

The cover slide features a background image split into two parts: the left side shows a close-up of tall, dry grass, and the right side shows a fire burning in a field of gorse. The University of Canterbury logo is in the top right corner, and the Scion and Department of Conservation logos are in the bottom left and right corners respectively.

# Ignition Thresholds for Grass and Gorse Fuels and Applicability to Fire Management

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The outline slide has a background image of a field with tall grass on the left and gorse on the right. The University of Canterbury logo is in the top left corner, and the Department of Conservation and Scion logos are in the top right corner. The word 'Outline' is centered in a white box with a grid pattern.

## Outline

- ☀ **Quick Intro**
- ☀ **Thresholds for Grass Fuels**
- ☀ **Thresholds for Gorse Fuels**
- ☀ **Management Applications**

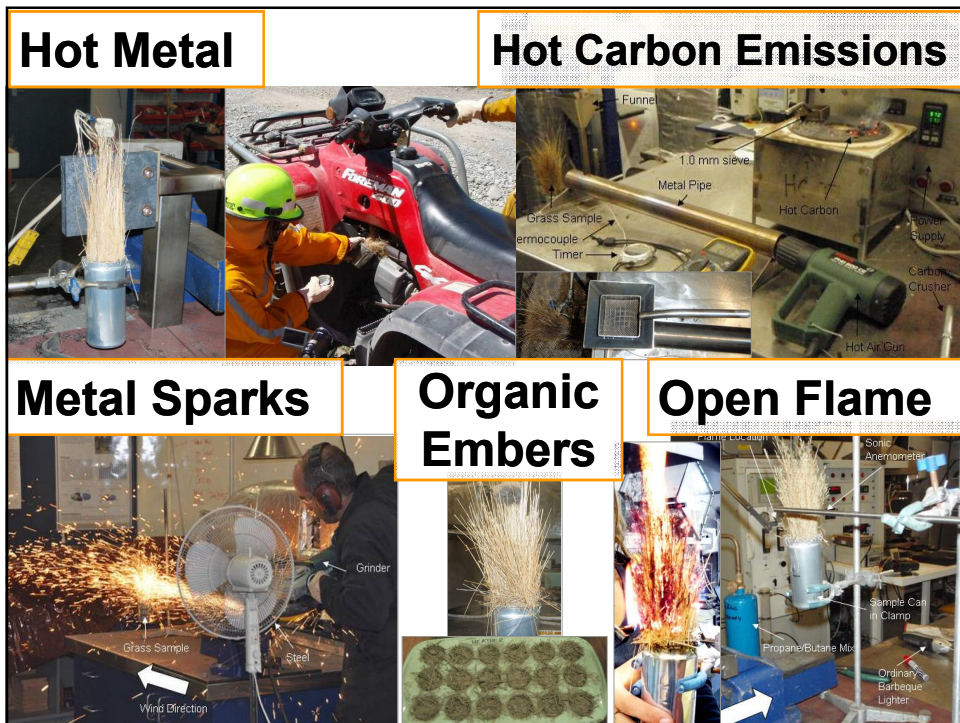
## Study Objective

**Investigate ignition thresholds conditions for grass fuels from five common ignition agents:**

-  **Hot Metal**
-  **Hot Carbon Emissions**
-  **Metal Sparks**
-  **Organic Embers**
-  **Open Flame**

## Methodology

- 100% cured grass fuels (Hard Tussock and Brown Top)
- Varied fuel moisture content (0 - 171%) and wind speed (0, 1, 2 m/s)
- Laboratory and field experiments



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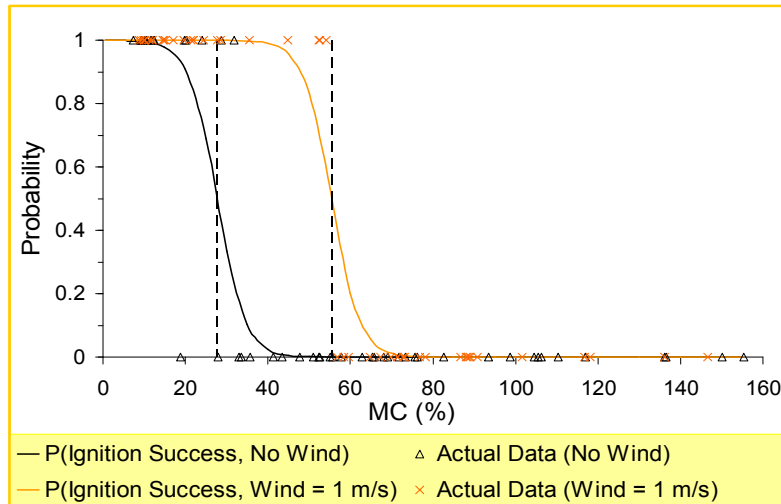
## Ignition Thresholds for Grass Fuels

Department of Conservation  
*Te Papa Atawhai*  
**SCION**

**Results**      Thresholds for a 50% probability of ignition

Ignition Source	Scenario	Ignition Threshold	
		FFMC	°C or MC
Hot Metal	Vertical Hot Plate, Wind = 2 ms <sup>-1</sup> , MC = 1%	<b>100</b>	<b>398°C</b>
	Vertical Hot Plate, Wind = 1 ms <sup>-1</sup> , MC = 1%	<b>100</b>	<b>421°C</b>
	Horizontal Hot Plate, Wind = 2 ms <sup>-1</sup> , MC = 1%	<b>100</b>	<b>429°C</b>
	Horizontal Hot Plate, Wind = 1 ms <sup>-1</sup> , MC = 1%	<b>100</b>	<b>452°C</b>
Carbon Emissions	N/A	<b>52</b>	<b>65% MC</b>
Metal Sparks	N/A	<b>69</b>	<b>37% MC</b>
Open Flame	No wind	<b>75</b>	<b>28% MC</b>
	Wind = 1 ms <sup>-1</sup>	<b>57</b>	<b>55% MC</b>

## Results *Open Flame Model*



## Study Objective

- Understand and model fuel moisture relationships in dead gorse
- Investigate threshold conditions for fire development (ignition and fire spread) in gorse fuels

## Methodology

- **Daily and hourly fuel moisture sampling of gorse fuel layers**
- **Fire ignition tests (not spread)**
  - cigarette lighter, individual bushes
- **Fire spread tests (ignition and sustained spread)**
  - drip torch, contiguous gorse

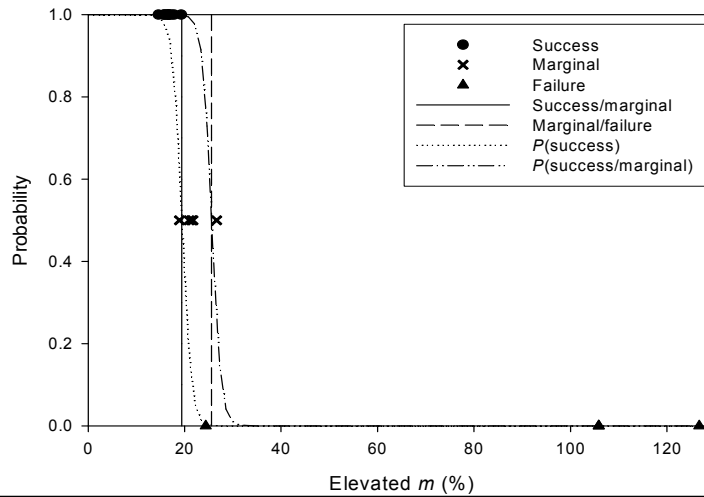
## Results

Ignition thresholds for fire development  
in terms of a 50% probability of ignition

Elevated <i>m</i> (%)	FFMC	Ignition	Fire Spread
> 36%	< 69.5	NO	NO
30 – 36%	69.5 – 73.9	MARGINAL	NO
26 – 30%	74.0 – 77.0	YES	NO
19 – 26%	77.0 – 82.7	YES	MARGINAL
< 19%	> 82.7	YES	YES

# Ignition Thresholds for Gorse Fuels

## Results *Ignition & Spread Model*



# Management Applications

Grass  
Fuels  
  
Open  
Flame  
Example

FFMC	MC	Probability of Ignition	
		No Wind	Wind = 1 m/s
100	1%	1.00	1.00
96	5%	1.00	1.00
91	10%	0.99	1.00
86	15%	0.98	1.00
82	20%	0.91	1.00
78	25%	0.69	1.00
74	30%	0.34	1.00
70	35%	0.10	1.00
67	40%	0.03	0.99
63	45%	0.01	0.96
60	50%	0.00	0.83
57	55%	0.00	0.53
55	60%	0.00	0.20
52	65%	0.00	0.05
49	70%	0.00	0.01
47	75%	0.00	0.00

## Management Applications

### Grass Fuels

- access restrictions or closures
- education
- restriction or prohibition of use of open flame or spark hazardous activities

### Gorse Fuels

- permit issue
- burning prescription

## Acknowledgements

### **Grass Project**

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### **Gorse Project**

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- Department of Conservation
- Environment Canterbury
- Pines Beach/Kairaki  
Volunteer Rural Fire Force
- Christchurch City Care Fire  
Team
- Waimakariri District Council
- Fraser Townsend & Kelsy  
Gibos (Scion)

## References

Wakelin, H. M., Anderson, S. A. J., Cochrane, C. H., & Teeling, A. M. (2010). Ignition thresholds in grassland fuels and management applications for public conservation land in Canterbury. Scion Rural Fire Research Group, Christchurch. Fire Technology Transfer Note 39 (June 2010). 12 p.

Scion. (2009). Thresholds for fire development in gorse. Scion, Rural Fire Research Group, Christchurch. *Rural Fire Research Update* 6 (December 2009). 4 p.