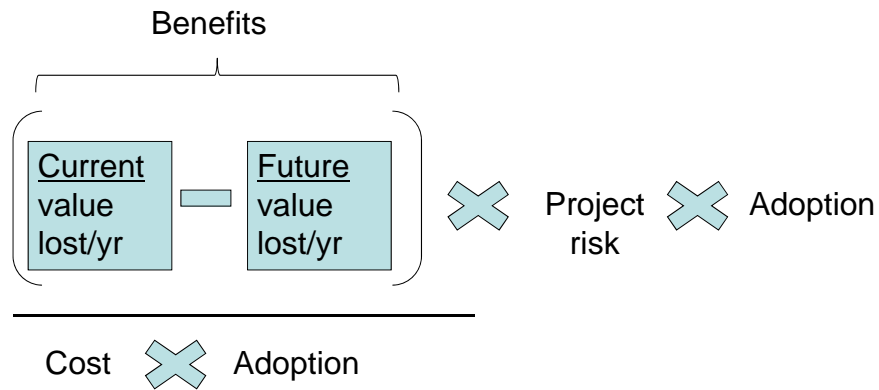


Benefit: Cost Ratio

- Evaluates whether the new strategies are better or worse than the status quo
- If $BCR > 1$, then the additional benefits of the new strategy are greater than the additional costs \Rightarrow new strategy is better than the status quo

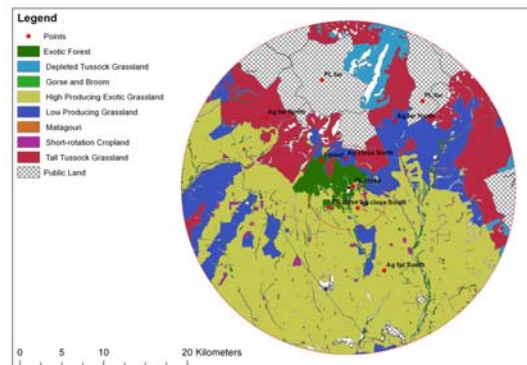


Benefit: Cost Ratio



Information

- Complex problems are data intensive
- Data drawn from a variety of sources: use the best available
- Quality is variable



Vegetation type within a 20 km boundary surrounding Naseby





Selected results

Current loss per year

Town

Fire Severity	Number of fires/year	Loss/year
Low	1.41	\$38,810
Medium	0.21	\$28,686
High	0.05	\$33,102
Very high	0.02	\$191,649
Extreme	0.01	\$947,971
Total	1.71	\$1,240,217

Forest

Fire Severity	Number of fires/year	Loss/year
Low	0.16	\$7,382
Medium	0.08	\$18,194
High	0.02	\$29,548
Very high	0.01	\$60,969
Extreme	0.00	\$40,039
Total	0.26	\$156,131



Town: community education

- Escape effectiveness = 50%
- Adoption = 50%
- Project risk = 20%
- Benefit = \$439,000/yr
- Cost = \$20,000/yr
- Benefit: Cost Ratio = 17.57



Town: regulation

- Escape effectiveness = 90%
- Project risk = 10%
- Compliance = 90%
- Benefit = \$791,000/yr
- Cost = \$201,000/yr
- Benefit: Cost Ratio = 3.54



Forest: fire breaks

- Spread effectiveness = 96 – 62%
- Adoption = 100%
- Project risk = 10%
- 10 metre
 - ❖ Benefit = \$77,000/yr
 - ❖ Cost (annualised) = \$12,000/yr
 - ❖ Benefit: Cost Ratio = 5.61



Agricultural: payments

- Escape effectiveness = 90%
- Payments = \$200/ha for land area burnt per year
- Adoption = 80%
- Project risk = 19%
- Benefit = \$17,000/yr
- Cost = \$4,220,000/yr
- Benefit: Cost Ratio = 0.0015



Agricultural: regulation

- Escape effectiveness = 90%
- Compliance = \$200/ha for land area burnt per year
- Adoption = 90%
- Project risk = 36%
- Benefit = \$17,000/yr
- Cost = \$4,580,000/yr
- Benefit: Cost Ratio = 0.001



Why is the BCR so low?

- Costs of practices are high (~\$4m)
- 75 fires over 14.5 years in agricultural zone (5/yr)
- Fire risk reduces with distance from Naseby
- Strategy only controls the proportion of fires from agricultural burning (40%)
- How many fires start by farmers in the agricultural region and reach Naseby each year?
0.0073 (1 in 136 years)



Agricultural: training program

- Escape effectiveness = 80%
- Adoption = 65%
- Project risk = 10%
- Close and distant zones
 - ❖ Benefit = \$15,000/yr
 - ❖ Cost = \$6,000/yr
 - ❖ Benefit: Cost Ratio = 2.33



Sensitivity analysis

- Provides guidance to which parameters affect BCRs the most
- Process helps identify knowledge gaps
- Tested escapes and spread effectiveness of strategies
- Results are robust to large changes in these key parameters



Key findings

- Cost-effective to focus management close to the asset (within the town and forest)
- Payments and regulation have low BCRs as farmers bear high opportunity or compliance cost
- Low cost strategies were more likely to be cost-effective
- Findings are robust to variation in key parameters
- Process highlighted information gaps



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