

# Use of Decision Support Tools for Bushfire Risk Management in NSW

Presented by Stuart Midgley  
Director of Risk Management Performance  
NSW Rural Fire Service



NSW RURAL FIRE SERVICE

*...for our community*



## Definition

- ❑ Decision support tools or decision supporting systems are interactive computer-based programs that aid users in decision making



NSW RURAL FIRE SERVICE

*...for our community*



## Why Use Decision Support Tools?

- Aid human cognitive deficiencies
- Support choice among well-defined alternatives
- Employ artificial intelligence methods to heuristically address problems that are intractable by formal techniques
- Increase productivity, efficiency, and effectiveness



NSW RURAL FIRE SERVICE

*...for our community*



## Decision Support Tools for Bushfire Risk Management in NSW

- Bushfire Attack Assessor – A tool for bushfire attack assessment
- Bushfire Risk Register – A tool for bushfire risk management planning



NSW RURAL FIRE SERVICE

*...for our community*



## What Is Bushfire Attack Assessor?

**Bushfire Attack Assessor is a computer program which can be used to:**

- determine the level of bushfire attack and the corresponding standard construction level
- calculate safe setback distance for a given construction level or a radiant heat threshold
- Formulate and evaluate alternative solutions



NSW RURAL FIRE SERVICE

...for our community



## Bushfire Attack Assessor

The screenshot displays the Bushfire Attack Assessor Version 3.0 software interface. The window is titled "Bushfire Attack Assessor Version 3.0" and features a menu bar (File, Edit, View, Insert, Format, Reports, Tools, Windows, Help) and a toolbar. The main interface is divided into two columns: "User's Input" and "Assessment Results".

**User's Input:**

- Vegetation Class: Dry sclerophyll forest
- Effective Slope(degree): 1
- Separation Distance(m): 20
- Flame Angle(degree): 17
- Elevation of Receiver(m): 1
- Site Slope(degree): 1

**Assessment Results:**

- Rate of Fire Spread (km/h): 1.61
- Fire Intensity (kw/m): 20756
- Flame Length(m): 13.45
- Transmissivity: .847
- View Factor: .3226
- Radiation Level(kw/m<sup>2</sup>): 30.6
- Category of Attack: Extreme
- Level of Construction: Level 3

**Commands:**

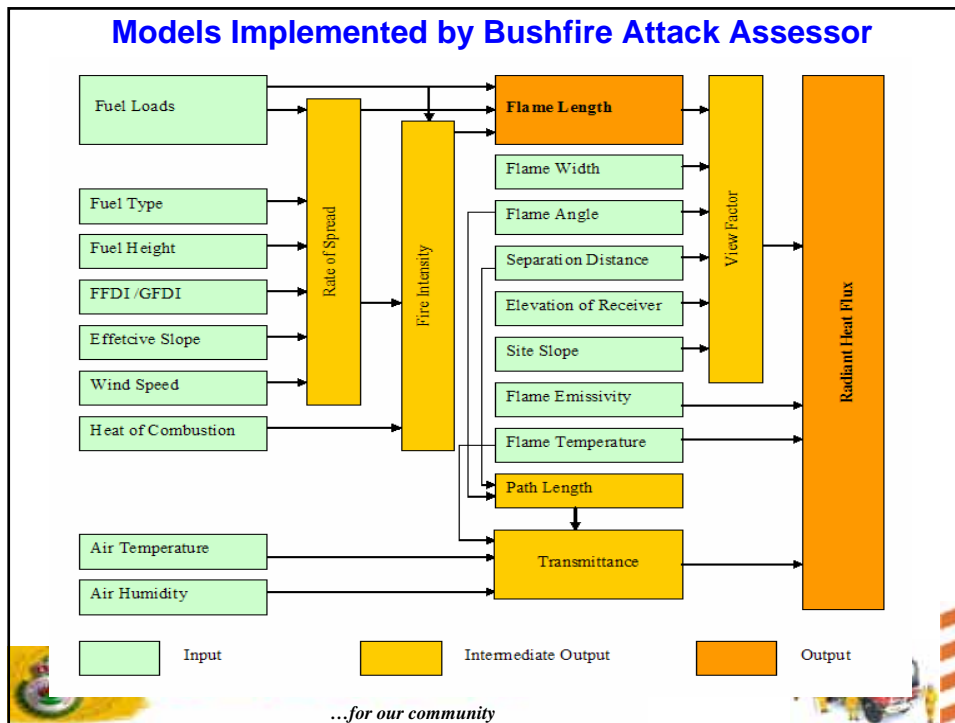
- Calculate, Preview, Report, Settings, About, Help, Clear, Disclaimer, Exit



NSW RURAL FIRE SERVICE

...for our community





- ### Inputs of Bushfire Attack Assessor
- Vegetation type
  - Effective slope
  - Separation distance
  - Flame angle (optional)
  - Elevation of receiver (optional)
  - Site slope
- NSW RURAL FIRE SERVICE**  
*...for our community*

## Settings of Bushfire Attack Assessor

- ❑ **Flame characteristics**
  - Flame temperature
  - Flame emissivity
  - Flame width
- ❑ **Fuel characteristics**
  - Surface fuel load
  - Overall fuel load
  - Fuel height
- ❑ **Fire behaviour**
  - Rate of spread model
  - Flame length model
- ❑ **Fire weather**
  - Fire Danger Index
  - Wind speed
  - Ambient temperature
  - Relative humidity
- ❑ **Radiation exposure**
  - Predefined radiation thresholds for each category of attack
  - Choice for modelling atmospheric attenuation



NSW RURAL FIRE SERVICE

...for our community



## Settings - Fuel Characteristics

Bushfire Attack Assessor Version 1.1

Options

Flame Characteristics | Fuel Characteristics | Radiation Exposure | Fire Weather | Fire Behaviour

Vegetation	Surface available fuel load(t/ha)	Overall fuel load(t/ha)	Height(m)
1. Wet sclerophyll forest	25	25	20
2. Dry sclerophyll forest	20	25	20
3. Woodland	15	25	20
4. Tall heath (scrub)	25	25	2
5. Open scrub	15	15	1.5
6. Closed heath	15	15	1.5
7. Shrubland (Chenopod)	12	12	1.5
8. Scaeforest (closed forests)	10	12	25
9. Mallee/mulga scrub	5	5	5
10. Open woodland	15	15	3
11. Grassland (pasture)	5	5	1
12. Grassland (native)	5	5	1

OK Reset



NSW RURAL FIRE SERVICE

...for our community



## Outputs of Bushfire Attack Assessor

- Rate of Spread
- Fire Intensity
- Flame Length
- View Factor
- Radiant Heat Flux
- Category of Bushfire Attack
- Level of Construction Standard



NSW RURAL FIRE SERVICE

...for our community



## Preview/ Print Assessment Report



NSW RURAL FIRE SERVICE

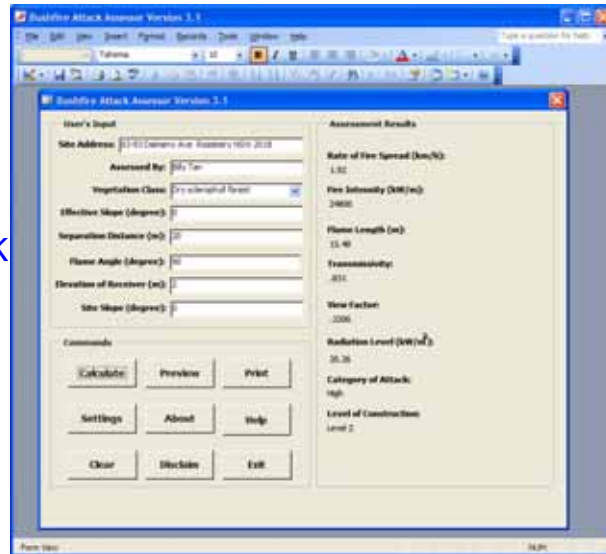
...for our community



## Example I – Determine Construction Level

### Major Parameters' Setting:

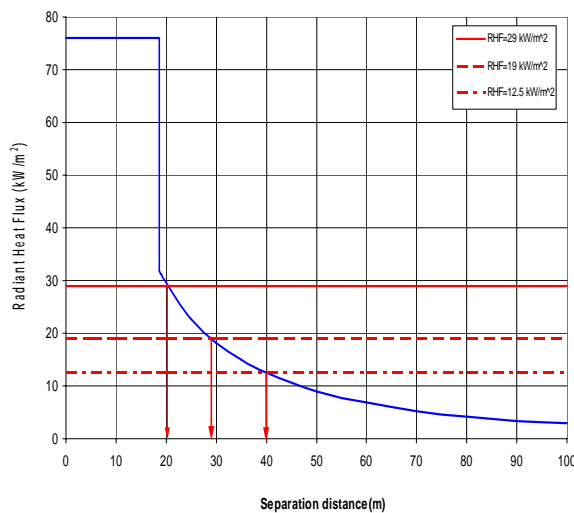
- Surface fuel=20t/ha
- Overall fuel=25t/ha
- Flame temp.=1090K
- Emissivity=0.95
- Flame width=100m
- FDI=80



## Example II – Determine Separation Distance

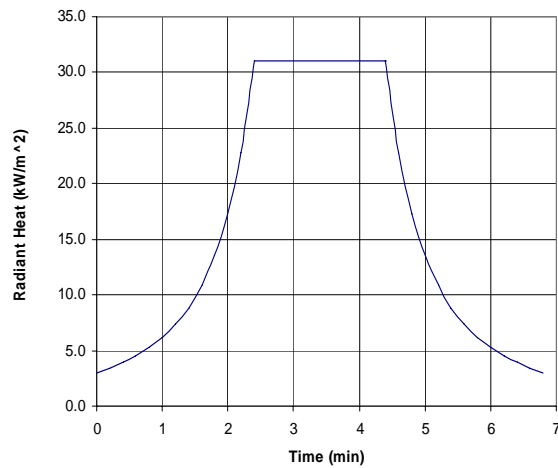
### Inputs and Settings of Major Parameters:

- Dry Sclerophyll Forest
- Level ground
- Surface fuel =20t/ha
- Overall fuel =25t/ha
- Flame temp.=1090K
- Emissivity=0.95
- FDI=100
- Air temp.=308K
- Air humidity=25%



## Example III – Derive Radiant Heat vs. Time Profile

- Veg.=Tall heath
- Slope=0 degree
- Sep. distance=20m
- Surface fuel =25t/ha
- Overall fuel =25t/ha
- Fuel height=3m
- Flame emissivity =0.95
- Flame temp. =1200K
- Flame width=100m
- Wind speed=45 Km/h
- Air temp.=308K
- Humidity=25%



## What Is Bushfire Risk Register?

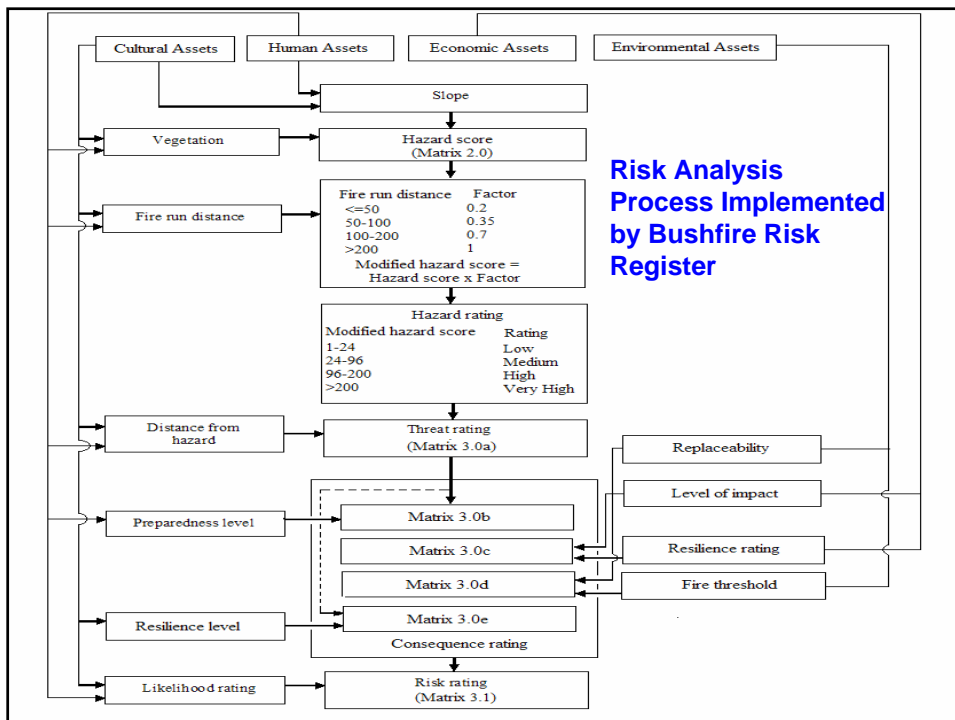
**Bushfire Risk Register is a computer program which is designed to:**

- automate the computation involved in risk analysis process
- provide an electronic means for registering, storing, searching and reporting the risk analysis and treatment data
- add spatial features to the registered assets
- facilitate hazard and risk mapping process





# Bushfire Risk Register



## Human Settlement Assets Risk Register

**Human Settlement Assets Risk Register**

Asset ID	BS2007127014110	
Subclass	Special fire protection	?Subclass
Asset name	High Rise Residential Park	
Address	101 High Rise Inset	
BPNC	Baulkham Hills	View/Edit Treatments
LGA	Baulkham Hills	
Primary land tenure	Commonwealth	
Vegetation type	Tall Grass	?Veg. Class
Slope	<17 degrees	
Hazard score	15.0	?Matrix 2.0
Fire run distance	>=75m	
Modified hazard score	1.74	?Modification
Hazard rating	Low	?Table 2.1a
Distance from hazard	<75m	
Threat rating	Extreme	?Matrix 3.0a
Preparedness level	Lowest	?Preparedness
Consequence rating	Major	?Matrix 3.0b
Likelihood rating	Almost certain	?Table 3.1
Risk rating	Extreme	?Matrix 3.1

Record: 14 of 1

NSW RURAL FIRE SERVICE ...for our community

## Economic Assets Risk Register

**Economic Assets Risk Register**

Asset ID	ECO2007114888917	
Subclass	Other	?Subclass
Asset name	Baulkham Hills Coal Mine	
Address	101 Mine Street	
BPNC	Baulkham Hills	View/Edit Treatments
LGA	Baulkham Hills	
Primary land tenure	Commonwealth	
Level of impact	Local	?Impact
Resilience rating	Vulnerable	?Resilience
Consequence rating	Major	?Matrix 3.0a
Likelihood rating	Almost certain	?Table 3.1
Risk rating	Extreme	?Matrix 3.1

Record: 14 of 1

NSW RURAL FIRE SERVICE ...for our community

## Environmental Assets Risk Register

**Environmental Assets Risk Register**

Asset ID: NSW2001219091118

Subclass: Threatened

Asset name: Koolah Park

Address: 100 Koolah Street

BPMC: Bankham Hills

LGA: Bankham Hills

Primary land tenure: Commonwealth

Replacability: Common

Fire threshold: Exceeds Threshold

Consequence rating: Substantive

Likelihood rating: Almost certain

Risk rating: High

View/Edit Treatments

Replacability

Fire Threshold

Matrix 3.0d

Table 3.1

Matrix 3.1

First Last Next Previous Delete New

Records: (14) Page View

NSW RURAL FIRE SERVICE

...for our community

## Cultural Heritage Assets Risk Register

**Cultural Heritage Assets Risk Register**

Asset ID: NSW2001219091278

Subclass: Aboriginal significance

Asset name: 100 Aboriginal Art Site

Address: 100 Art Street

BPMC: Bankham Hills

LGA: Bankham Hills

Primary land tenure: Private

Vegetation type: Grassy forest

Slope: 5-7 degrees or developed

Hazard score: 13.3

Fire run distance: >50-100m

Modified hazard score: 4.72

Hazard rating: Low

Distance from hazard: <50m

Threat rating: Substantive

Resilience level: Vulnerable

Consequence rating: Significant

Likelihood rating: Almost certain

Risk rating: Extreme

View/Edit Treatments

Veg. Class

Matrix 3.0

Modification

Table 2.3a

Matrix 3.0a

Resilience

Matrix 3.0a

Table 3.1

First Last Next Previous Delete New

Records: (14) Page View

NSW RURAL FIRE SERVICE

...for our community

## Treatment Plans Register

The screenshot shows the 'Risk\_Treatment\_Form' window in the 'Risk Register' software. The form contains the following fields and options:

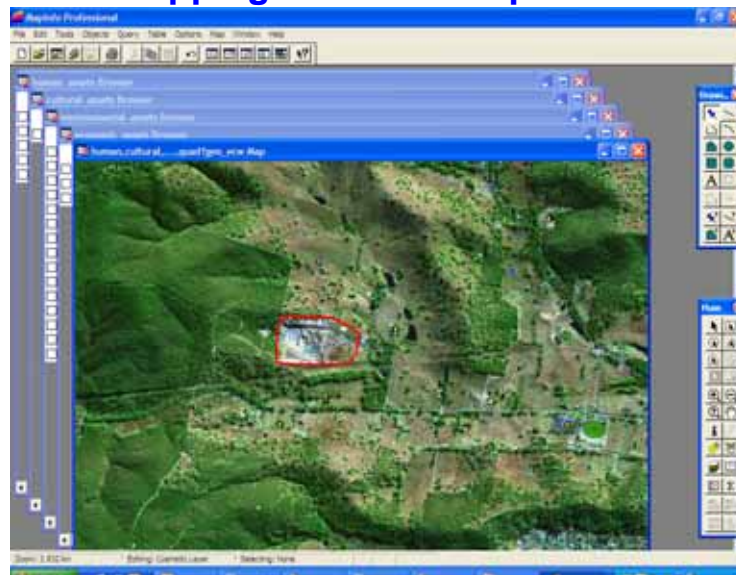
- Treatment ID:** 10020051218081015
- Asset Treatment:** [Dropdown menu]
- Asset name:** Sandstone Hills Civil Works
- Address:** 101 Lane Street
- Priority:** [Dropdown menu]
- Consequence:** Major
- Likelihood:** [Dropdown menu]
- Risk Rating:** Extreme
- Options:** Avoid the risk
- Strategy:** Use LEP to Control Developments
- Options and Strategies:** [Dropdown menu]
- Date of Registration (MM/DD/YYYY):** 09/12/2007
- Action (What, Where and How):** [Text area]
- Scheduled Start Date (MM/DD/YYYY):** 01/01/2007
- Scheduled End Date (MM/DD/YYYY):** 01/01/2007
- Responsible Agency:** CA, DL, LGA, NPS, NSWYS, Private, RailCorp, RTA, RFS, IF, Other
- Treatment status:** Not commenced
- Comment (e.g. reasons why a treatment hasn't been actioned yet):** [Text area]

Buttons at the bottom include: First, Last, Next, Previous, Delete, New.

NSW RURAL FIRE SERVICE

...for our community

## Mapping Assets in MapInfo



NSW RURAL FIRE SERVICE

...for our community

## Search the Register

**Bushfire Risk Register Version 1.5**

Search : Form

Choose a register

- Search human settlement assets register
- Search economic assets register
- Search environmental assets register
- Search cultural heritage assets register
- Search risk treatments register

Search by

- Asset ID
- Asset name
- Asset address
- Hazard rating
- Risk rating
- Primary tenure

Format of search results

- Datasheet
- Form

Search Cancel

NSW RURAL FIRE SERVICE

...for our community

## Generate Reports

**RFS Bushfire Risk Register Version 1.5**

Report On

- Human Settlement Assets
- Economic Assets
- Environmental Assets
- Cultural Heritage Assets
- Risk Treatments

Report Type

- Summary
- Details

Report Format

- Text
- Chart

Summarised By

- Hazard Rating
- Threat Rating
- Preparedness Level
- Consequence Rating
- Likelihood Rating
- Risk Rating
- Tenure
- Tenure and Risk Rating

Preview Cancel

NSW RURAL FIRE SERVICE

...for our community

## Sample Report

Bushfire Risk Register Version 1.5 - [Human Settlement Assets]

Human Settlement Assets Risk Register

Asset	Asset ID	On Site Address	Market Value	Risk Rating	Owner (Post Code)	Fire rating	Response Plan	Compliance	Classification	Est. Value
Water Treatment Plant	17	400-000	1,000	Low	4000	Medium	Service	High	Non-residential	20000
New Park	183	400-000	800	Low	4000	Low	None	None	Residential	10000
Agri Shop/Office	181	400-000	11,000	Low	4000	Low	Service	Medium	Residential	10000
Barbecue Shed	181	400-000	1,000	Low	4000	Low	None	None	Residential	10000
Suburban 1/2 Residential Prem	221	400-000	42,000	Medium	4000	Medium	None	Medium	Residential	10000
Garage to Agri Shop	183	400-000	12,100	High	4000	High	Service	Low/Medium	Residential	10000
New Park	183	400-000	12,000	Low	4000	Low	None	None	Residential	10000
Shed to Shed	183	400-000	24,200	Medium	4000	Medium	None	Medium	Residential	10000
Shed	1	400-000	14	Low	4000	Low	None	None	Residential	10000

Page 1 of 1  
Printed: 27 December 2009

NSW RURAL FIRE SERVICE

...for our community

## Future Works

- Improve the existing decision support tools
  - Create more user friendly interface
  - Add more functionalities
  - Integrate the existing tools
- Develop new decision support tools
  - Bushfire simulator
  - Prescribed burning planner
  - Operational planning facilitator
  - House loss risk analyser
  - Bushfire escape route planner

NSW RURAL FIRE SERVICE

...for our community