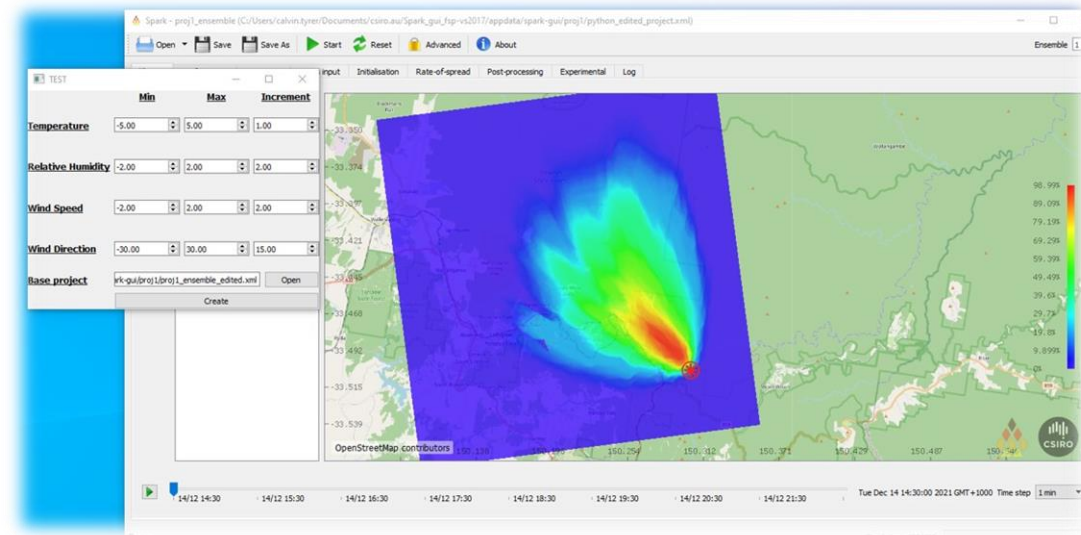


WILDFIRE MODELLING IN A DYNAMIC ENVIRONMENT – A CASE STUDY IN THE BLUE HEART, SUNSHINE COAST

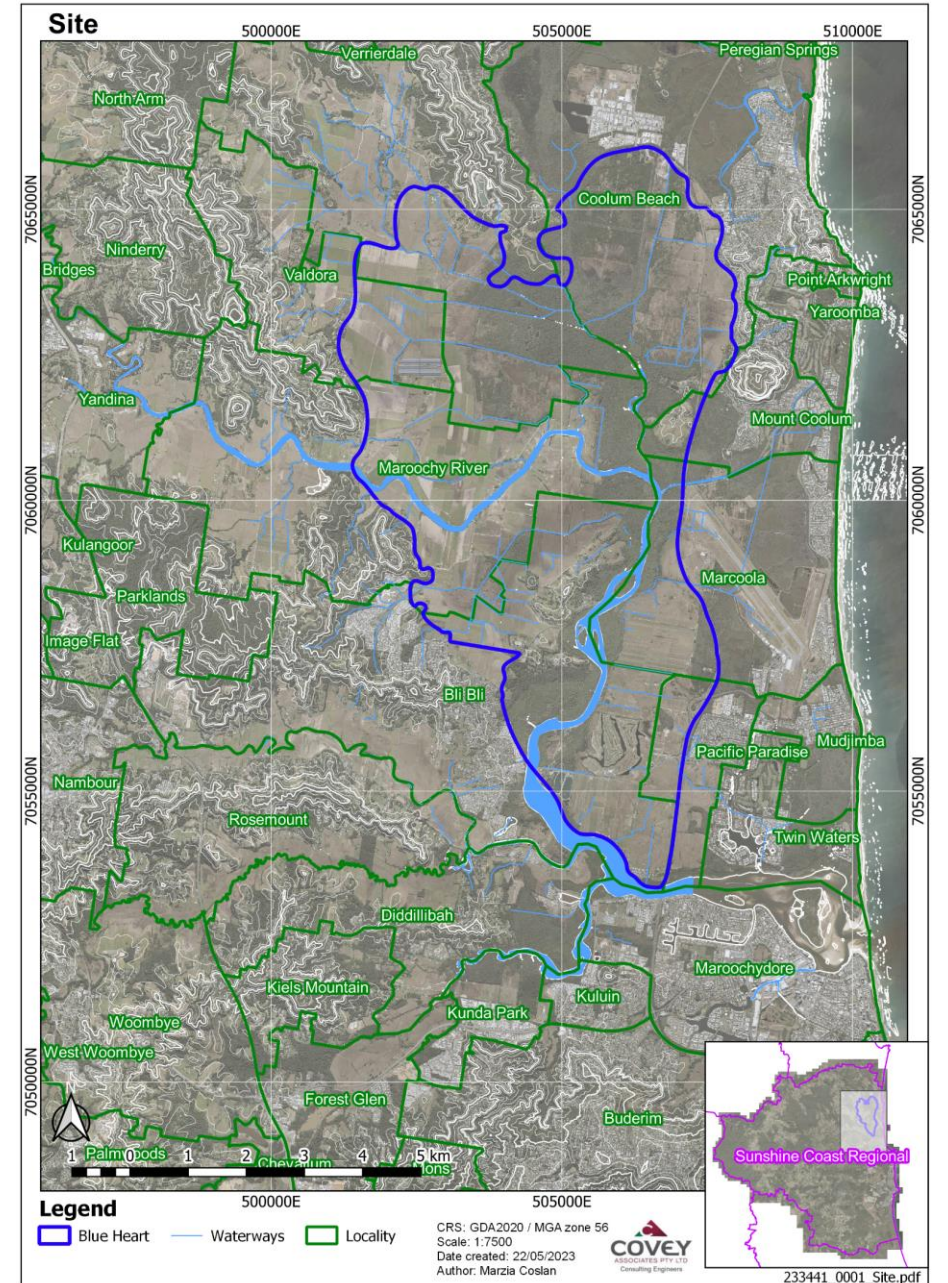
ANTHONY POWER, MARZIA COSLAN, AARON BULFIN

ANZIF CONFERENCE, OCTOBER 2023 anthony@covey.com.au



WHAT IS AND WHERE IS THE BLUE HEART?

- 5,000+ hectares of natural floodplain in the Maroochy River catchment on Sunshine Coast, Queensland
- 1,400 hectares of public land
- Traditional lands of the Kabi Kabi people
- Only a few metres above sea level
- Led by SCC, the Blue Heart Project is an accelerated strategic land program to improve conservation, flood mitigation, sport and recreational opportunities to help protect natural assets, respond to climatic changes and provide spaces for people



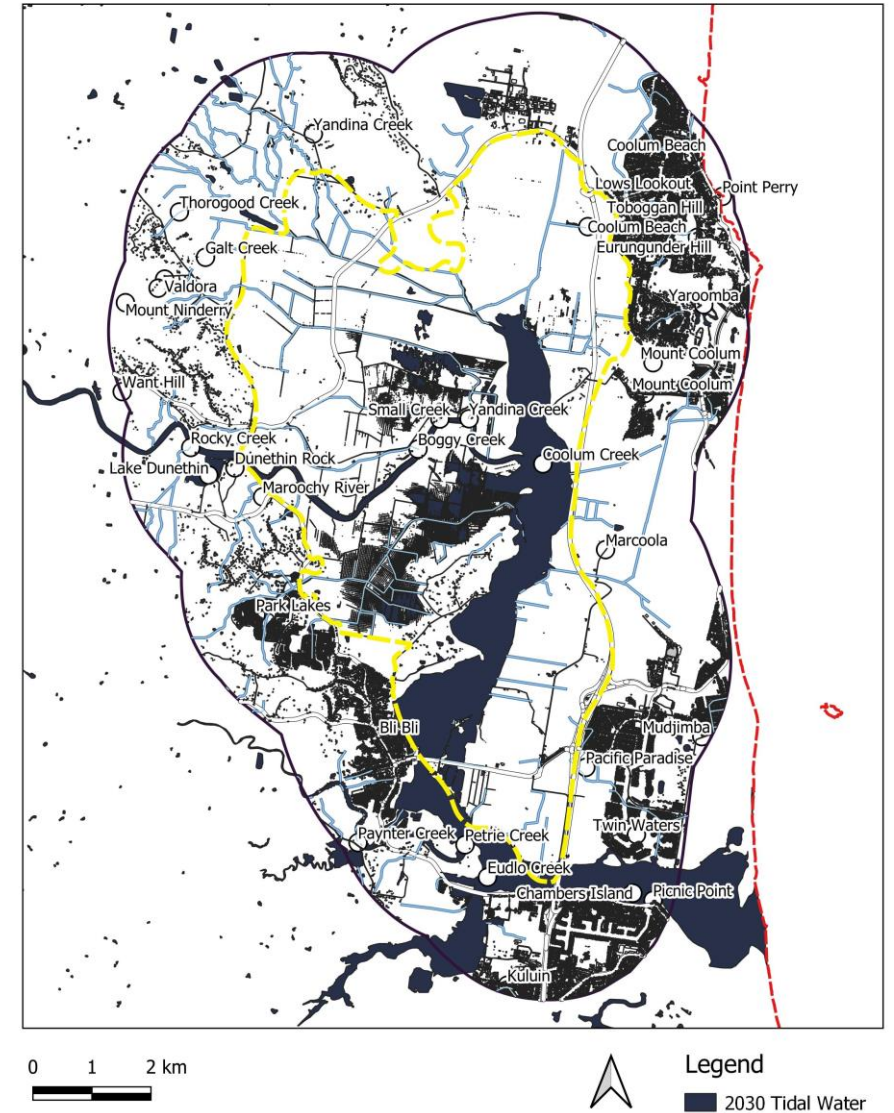
A LAND IN TRANSITION

- From the late nineteenth century to early twenty-first century, the floodplain was a regional hub for sugar-growing
- The Nambour Mill closure in 2003 led to many cane farms becoming economically unviable
- Private land in the Blue Heart comprises some continuing cane growing, grazing, cropping and large areas of former cane land with no, ongoing, active uses



A FLOODPLAIN BESET BY CHALLENGES

- The Blue Heart is susceptible to incremental tidal inundation
- Sea level rise and failing cane drain infrastructure are changing the nature of vegetation across the Blue Heart to an estuarine environment
- By 2100, the Qld Gov anticipates 80cm of sea level rise, subjecting most of the Blue Heart area to permanent tidal inundation
- Some former cane land is regenerating into potential areas of invasive weeds and fire risk



Blue Heart Inundation Extents 2030

A CHOICE TO UNDERSTAND AND MANAGE FIRE RISK – OUR BRIEF

- Investigate and report on changes in fuel types across the Blue Heart
- Investigate and report on changes in fire risk across the Blue Heart, including a 2km buffer around the Blue Heart
- Include assessment at specific timeframes including 2023, 2030, 2050 and 2125
- Assess fire risk under future vegetation scenarios

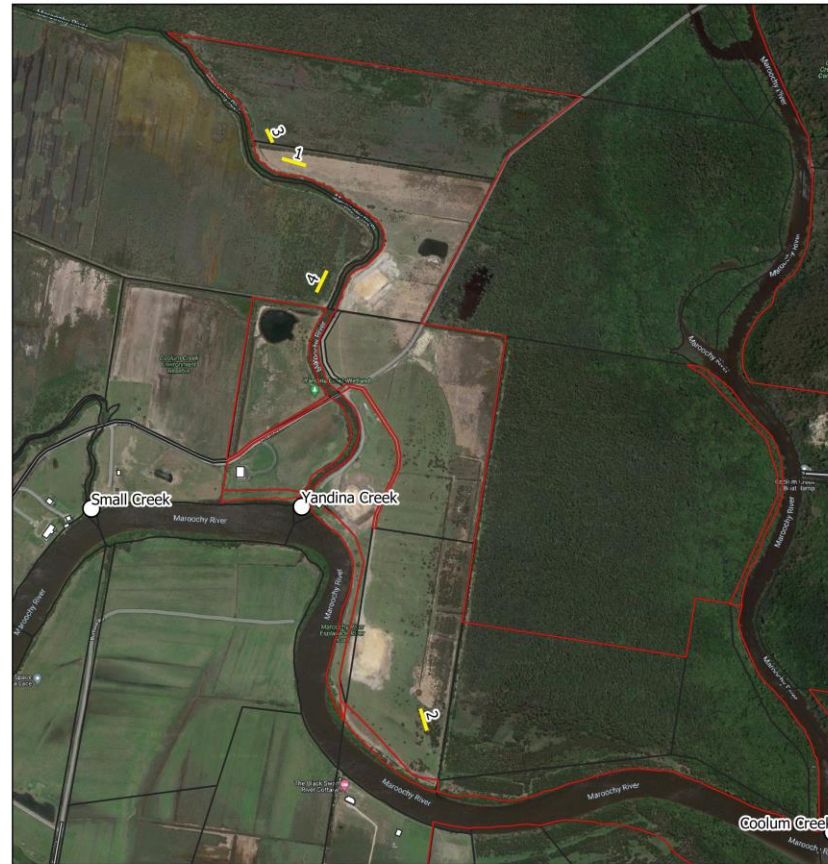


photo credits: Sunshine Coast Council

UNDERSTANDING THE FUELS



- 4 transects
- 40 destructive sfl & nsfl samples
- NSF height
- FPC %



Legend

- Buildings
- Cadastre
- Field-Survey-Transects
- ▭ SCC Reserves

id	Veg Type	Length (m)
1	Phragmites	50
3	Casuarina Regrowth with Phragmites	25
4	Casuarina/Melaleuca Community	50
2	Casuarina Regrowth	50

0 100 200 m



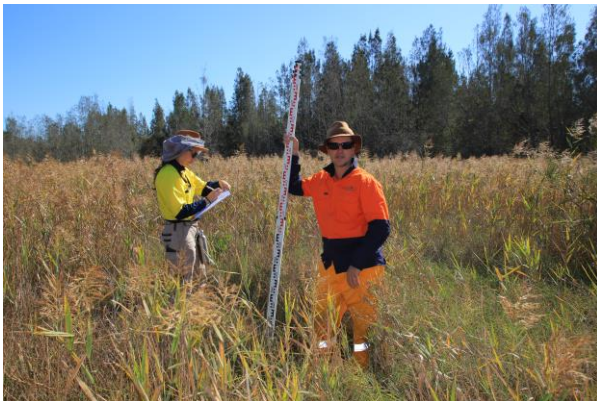
Blue Heart Fuel Survey Transects



THE FUELS ARE HIGH

Phragmites Communities:

- ~ 9.23t/ha EFL
- ~ 2.8t/ha SFL



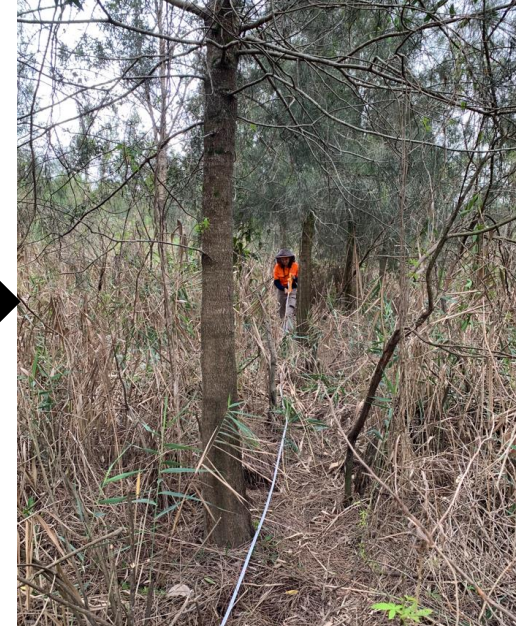
Casuarina Forests:

Ex – Cane Paddock / Field



She-oak Regrowth with Small Flower Summer Grass

- Mean SFL ~ 7.17t/ha
- Mean NSFL ~ 8.5t/ha sfl
- Mean NSF Height: 59cm
- FPC: 66%



She-oak Regrowth with Phragmites

- Mean SFL ~ 41.4t/ha
- Mean EFL ~ 9.3t/ha sfl
- Mean EF Height: 145cm
- FPC: 88%



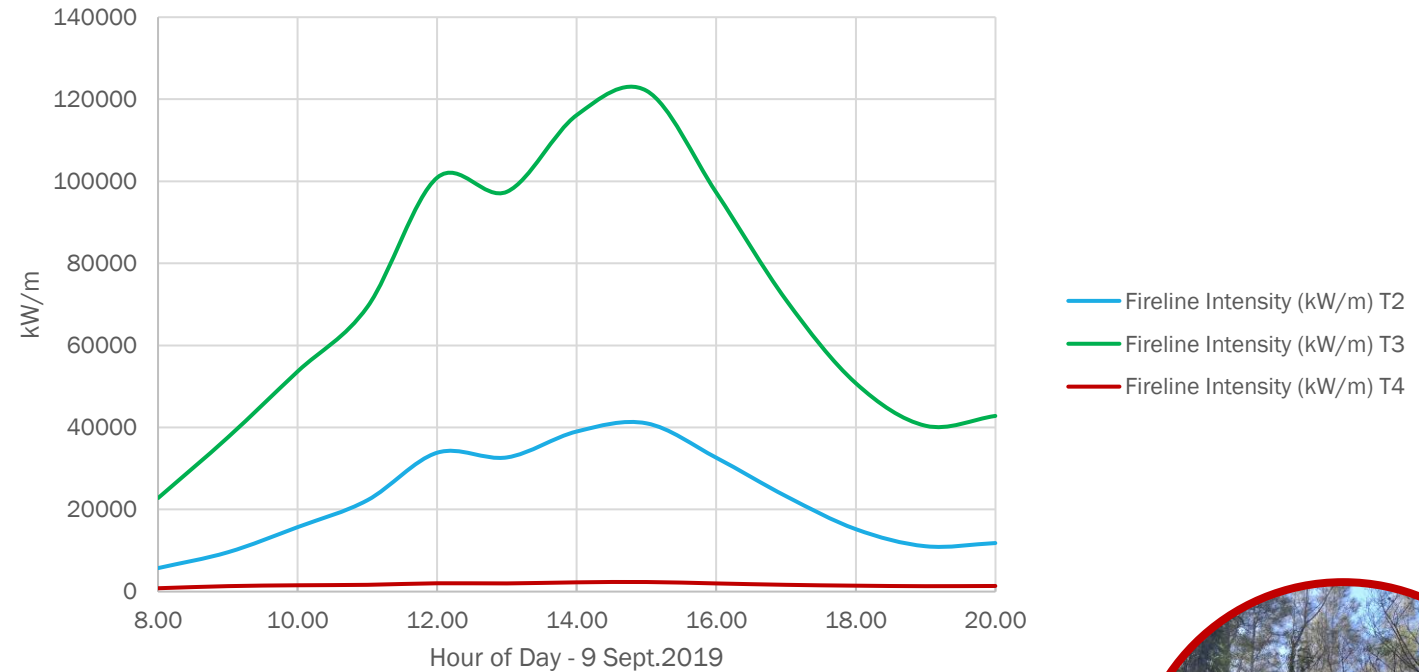
She-oak /Melaleuca Woodland (~20 years)

- Mean SFL ~ 28.8 t/ha
- Mean NSFL ~ 0 t/ha sfl
- Mean EF Height: 0cm
- FPC: 91%

REGROWTH IS CHALLENGING

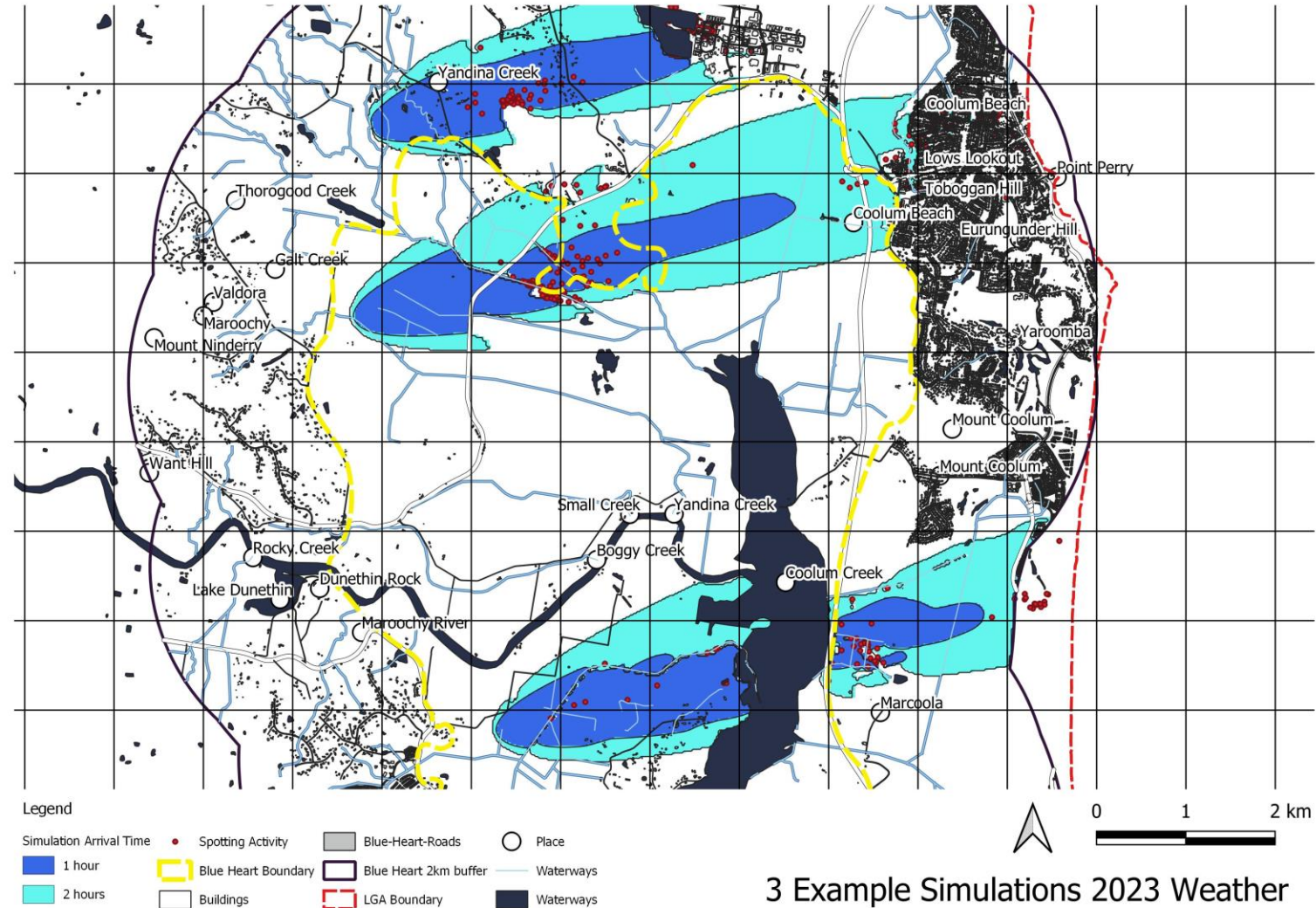
- All three communities belong to VHC28.1 - *Open forests in coastal locations with species such as she-oak or swamp box*
- Each regenerative phase exhibits potentially very different fire behaviour. Graph adopts Peregrin Beach Fire Weather 2019

Blue Heart T2-T4, Fireline Intensity (kW/m) - Vesta Mk 2



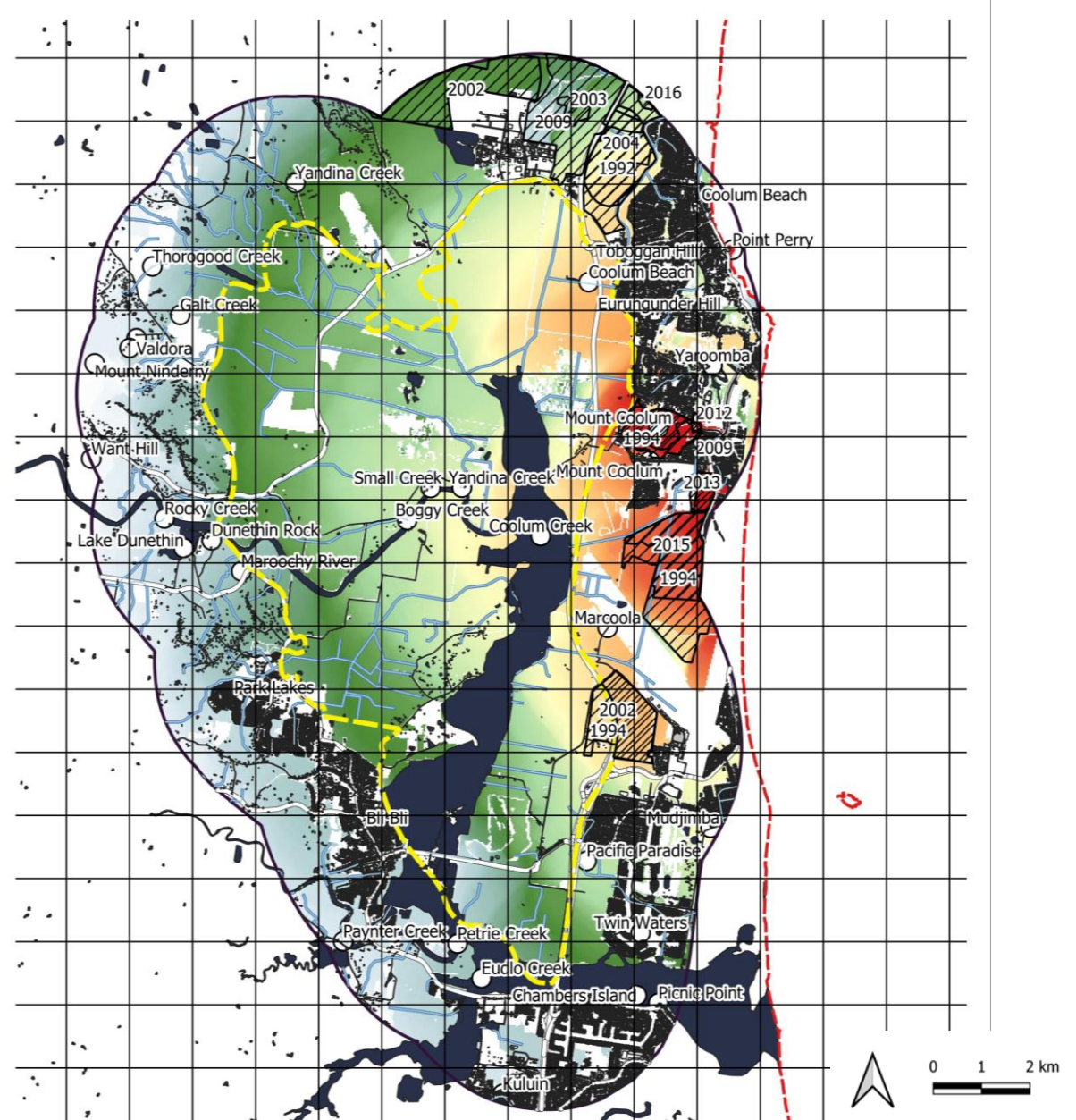
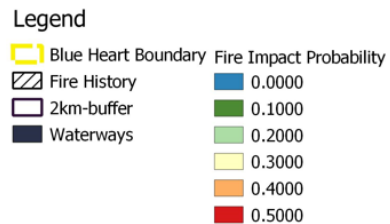
LARGE FIRES CAN MOVE ACROSS THE BLUE HEART

- Long fire runs impacting the highly urbanised coastal settlements
- Especially under the influence of strong westerly winds
- Mount Coolum, Marcoola and Yaroomba are particularly vulnerable from fires starting in the Blue Heart



FIRE STARTING IN THE BLUE HEART ARE MOST LIKELY TO IMPACT THE COASTAL SETTLEMENTS

- 1,580 fires simulated with south westerly winds under current landscape scenario and 1:20 year fire weather
- Highest Impact Probability accords well with local Fire History



THE WEATHER IS GETTING WORSE

- Fire Weather expected to worsen across the Blue Heart, peaking in 2040-2059 under climate change RCP 8.5 scenario and a warm dry global climate model ensemble
- GCM Data was extracted from the Electricity Sector Climate Information project (ESCI)

Fire Weather FFDI AEP's GEV Analysis – Sunshine Coast Airport AWS

FFDI for Recurrence intervals	
Recurrence period (years)	Projected FFDI based on AWS Recorded Data over 26-year period
1	30.75
2	35.147
5	40.960
10	45.357
20	49.754
25	51.170
30	52.327
50	55.567
100	59.965

Fire Weather FFDI AEP's GCM- Blue Heart 5km Grid Cell, RCP8.5 Scenario

Climate Model	IPCC RCP8.5				
	1986-2005	2020-2039	2040-2059	2060-2079	2080-2099
Warm Dry					
1:2 year	24.48	36.79	37.94	32.36	36.94
1:5 year	38.04	51.26	53.48	46.89	44.07
1:10 year	49.8	60.28	63.6	58.85	47.84
1:20 year	63.75	68.54	73.18	72.45	50.89

WHAT TO DO ???

- *Can we accelerate the transition to non/less flammable vegetation types like Mangrove and Mature Casuarina forests?*
- *Can we create opportunity for sporting/recreational open space and carbon credit revenues?*
- *Can we create opportunity for flood water storage?*



A NEW BEGINNING – A NEW HEART

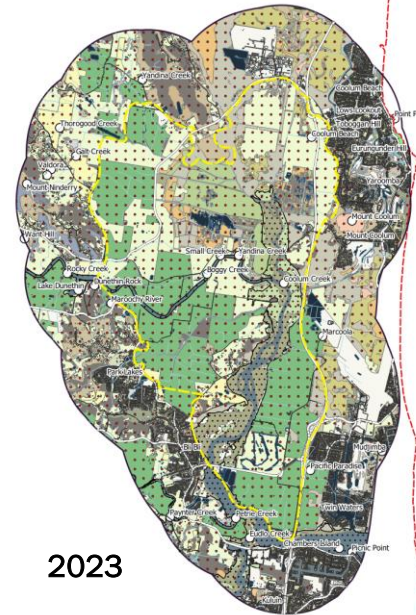
- Decision to remove old tidal gates and regenerating mangrove communities in a ‘design with nature’ approach
- Managing weeds that exacerbate the fire risk by creating ladder fuels
- Targeting areas of remaining flammable vegetation with hazard reduction burns, especially where large fires may start and near assets
- Installing fire management infrastructure to facilitate suppression and containment of fires



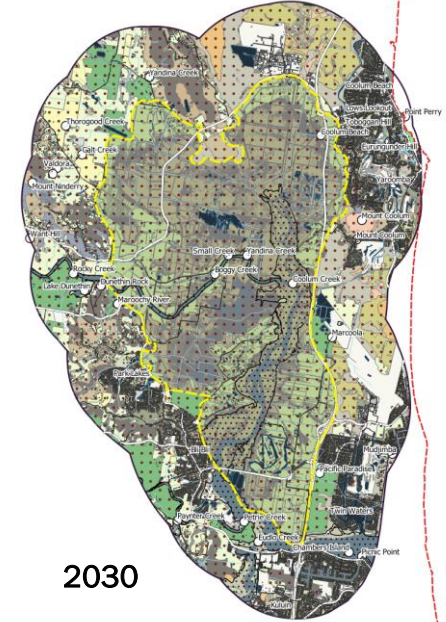
photo credit: Sunshine Coast Council

MODELLING AN ALTERNATIVE FUTURE

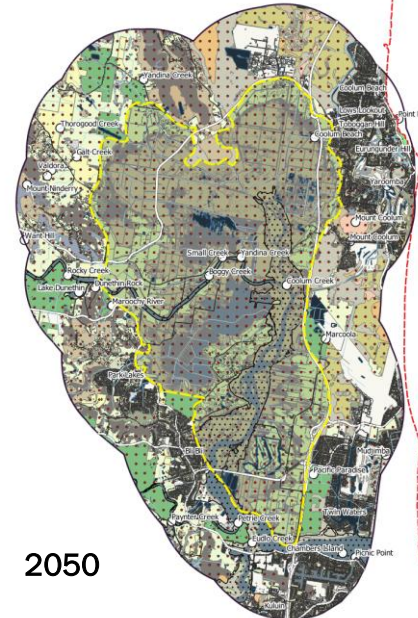
- Build custom GIS's of Vegetation Hazard Classes for 2023, 2030, 2050 & 2125
- Estimate tidal inundation
- Shp files of anticipated vegetation change provided by FireScape Pty Ltd – Mangroves, Supratidal Forests, Saline Waterbodies
- Combined with LiDar derived vegetation extents, land use data, waterways, roads, houses



2023



2030

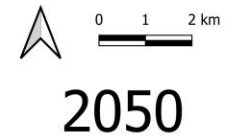
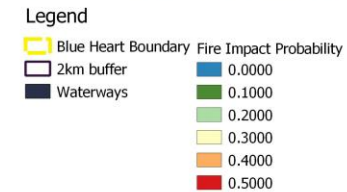
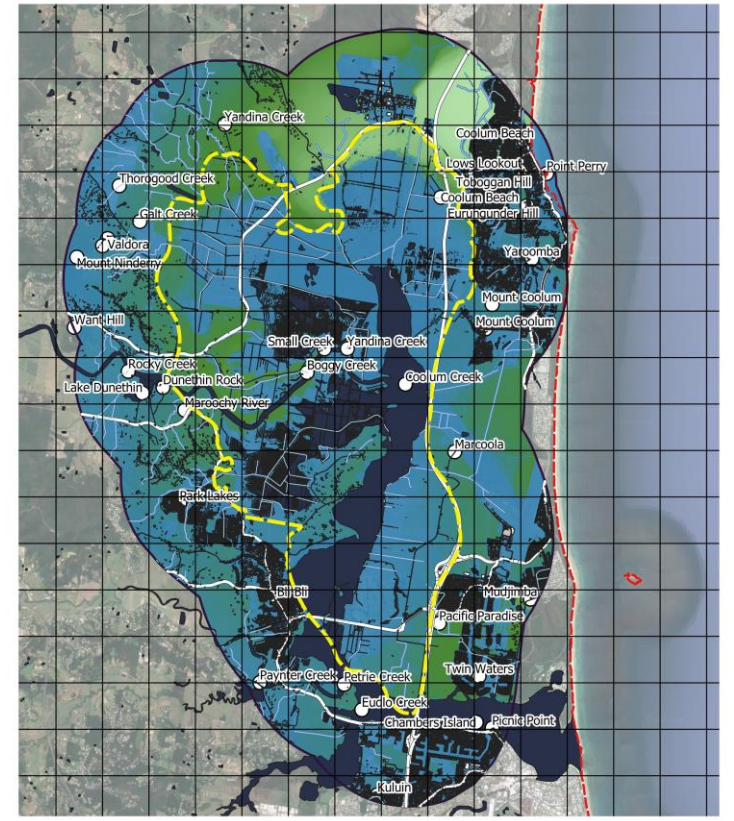
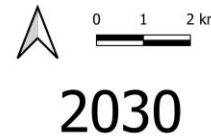
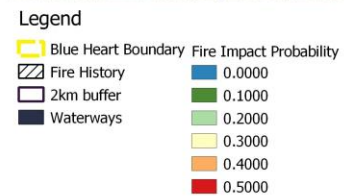
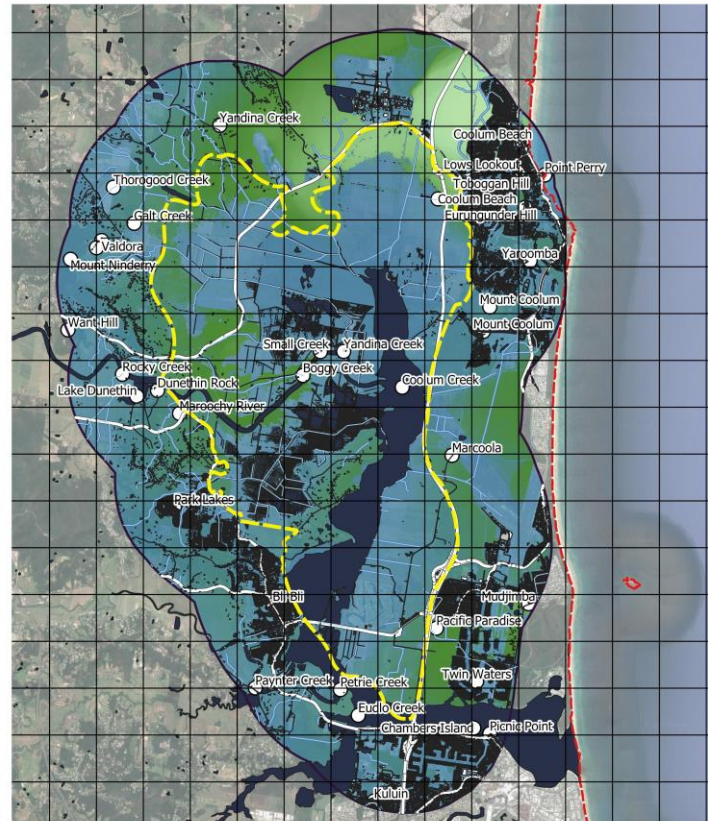
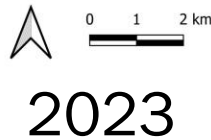
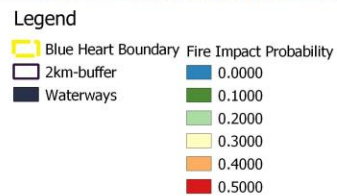
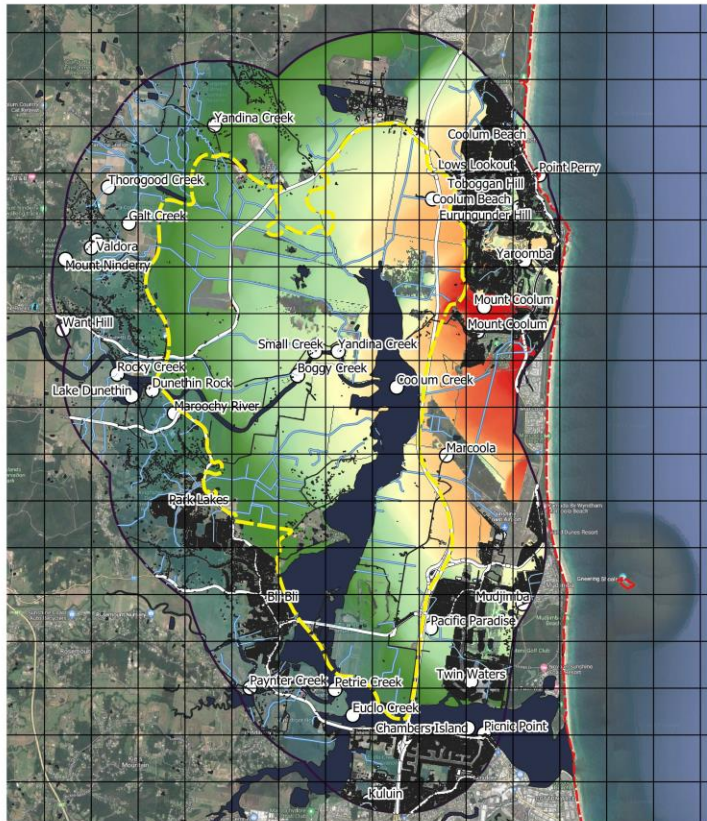


2050



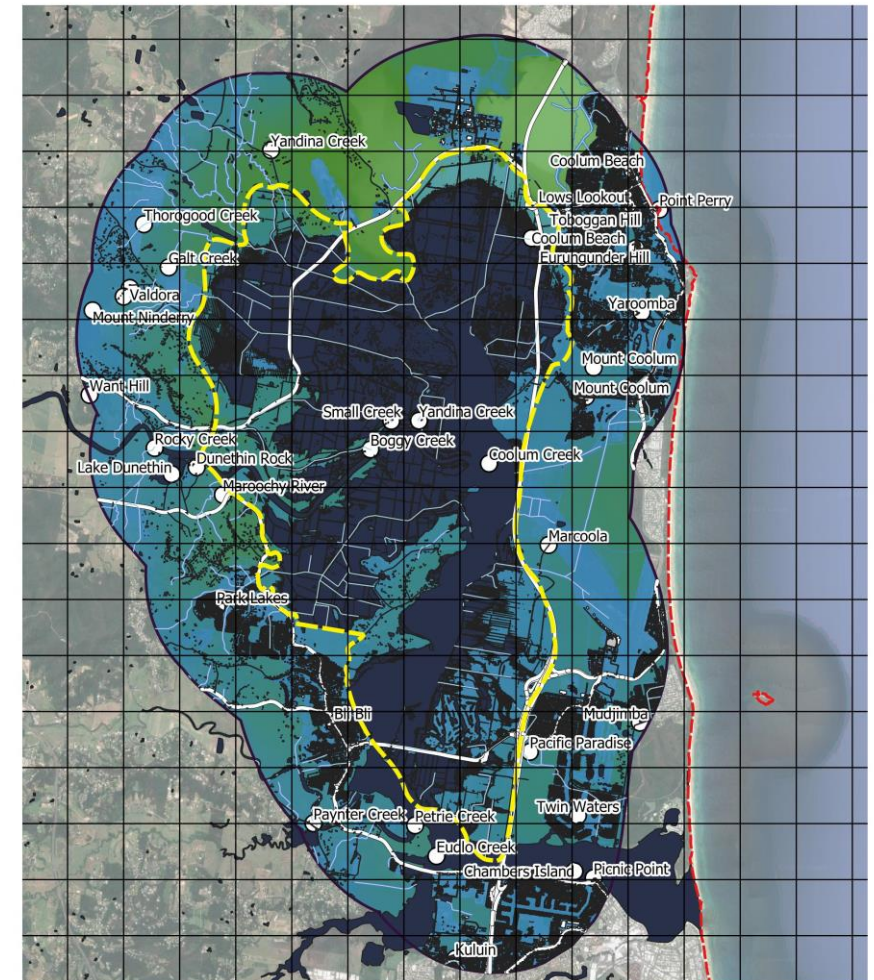
2125

WITH REDUCED FIRE BEHAVIOUR



ULTIMATELY A HEALTHY BLUE HEART

- Residual risk to the north of the Blue Heart
- Tidal extent significantly increased
- Critical infrastructure such as the airport and highly populated settlements better protected from landscape wildfire
- Ecosystem services will be greatly enhanced – e.g. habitat, flood storage, water quality, carbon sequestration



Legend

Blue Heart Boundary	Fire Impact Probability
2km buffer	0.0000
Waterways	0.1000
	0.2000
	0.3000
	0.4000
	0.5000

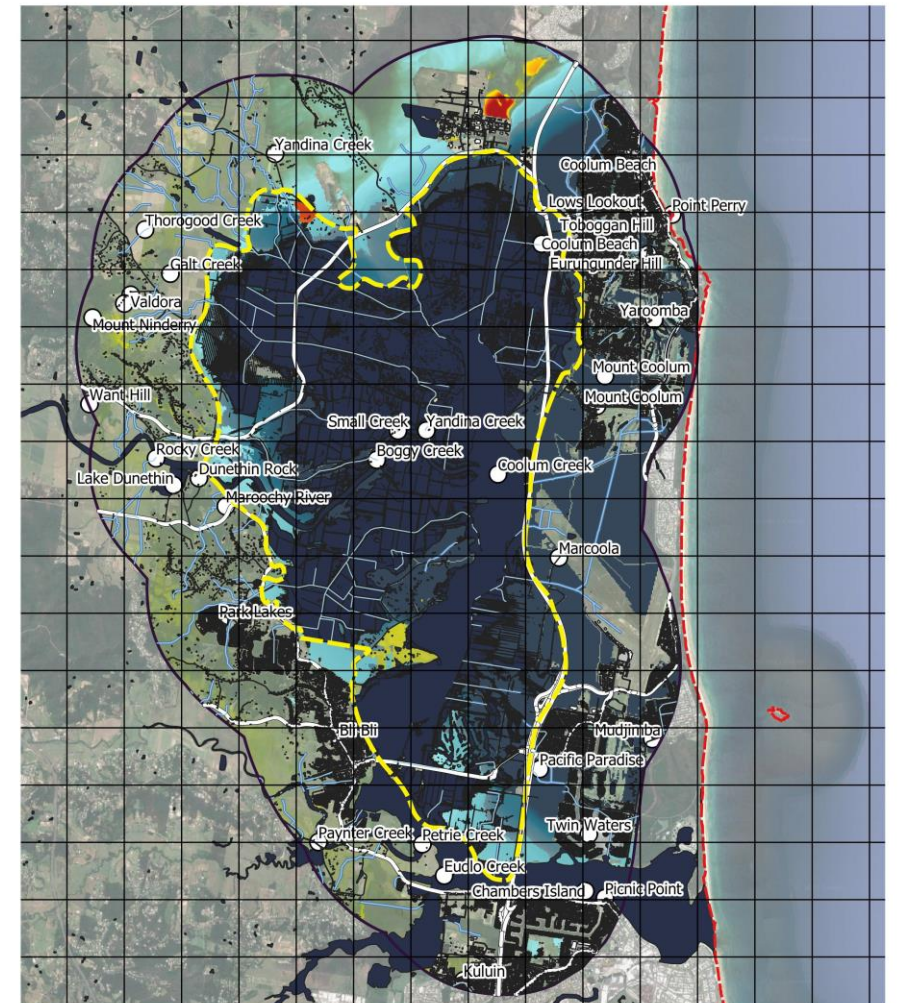


0 1 2 km

2125

IN CONCLUSION WE FOUND THAT:

- Long fire runs will be eliminated
- The coastal settlements will be very well protected by landscape fire from the west
- Some likely increase in risk to the west of the Blue Heart
- Managing regrowth vegetation is locally important to reduce local fire behaviour
- Simulation modelling techniques are helpful in assessing landscape change and alternative landscape design options/decisions
- Potential future work: intensity modelling, additional scenario's and radiant heat flux impacts on structures



Legend

Blue Heart Boundary	-200 to -250 impacts	0 to 50 more impacts
2km buffer	-150 to 200 impacts	50 to 100 more impacts
Waterways	-50 to -1000 impacts	100 to 150 more impacts
Difference	0 to -50 impacts	200 to 250 more impacts
-250+ impacts	No change	250+ more impacts

0 1 2 km



Difference 2023 to 2125

THANKYOU



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