





An Interactive Wildland Urban Interface Wildfire Risk Assessment Tool Dean Ferreira & Jonathan Bell NCC Environmental Services Cape Town – South Africa





- **CPFPA:** Cape Peninsula Fire Protection Association
- **CSIR:** Council for Scientific Industrial Research
- NCC: Environmental Services and NCCWildfires
- **TMNP:** Table Mountain National Park
- Wildfire: veldfire, vegetation fire, bush fire
- WUI: Wildland-Urban interface, interchange, intermix

Context



- City of Cape Town predominantly winter rainfall
- Fynbos vegetation is wildfire-dependant and wildfire-prone;
- Exceptional degree of biodiversity and endemism, 9 500 species, of which 6 000 of these are endemic;
- Natural areas are infested with invasive alien plant species;
- Over 990 kilometres of Wildland Urban Interface;
- Huge discrepancies between the "haves" and "have nots";



















Context







Context

CHOOL

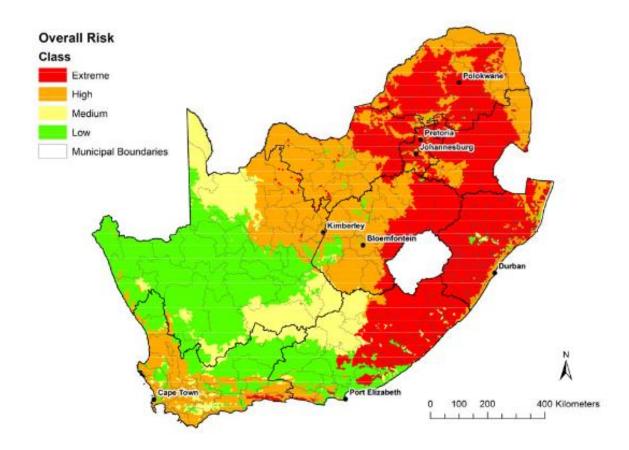


- An open access National Park within a City;
- TMNP receives 4 mil visitors per year, same as Yellowstone NP, but less than 3% of its size;
- Population of around 4 mil people, with a population density of 1 100 people/km² - SA average is 42,4 people/km²;
- In TMNP, 92% of fires are caused by humans (45% is malicious intent);
- Many of these fires originate along the WUI; and
- The City and the Fire Protection Association needed to understand its WUI Wildfire Risk

History and Background



• 2010: CSIR conducts a National Veldfire Risk Assessment



History and Background



- 2015: CSIR and GEF FynbosFire WUI fire risk assessment pilot study Helderberg Basin and Bitou
- 2015 2017: NCC in conjunction with CPFPA was awarded funding by TMF to assess the CPFPA's North and West Wards



Methodology



- Use scientifically sound and repeatable methodology
- A SANS 31000:2009 approach
- AS/NZS ISO 31000:2009 risk management principles and guidelines
- Risk easily defined and calculated
- [risk significance] = [consequence] x [likelihood of occurrence] x [CoCT emergency response time] x [slope]
- Set-up a steering committee with local expert knowledge
- Run a desktop model
- Field verify and back test against real world wildfire events
- Nine step process





Delineate the WUI







Create a 100m buffer on either side of WUI







Characterise the assets found along the WUI

SETTLEMENT TYPE	LIFE	ECONOMY
Formal residential	Minor	Moderate
Informal residential	Catastrophic	Minor
Homeowners or property association	Moderate	Moderate
Small holding	Moderate	Minor
Small farm	Moderate	Moderate
Composting	Minor	Minor
Large farm	Minor	Major
Infrastructure	Moderate	Moderate
Nature reserve and resort	Minor	Moderate
Educational institution, shopping centres, hospitals, office blocks	Moderate	Moderate
Shooting range	Minor	Insignificant
Quarries and mines	Minor	Moderate
Warehousing, factories, refineries	Moderate	Major
Sports, recreation and animal facilities	Minor	Minor
Vacant	Insignificant	Insignificant
Power plants & substations	Catastrophic	Catastrophic
Hazardous waste management site	Minor	Minor





Describe the fuel types observed along the WUI

FUEL TYPE	DESCRIPTION	FUEL LOAD	FREQUENCY	LIKELIHOOD RATING
Natural veld non-flammable	Indigenous forest & thickets, strandveld, fynbos that is < 4 years old or renosterveld < 2 years old	Low	100 years	Rare
Agriculture less flammable	Vineyards, orchards and irrigated fields	Low	25 years	Unlikely
Wheat fields	Annual crops and fallow land	Low	25 years	Unlikely
Natural veld flammable	Fynbos > 4 years old or renosterveld > 2 years old	High	15 years	Possible
Invaded natural veld < 50%	< 50% woody invasive alien plants	Medium	15 years	Possible
Invaded natural veld >50%	> 50% woody invasive alien plants	High	10 years	Likely
Woodlots	Woodlots are mainly eucalyptus or pine stands	Extreme	10 years	Likely
Invaded fallow land	Agriculture invaded by woody invasive alien plants	Medium	Annual	Almost certain





Create paired zones of similar assets (consequence: buildings) and hazards (fuels: likelihood)







Assess likelihood of a wildfire occurring in each wildland zone

FUEL TYPE	DESCRIPTION	FUEL LOAD	FREQUENCY	LIKELIHOOD RATING
Natural veld non-flammable	Indigenous forest & thickets, strandveld, fynbos that is < 4 years old or renosterveld < 2 years old	Low	100 years	Rare
Agriculture less flammable	Vineyards, orchards and irrigated fields	Low	25 years	Unlikely
Wheat fields	Annual crops and fallow land	Low	25 years	Unlikely
Natural veld flammable	Fynbos > 4 years old or renosterveld > 2 years old	High	15 years	Possible
Invaded natural veld < 50%	< 50% woody invasive alien plants	Medium	15 years	Possible
Invaded natural veld >50%	> 50% woody invasive alien plants	High	10 years	Likely
Woodlots	Woodlots are mainly eucalyptus or pine stands	Extreme	10 years	Likely
Invaded fallow land	Agriculture invaded by woody invasive alien plants	Medium	Annual	Almost certain





Assess consequences of a wildfire in each urban zone

SETTLEMENT TYPE	LIFE	ECONOMY
Formal residential	Minor	Moderate
Informal residential	Catastrophic	Minor
Homeowners or property association	Moderate	Moderate
Small holding	Moderate	Minor
Small farm	Moderate	Moderate
Composting	Minor	Minor
Large farm	Minor	Major
Infrastructure	Moderate	Moderate
Nature reserve and resort	Minor	Moderate
Educational institution, shopping centres, hospitals, office blocks	Moderate	Moderate
Shooting range	Minor	Insignificant
Quarries and mines	Minor	Moderate
Warehousing, factories, refineries	Moderate	Major
Sports, recreation and animal facilities	Minor	Minor
Vacant	Insignificant	Insignificant
Power plants & substations	Catastrophic	Catastrophic
Hazardous waste management site	Minor	Minor





Assign risk ratings to each similar paired zone



Likelihood Rating	Consequence Ra	ting			
	Insignificant	Minor	Moderate	Major	Catastrophic
Almost certain	Medium	Medium	High	Extreme	Extreme
Likely	Low	Medium	High	Extreme	Extreme
Possible	Low	Medium	High	High	Extreme
Unlikely	Low	Low	Medium	High	Extreme
Rare	Low	Low	Low	Medium	High

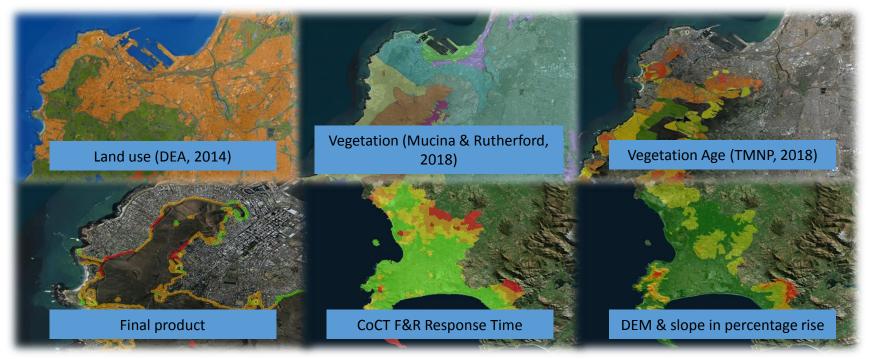
¹ Adapted from AS/NZS 4360:2004 (Forsyth et al. 2010)





Map the risk

- a) MS Excel based algorithm used to calculate the risk
- b) Run a desktop model using existing datasets
- c) Conduct in-depth field verification and adjust where necessary



End Product



- Live, easily updatable GIS model;
- Understand where the risk is located spatially;
- Identify and understand the contributing factors to the risk;
- Manage and mitigate the contributing factors to reduce overall risk;
- Decision support tool for the user;
- Geographic information system based model with 96 000 data points;
- User can prioritise and better manage limited resources/budgets;

Total length of Urban Interface (km WUI Maximum Ris Live AGOL web application; Interactive map based dashboard with statistic based; Users now have full access to the dataset; and Decision support tool with limited analysis based functionality and widgets https://nccgroup.maps.arcgis.com/apps/webappviewer/index .html?id=d50ffb5d44d24ab395a38d8ed0cedbed Small holdi Infrastructure Natura recense & reco Vacant Interface length (km) per Settlement Typ her of Asset Zones per Settler

End Product



Acknowledgements





SERVICES

Working with people in the landscape

Thank You





www.facebook.com/NCCEnviron or www.facebook.com/NCCWildfires @nccenvironmentalservices



@NCCEnviron or @NCCWildfires



NCC Environmental TV



NCC Environmental Services