RESULTS AND DISCUSSION

CURRENT BUSHFIRE RISK

Figure 17 shows the location of modelled high intensity fires of >3,000kW/m, with shading indicating the number of times that those areas were impacted by high intensity fires under the modelled current fuel conditions. These maps provide an indication of the likelihood of high intensity fire in response to terrain, current fuel type and load, and 99th percentile summertime weather conditions modelled in Phoenix. Figure 17 shows a potentially high incidence of high intensity fire south of Hobart in the Huon Valley extending through to the Channel, large areas from Sorell north east to Little Swanport, large tracts of areas modelled primarily as grassland south of Launceston, forest south of Fingal Valley, parts of the Derwent Valley and tracts of buttongrass in the Southwest.

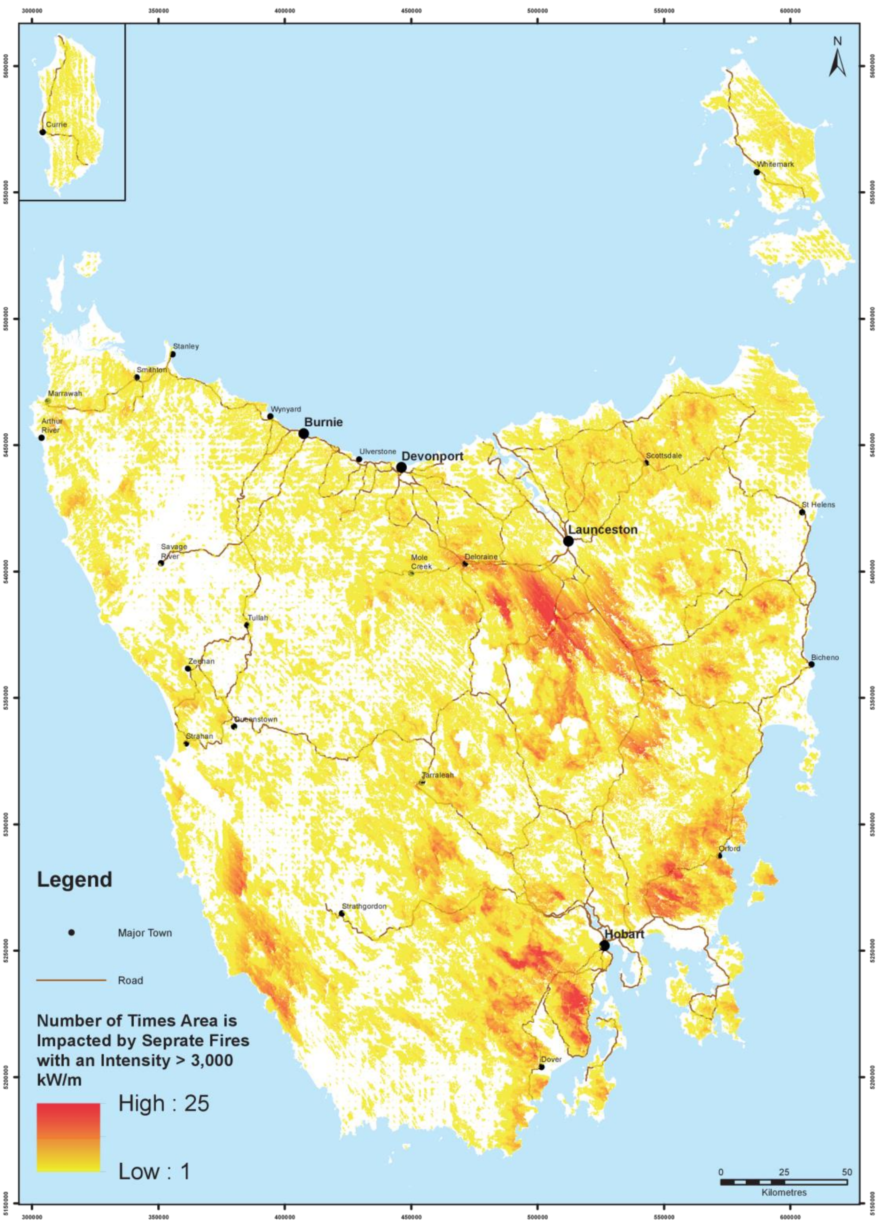

Figure 17: Location of high intensity fire impacts over 3,000kW/m under current fuel conditions, modelled in Phoenix.

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MODELLED IMPACTS ON HUMAN SETTLEMENT AREAS UNDER CURRENT, MAXIMUM AND MINIMUM TREATABLE FUEL LOADS

Information provided by vegetation mapping, fire mapping and fuel re-accumulation rates were used in Phoenix to model the potential for bushfires to impact on Human Settlement Areas. Predicted fire intensity and ember density was used to estimate the potential for house loss within Human Settlement Areas. Predicted impacts under current fuel load conditions were also compared to the maximum potential number of bushfire impacts that could occur if the fuel loads were allowed to accumulate to their maximum potential, i.e. if there had been no fuel reduction burning or bushfires to reduce the fuel loads to their current state. Impacts were then measured under conditions where the fuel age in all treatable vegetation was set to zero, allowing us to map the areas in the state where fuel reduction burning could potentially reduce bushfire impacts on Human Settlement Areas.

Areas shown in orange in Figure 19 indicate the additional extent of Human Settlement Area that could be impacted if fuels were at their maximum potential load according to the fuel accumulation equations used in the models. Some of these locations provide good examples of where fires in the past have reduced the bushfire risk to communities, e.g. along the northern suburban fringe of Hobart's Eastern Shore (Figure 18). The additional area representing impacts under maximum fuel loads is relatively small when compared to impacted cells under current fuel load conditions, indicating that in many areas fuel loads are likely to have accumulated to their maximum potential.

Figure 18: A bushfire burning north of Hobart's Eastern Shore Suburbs, 12 October 2006. Photographer: Ian Stewart.

In Figure 19, areas shown in red are the extent of Human Settlement Areas that were impacted by the modelled bushfires when the fuel age in all treatable vegetation was set to zero. Clusters of these areas occurred south of Hobart, south of Launceston and Deloraine, along the North West Coast, south of Scottsdale and around Sorell. By measuring impacts under minimum treatable fuel loads, we can identify Human Settlement Areas that are vulnerable to bushfire impacts, where nearby vegetation cannot be treated with fuel reduction burning. For these areas, other bushfire mitigation options like fire prevention, building design, garden maintenance, mechanical fuel removal, access, fire trail and fire break maintenance, bushfire detection and reporting, bushfire response plans, and effective communication including community education become even more important, as well as strategic fuel reduction in areas that may carry fire into the untreatable vegetation.

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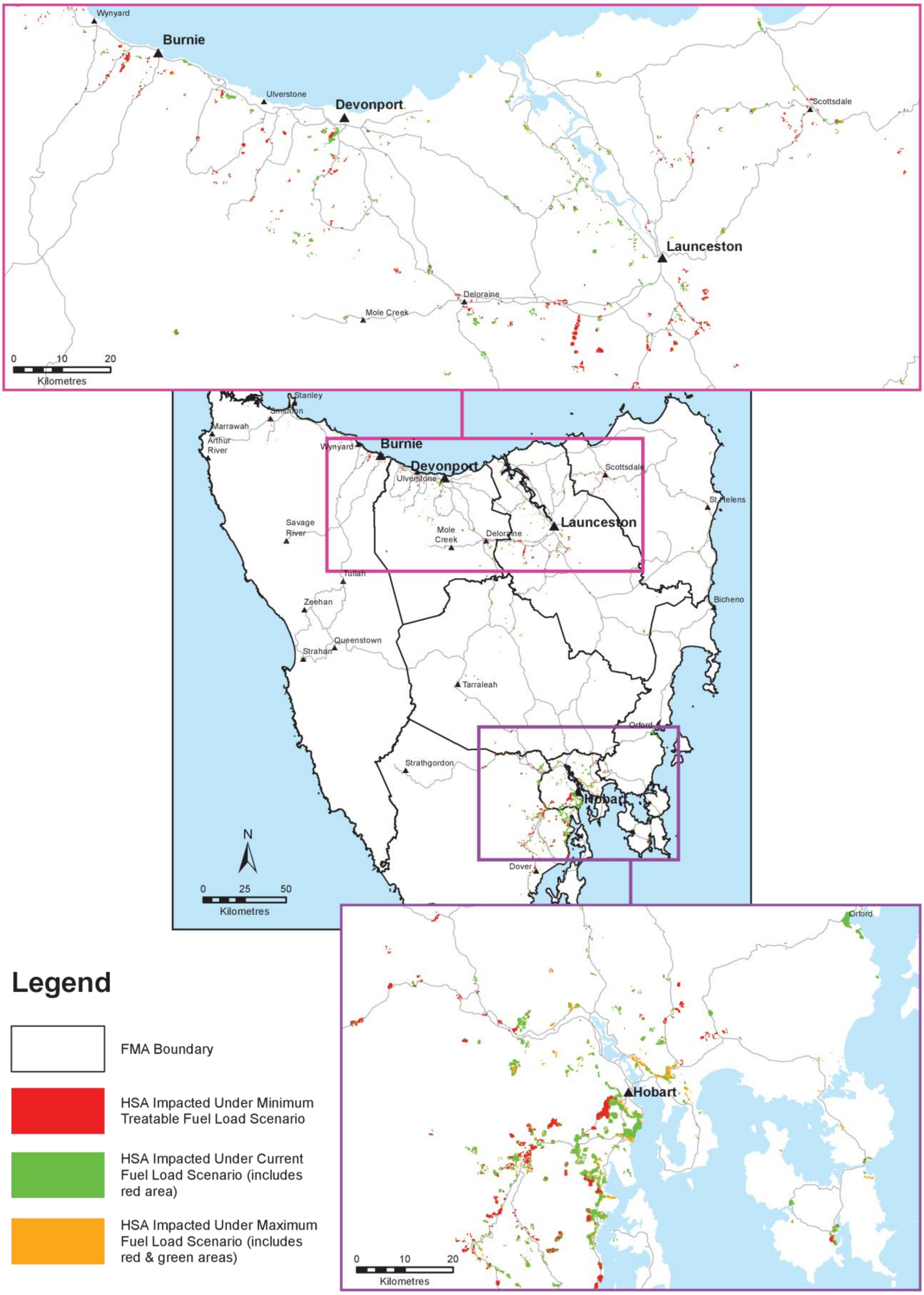

Figure 19: Modelled Human Settlement Area impacts under current, maximum and minimum treatable fuel loads.

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The following pie chart (Figure 20) shows the number of impacts that were measured in each of the FMAs, comparing the impacts under current fuel conditions to impacts that were measured under minimum treatable fuel conditions. The chart indicates that the majority of impacts in each FMA could potentially be managed with fuel reduction burning. However capacity to conduct fuel reduction is limited, so the challenge is to understand where to prioritise fuel reduction given the constraints to burning, for example budget, time and resources, and the need to manage for multiple objectives including biodiversity and environmental health, amenity and air quality.

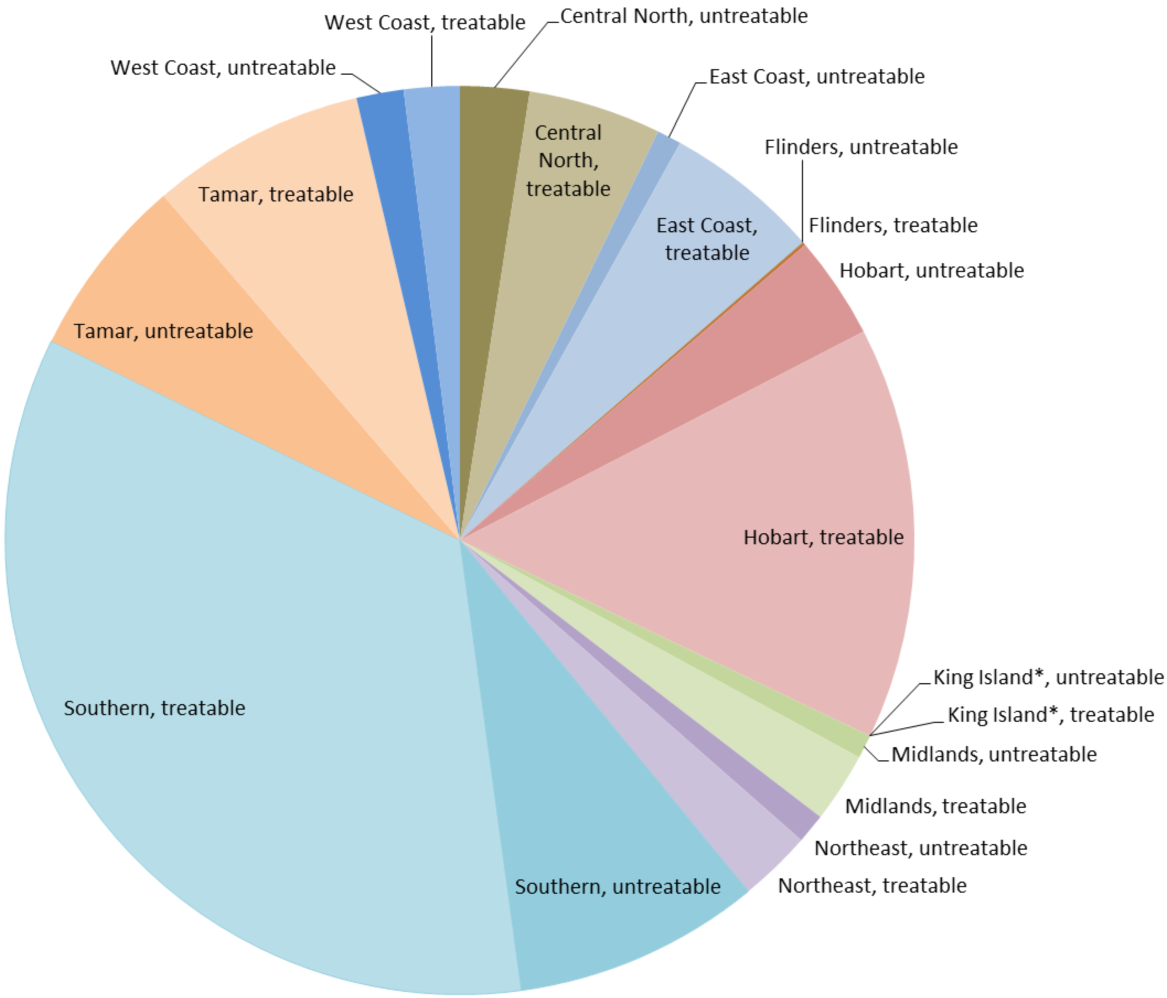

Figure 20: Total number of modelled Human Settlement Area impacts in each Fire Management Area, categorised as treatable and untreatable with fuel reduction burning. *No Human Settlement Area impacts were measured on King Island.

PREDICTED IGNITION POINT IMPACTS UNDER CURRENT FUEL CONDITIONS

Maps were prepared to show the ignition points that led to impacts on Human Settlement Areas. Often the ignition occurred a considerable distance away from the locations where the impacts were measured. These maps provide useful information to determine where fuel reduction can be strategically located to treat bushfire risk at potential ignition sources. Fires that start in areas of reduced fuel are more likely to self-extinguish or take longer to build in size and fire intensity, largely because the vegetation structure is less continuous, slowing the fire's progression.

Figure 21 shows the ignition points that led to measured impacts on Human Settlement Areas, with shading to indicate how many hectares of Human Settlement Area were impacted by each ignition point. Ignition points that led to the greatest impacts were located around Hobart, the Huon Valley and Orford.

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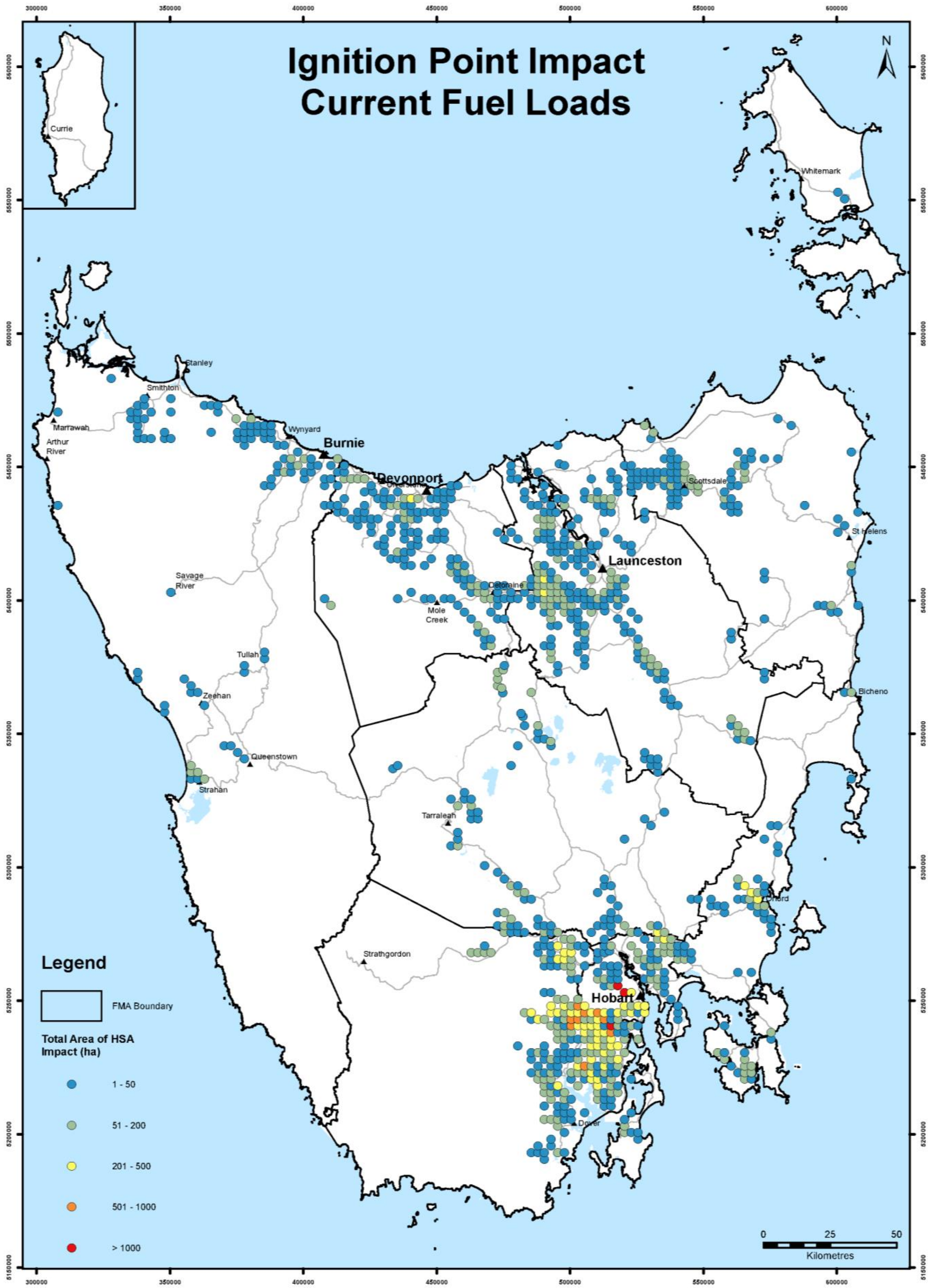

Figure 21: Ignition points that led to impacts on Human Settlement Areas under current fuel conditions.

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FUEL REDUCTION BURNING SCENARIOS

As mentioned earlier in this chapter, the majority of potential bushfire impacts could be managed using fuel reduction burning as a mitigation technique. However the challenge is to prioritise treatment so that fuel reduction burning can be carried out within existing constraints. The scenarios that were developed for this report attempt to take into account some of the quantifiable constraints to burning including the treatability of different vegetation types, the locations where burning may potentially occur based on land tenure and proximity to communities, and the amount of burning that could occur each year.

The scenarios consider the protection of communities as the highest priority. Human Settlement Areas, i.e. places where people live and work, were identified to represent the location of communities in the context of the report. The scenarios have not been developed to protect other values, for example natural values, agricultural crops and forestry assets. However, the BRAM has been used to prioritise burning, which does take these values into account.

TREATABLE VEGETATION

The West Coast, Midlands and Tamar, followed by Southern, Northeast and East Coast FMAs have the greatest area available for fuel reduction burning (Figure 22). These figures reflect the relatively large sizes of some of the FMAs, particularly the West Coast.

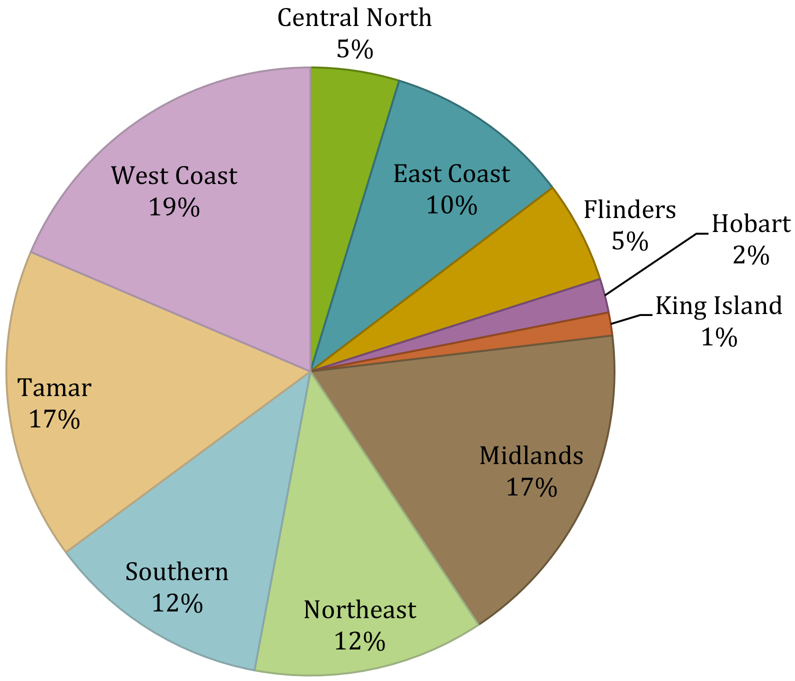

Figure 22: Distribution of treatable vegetation across the state, as a proportion of the total Tasmanian land area.

Figure 23 shows that the Flinders and East Coast FMAs have the highest proportion of treatable vegetation, with about two thirds of their area being treatable. Tamar, Northeast, Midlands and Hobart have treatable fuels in just under half of their management area, and Southern, King Island, West Coast and Central North have proportionally the least area available for treatment, around a quarter. Both Figure 22 and Figure 23 suggest that FMAs with large areas to manage, large areas of treatable fuels and more Human Settlement Areas are more likely to have larger fuel reduction burning programs as part of their Fire Protection Plans, for example Northeast, Midlands, Tamar, West Coast and East Coast.

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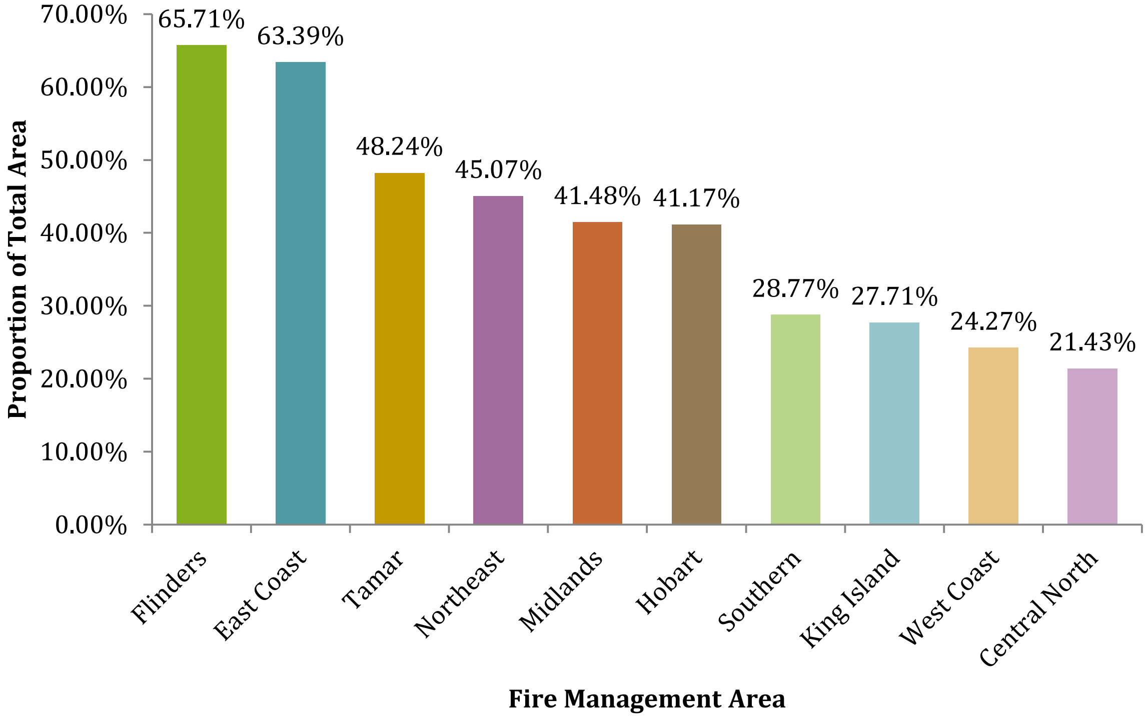

Figure 23: Treatable vegetation as a proportion of the total land area of each Fire Management Area.

PUBLIC LAND ONLY SCENARIOS

The Public Land Only Scenarios compared burning 5% and 2.5% of treatable fuels only on public land. Burn area selection was based on Statewide bushfire risk, with selected burn areas chosen using State Selection or FMA Selection methods. Maps for each of the five year burning scenarios can be found in Appendix 5.

Approximately 58% of the state is public land, most lying in the western half of the State where large areas of vegetation are untreatable in terms of fuel reduction burning. The Public Land Only treatments therefore treated less area annually compared to the tenure-blind (Public and Private Land Only) scenarios. Much of the private land is concentrated around major population centres, so the Public Land Only scenarios tended to burn areas that were further away from communities compared to the Public and Private Land and Fire Management Zone scenarios. The 5% and 2.5% Public Land Only scenarios involved burning a minimum of 74,000 and 37,000 hectares of treatable vegetation on public land, respectively.

There were considerable differences in strategic burn selection when comparing the state and FMA Selection methods. The State Selection method, which prioritised burning based on Statewide risk, resulted in more burning occurring in the north-east and east coast. In comparison the FMA Selection method resulted in more burning in the far southwest of the state. The State Selection method resulted in more immediate treatment of areas around greater Hobart, the Channel, the Huon Valley and the Central Highlands. The FMA Selection method resulted in more immediate treatment of bushfire risk in the northwest and northeast of the state, compared to the State Selection method.

Figure 24shows the land managers responsible for burning under the four Public Land Only Scenarios. Brown shows areas where burning is managed by Forestry Tasmania, and the green and yellow are managed by the Parks and Wildlife Service. There were considerable differences in terms of the proportion of responsibility for burning, with the Parks and Wildlife responsible for half to three quarters of the treatment area over the five years, largely driven by the selection of extremely large Analysis Blocks in the Western and Southern FMAs.

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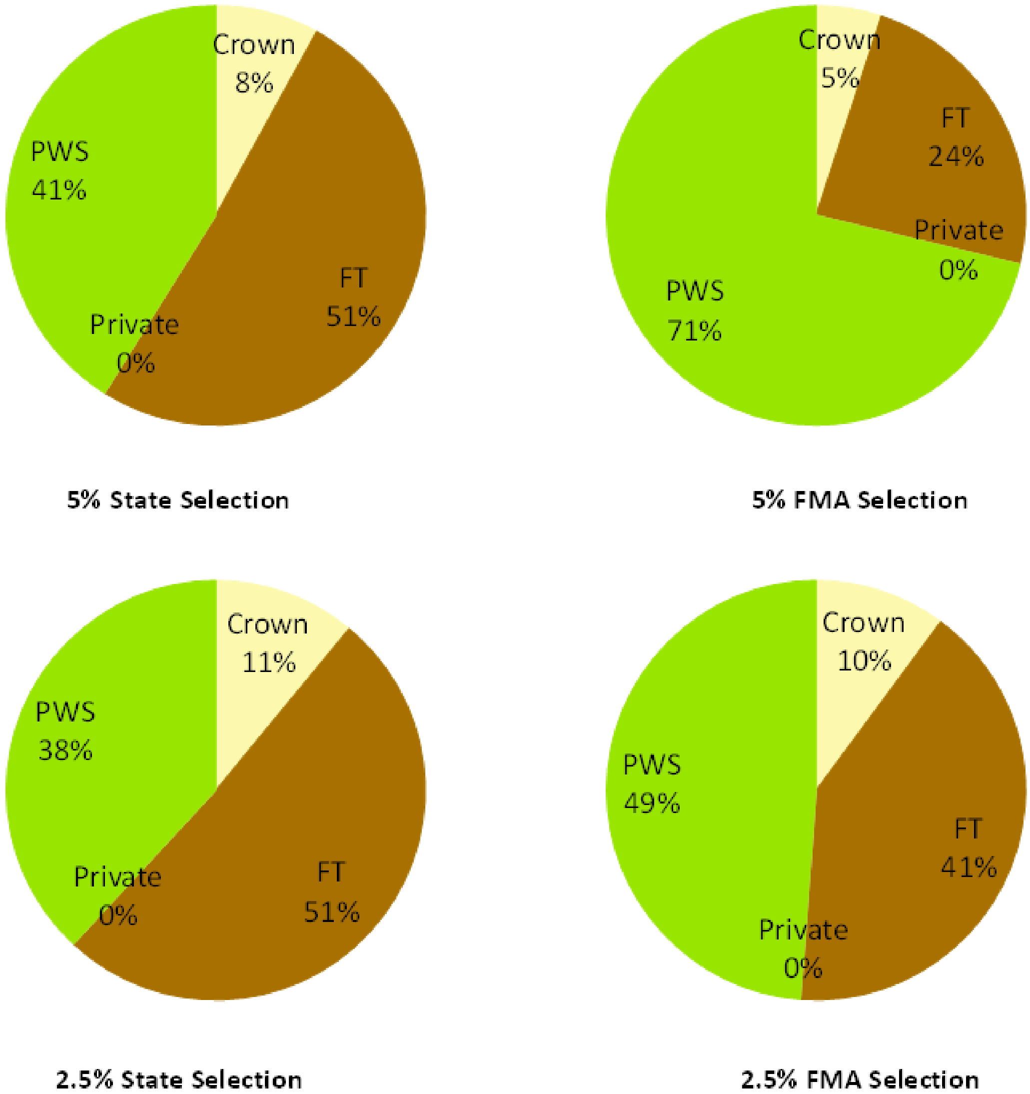

Figure 24: Distribution of treatment area by land tenure under the Public Land Only scenarios. Clockwise from top left, burning 5% of treatable vegetation per year using the State Selection method, 5% using FMA selection, 2.5% using FMA selection , 2.5% using state selection.

Public and Private Land Scenarios

The Public and Private Land scenarios in comparison were the least restricted in terms of the area that could be treated with fuel reduction burning. For these scenarios, the amount of burning was based on 5%, 2.5% and 1.25% of treatable vegetation, resulting in the treatment of at least 124,000 hectares, 62,000 and 31,000 hectares per year, respectively.

More burning occurred in the northeast, Central Highlands, central north and Midlands using the State Selection method to prioritise burns. In comparison the FMA selection resulted in more burning occurring in the southwest and northwest. More immediate priority was given to burning in the southeast, Central Highlands, northeast and East Coast under the State Selection method, whereas the FMA Selection method resulted in more immediate priority being given to areas in the northwest, and the Tamar valley.

Figure 25 shows that private land owners would be responsible for nearly half of the area treated under the Private and Public Land scenarios. PWS and FT would be responsible for around one quarter each.

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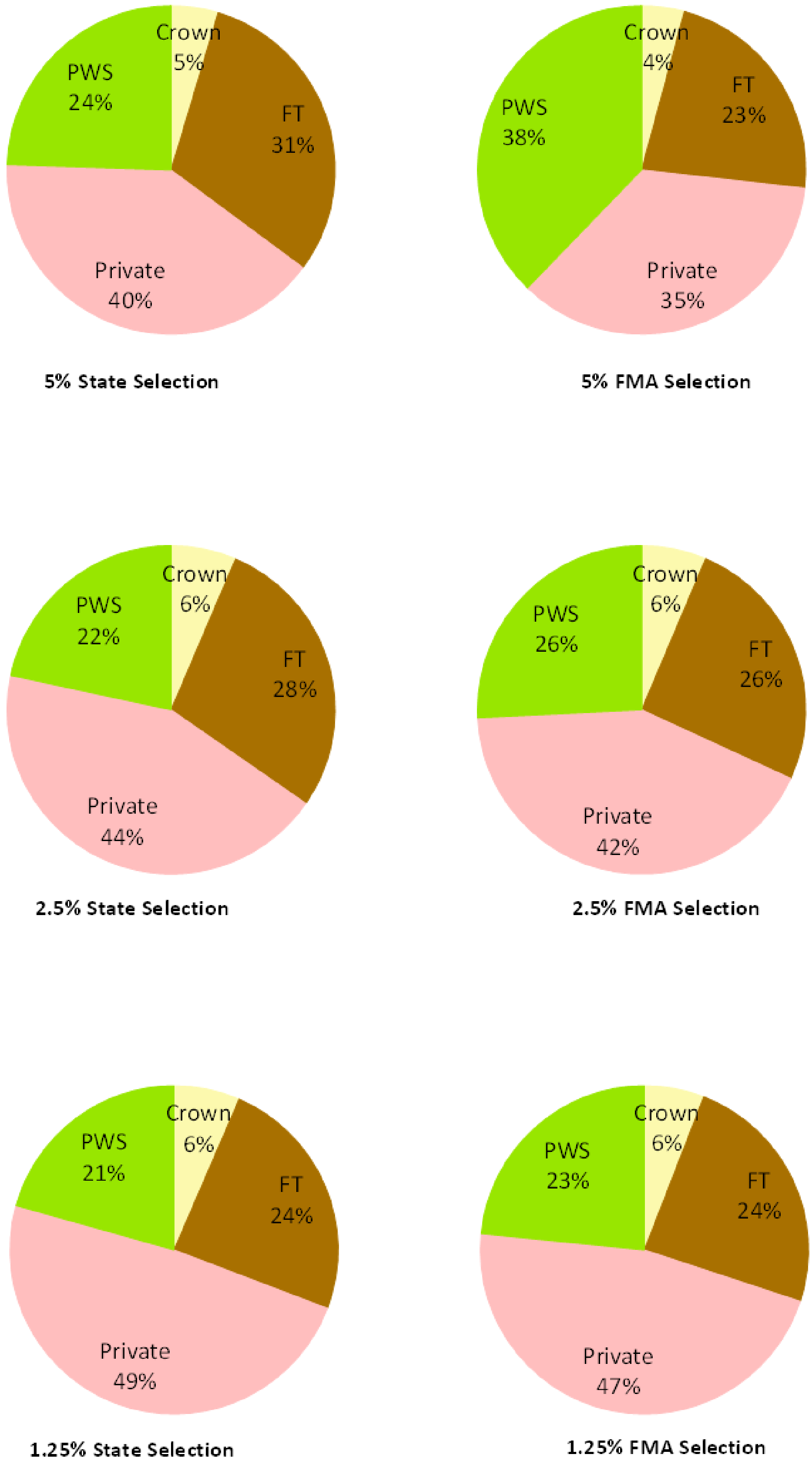

Figure 25: Distribution of treatment area by land tenure under the Public and Private Land scenarios.

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Fire Management Zone Scenarios

The fire management zone scenarios confined fuel reduction burning to within 6.05km of each Human Settlement Area. The development of these scenarios were based on recommendations from the National Inquiry into Bushfire Management (Ellis, et al., 2004) and research into the effects of fuel on fire severity (Bradstock, et al., 2010). Two levels of treatment were compared, referred to as the Full and Half treatments.

In the Full Fire Management Zone scenario, 20% of the treatable vegetation in Asset Protection Zones (within 1.05km of settlements) were burnt each year. 10% of the Strategic Fuel Management Zone (between 1.05 and 6.05km from the settlements) were burnt each year. This means that if the scenario was fully implemented, then all treatable vegetation inside Asset Protection Zones would have fuel ages of no more than five years, by the fifth year of treatment. Further out, half of the treatable vegetation would have a fuel age of less than five years inside the Strategic Fuel Management Zones. The Full Fire Management Zone scenario would require the treatment of approximately 100,000 hectares of treatable vegetation each year.

The Half Fire Management Zone scenario involved burning 10% of the treatable vegetation in Asset Protection Zones each year, resulting in treatment of half of the Asset Protection Zone within five years of a fully implemented program. Further out, 5% of the treatable vegetation in the Strategic Fuel Management Zone would be burn each year, so that 25% of the treatable vegetation would be burnt by Year 5. Therefore the Half Fire Management Zone scenario resulted in a much patchier treatment of fuels within 6.05 km of Human Settlement Areas.

The BRAM's Head Fire Intensity (HFI) score was used to prioritise areas for treatment. Statewide, BRAM HFI values close to communities were highest in coastal, scrub and buttongrass areas in the state's west and north-west, King Island and Flinders Island, along most of the north coast with much smaller areas along the east coast and south of Dover. This resulted in more burning, and more immediate treatment, around communities in the state's west and northwest. In fact the high HFI values in areas of the West Coast FMA resulted in most of the burning occurring in that area in Year 1. In comparison there was less burning and much later treatment in the State's southeast, particularly in the Half Fire Management Zone scenario.

The FMA Selection method in comparison distributed risk treatment more evenly around the state. Because burning was confined to areas close to communities, the FMA Selection method didn't lead to the treatment of large areas of public land in the southwest by Year 5, compared to other scenarios that used the FMA Selection method.

Given the proximity to Human Settlement Areas, over half of the burning occurred in areas managed as private property (Figure 26). Around one third of the area fell on land managed by PWS (who also manage fires on Crown), and the smallest proportion of area, shown in brown, was managed by FT.

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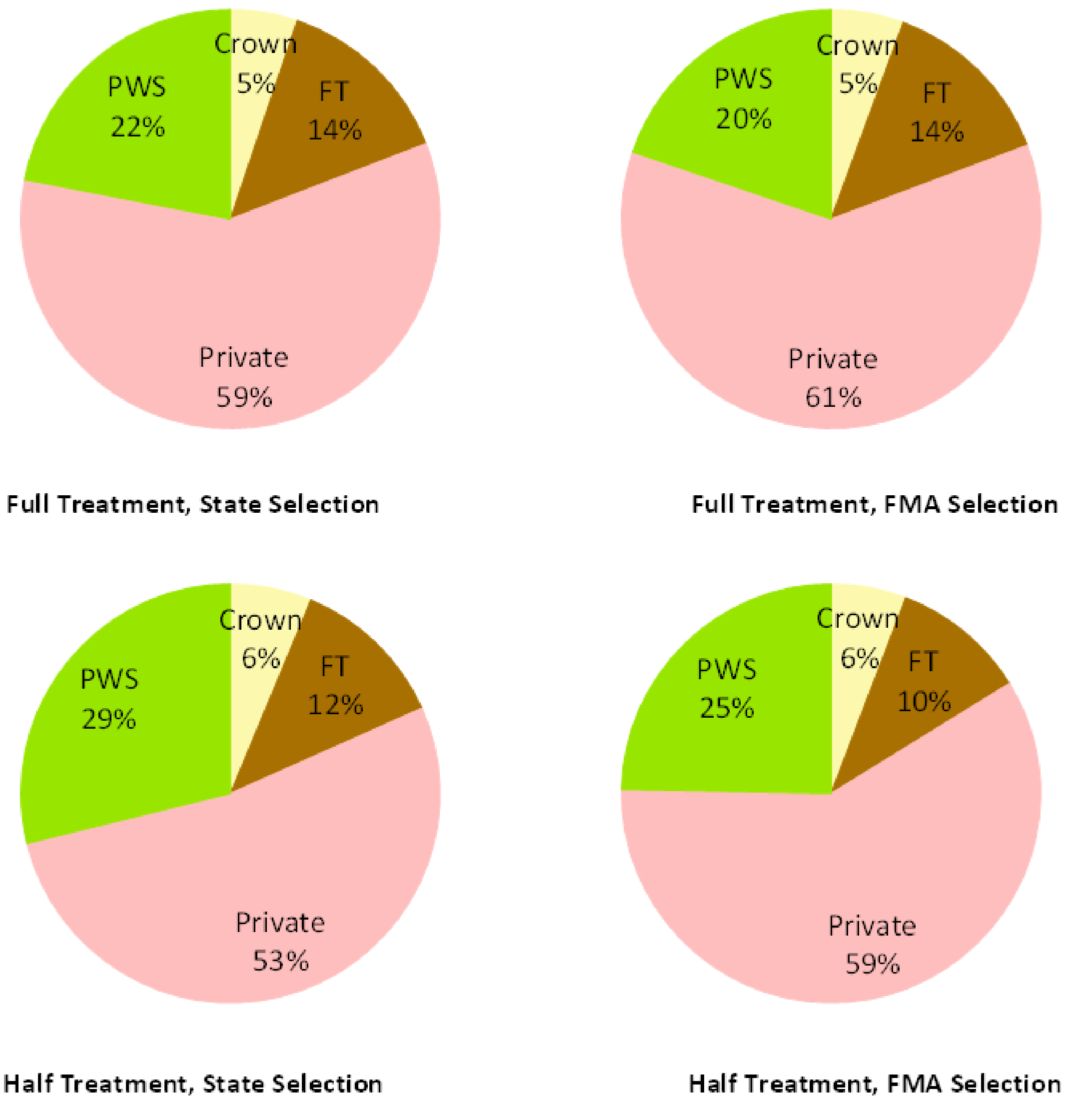

Figure 26: Distribution of treatment area by land tenure under the Fire Management Zone scenarios.

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STATEWIDE EFFECTS OF FUEL REDUCTION BURNING

HUMAN SETTLEMENT AREA IMPACTS

The risk profile for Tasmania is shown in Figure 27. The black line shows how the modelled impacts on Human Settlement Areas changed from year to year up until 2013. As described in the methodology, it is expressed as a proportion of the number of modelled impacts over the number of maximum potential impacts if all fuels had accumulated to their maximum potential.

The graph also shows the area burnt each year according to bushfire and fuel reduction burning histories. The chart shows projected relative risk over the next five years based on No Fuel Treatment, and planned burning associated with the fuel reduction scenarios that were developed using Statewide bushfire risk to prioritise burning.

Figure 27 shows that relative risk increased slowly to its highest level in 2013, where it currently lies at over 90% of maximum potential human settlement impacts.

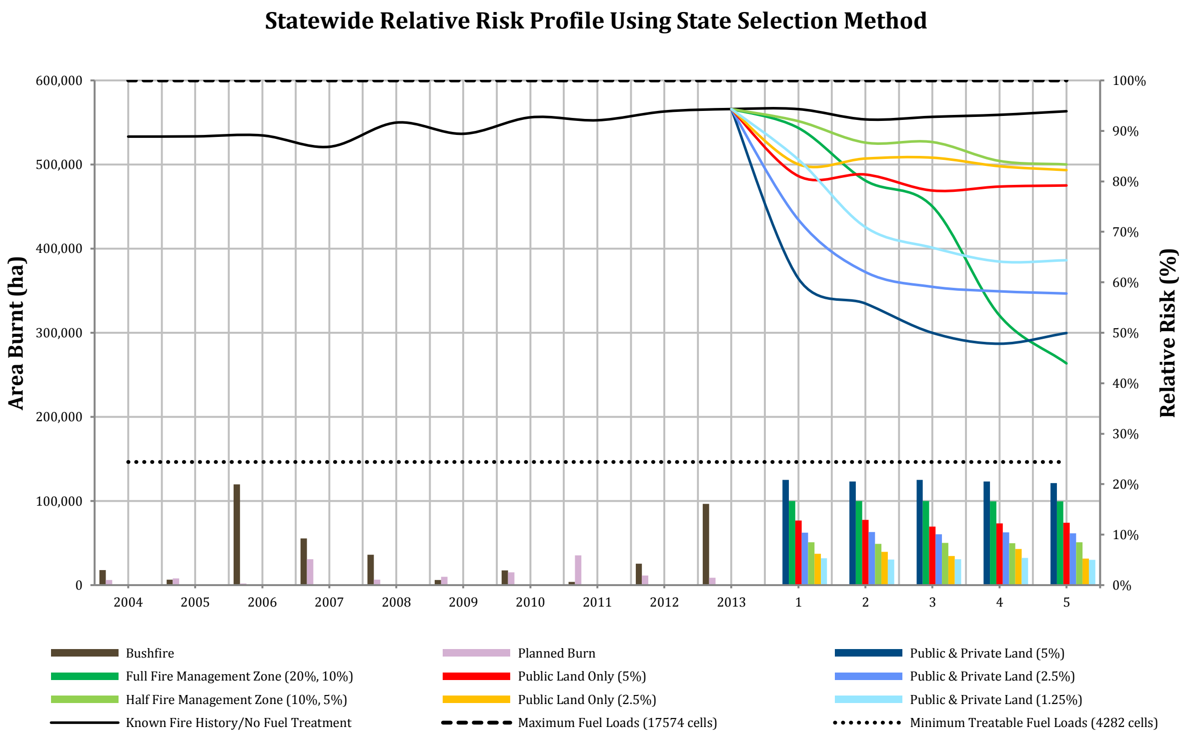

Figure 27: Relative risk profile for Tasmania based on weather scenarios representing 99.0 to 99.5 percentile summertime weather conditions. Fire history (bushfires and planned burning) is included for 2003-2013, along with the five year burning scenarios that were based on treating highest bushfire risk at the Statewide level.

The dotted line shows the number of Human Settlement Area impacts measured under conditions where all treatable vegetation types were given a fuel age of zero. This provides an indication of the level of fuel reduction burning that would be required to reduce impacts to their minimum. The number of impacts measured under minimum fuel loads shows that fuel reduction burning will never totally remove bushfire risk and potential house loss in all areas. In reality, a fuel reduction burning program could never reduce fuels to a point where all treatable vegetation was burnt in the same year. A relative risk profile would only drop below the minimum relative risk if bushfires burnt large areas of treatable and untreatable vegetation, under weather conditions that were similar to the modelled weather conditions.

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The coloured lines represent projected relative risk using the State Selection method, assuming that the scenarios were fully implemented in the five years following 2013. There was no attempt to estimate area burnt by bushfires in the five year forward projection. The state relative risk profile closely resembled the risk profiles for Southern and Hobart, because most of the impacts occurred in those FMAs. Relative risk charts were therefore prepared for each of the FMAs as well as the state, to get a better understanding of how the fuel reduction burning scenarios affected relative risk in areas other than the Southern and Hobart FMAs.

All treatments significantly reduced Human Settlement Area impacts except for the 2.5% Public Land Only scenarios, and the Half Fire Management Zone scenario using the State Selection method. The state relative risk profile dropped at the fastest rate, to just over 50% if 5% of treatable fuels were burnt each year on public and private land, using both the state selection and FMA Selection methods. Burning 2.5% and 1.25% of treatable vegetation on public and private land each year also reduced relative risk significantly, to about 60% in year 5 using the State Selection method.

The Full Fire Management Zone scenarios reduced relative risk to the lowest level by year 5 to just over 40% under both state and FMA Selection methods. The FMA Selection method (Figure 28) resulted in a faster decline in relative risk because more treatment occurred in the Southern and Hobart FMAs in the first few years. Under the State Selection method, treatment of high risk areas in the Southern and Hobart FMAs did not occur until years 4 and 5 of full treatment. Halving the program resulted in high risk areas not being treated within the five year period, i.e. they would probably have been treated around Years 8 to 10 of a longer-term program. Furthermore, the FMA Selection methods show large areas of remote public land in the southwest being treated by Years 4 and 5, with no apparent change in relative risk. Figure 27 and Figure 28 demonstrate how a strategic burning program can reduce potential bushfire impacts. The angle of the curves in Figure 28 indicate that long-term fuel reduction burning programs, in the order of decades, may be required under the more conservative burning programs (i.e. the Half Fire Management Zone and the 1.25% Public and Private Land scenarios) to reduce bushfire risk over time.

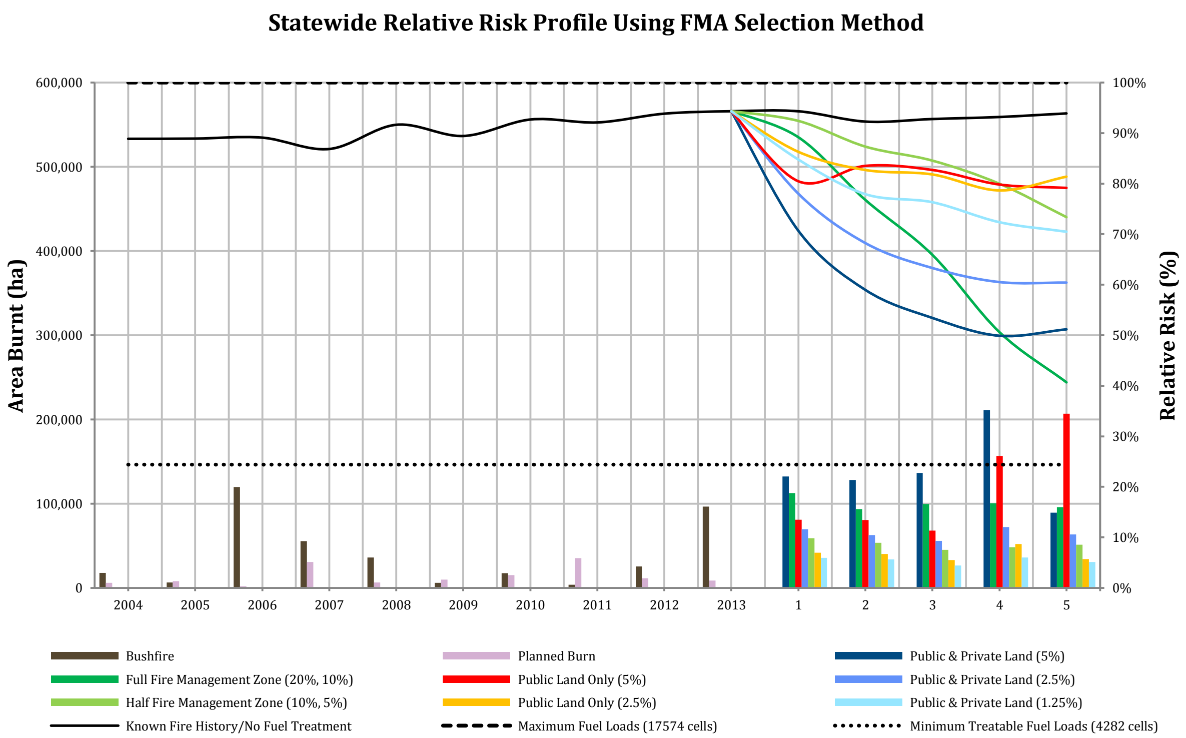

Figure 28: Relative risk profile for Tasmania based on weather scenarios representing 99.0 to 99.5 percentile summertime weather conditions. Fire history (bushfires and planned burning) is included for 2003-2013, along with the five year burning scenarios that were based on treating highest bushfire risk within each Fire Management Area.

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IMPACTING IGNITION POINTS

Figure 29 shows how fuel reduction at ignition points reduced Human Settlement Area impacts after Year 5 of treatment. The results from each scenario were quite similar, showing that the greatest reductions occurred in the Southern FMA. These maps provide an indication of where strategic fuel reduction burning could be located to reduce the potential for potentially high impact bushfires, if a fire were to start in that area.

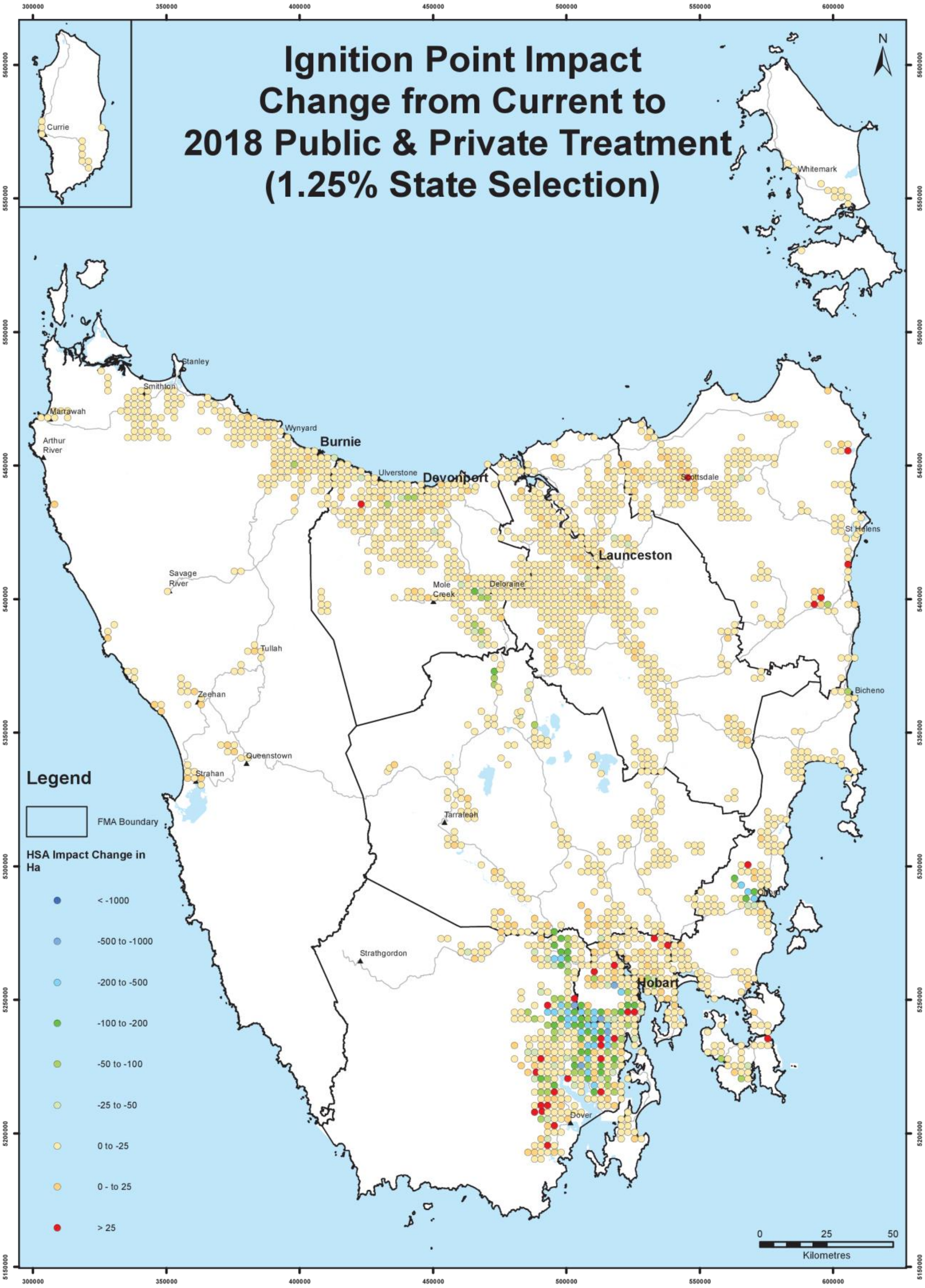

Figure 29: Location of ignition points that impacted on Human Settlement Areas, showing the difference in impact count between 2013 and Year 5 of the 2.5% Public and Private Land scenario using the State Selection method.

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EASE OF SUPPRESSION

Two measures were used to quantify ease of suppression: fire intensity and fire size. Fire intensity was categorised into low and high intensity fire using a threshold of 3000kW/m, representing the upper limit for effective firefighting. Over 3000kW/m, firefighting was considered to be less effective and unsafe. In reality it is difficult to quantify the point at which fire suppression is considered to be unsafe, because there are many elements of fire behaviour that influence ease of suppression, e.g. terrain, rock, forest cover, resource type and skill level (McCarthy, et al., 2003).

These results should be treated with some care. Fuel accumulation equations are based on empirical data collected in the field. Therefore fuel accumulation rates and subsequent fire intensity calculations are generally based on data collected from a mixture of areas burnt at a range of intensities, from prescribe low intensity fire through to high intensity bushfires. The fuel accumulation rates and subsequent fire behaviour calculations are based on an average of fire conditions.

Figure 30 provides a comparison of high intensity fire effects per ignition after Year 5 for each fuel reduction burning scenario. Scenarios with error bars that do not overlap with the NFT_1, i.e. entirely below the line, indicate statistically significant reductions in fire intensity after five years of treatment compared to impacts modelled under current fuel loads. Scenarios with error bars that do not overlap with the NFT_5 indicate statistically significant differences compared to impacts if fuels were allowed to accumulate with no treatment over five years. These results show that, at the Statewide scale, fire intensity was significantly lower than the no fuel treatment scenario in virtually all scenarios. When compared to current fuels, the scenarios that burnt the largest areas, i.e. the Full Fire Management Zone (FMAC_APZT, STATE_APZT), Public and Private Land burning5% and 2.5% of treatable fuel (FMAC_PPT, FMAC_PPT_HF, STATE_PPT, STATE_PPT_HF), and Public Land Only scenarios burning 5% of treatable fuels (FMAC_PT, STATE_PT), significantly reduced the amount of high intensity fire in the landscape to below 3000kW/m.

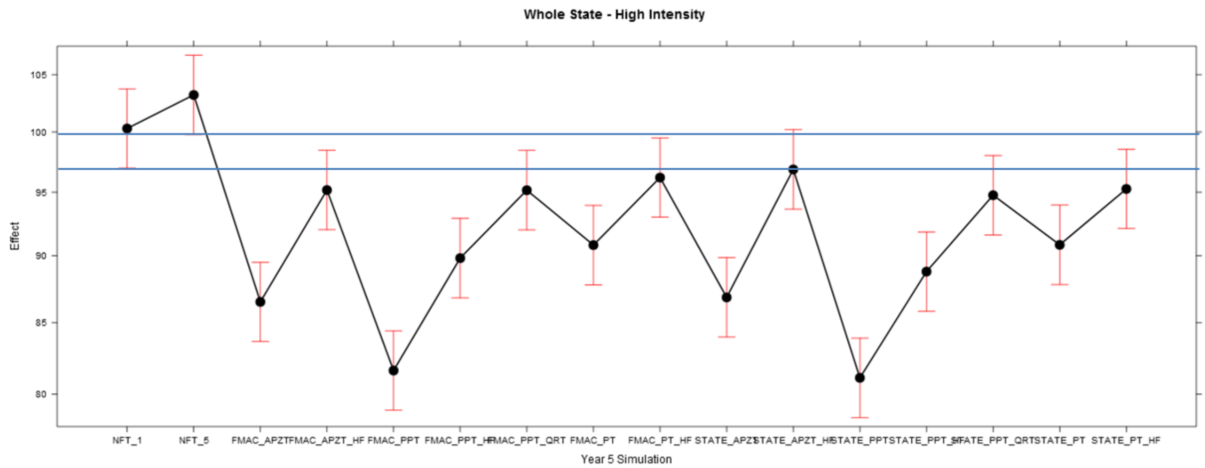

Figure 30: A Statewide comparison of high intensity fire effects per ignition after Year 5 for each fuel reduction burning scenario, modelled in PHOENIX RapidFire.

The fuel reduction scenarios were also compared against current and no fuel treatment using the Head Fire Intensity (HFI) component of BRAM, which uses different fuel accumulation and fire behaviour equations to calculate fire intensity for every $100m^2$ grid cell in Tasmania based on fuel types, fuel age, fuel loads and a standard 90^{th} percentile weather profile based on weather observations from the nearest relevant weather station (InsightGIS, 2013). The BRAM results confirmed a reduction in the occurrence of high intensity fire >3,000kW/m, reducing up to 100,000 ha of area down into the low intensity category within 10km of Human Settlement Areas (Figure 31).

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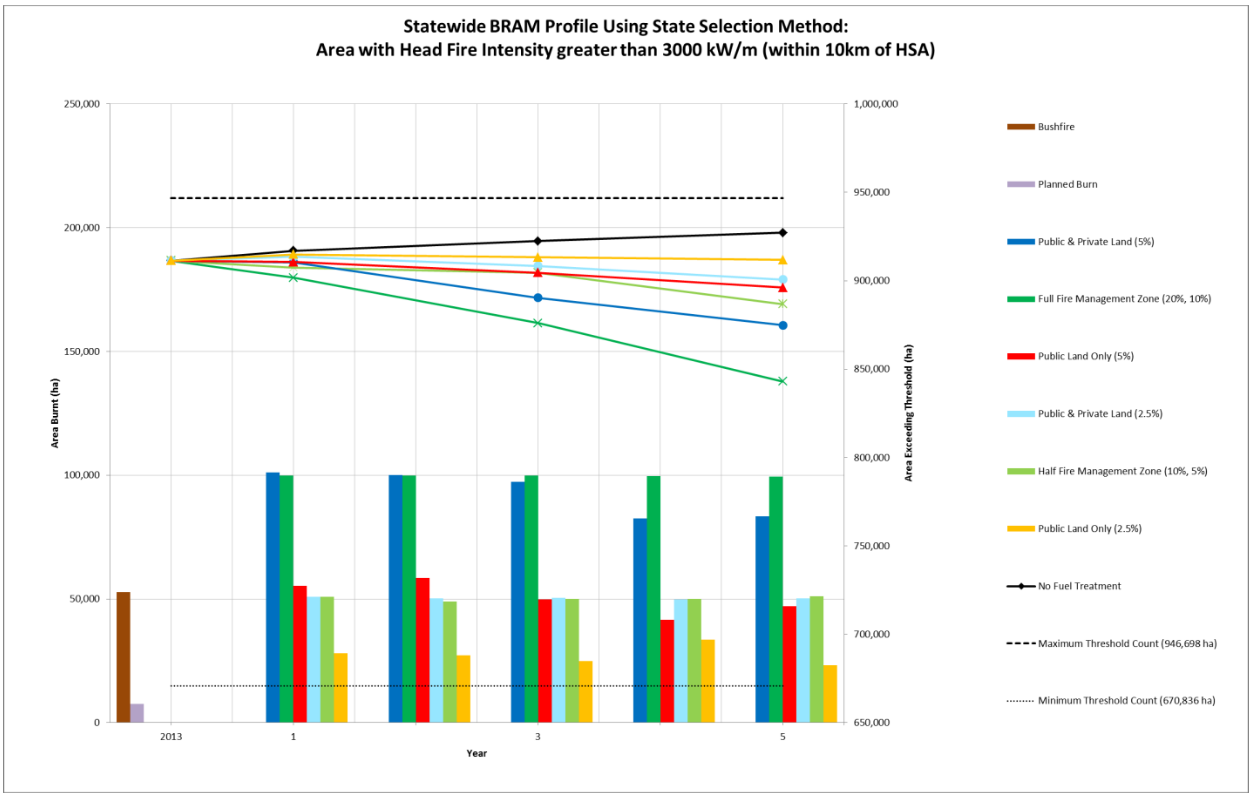

Figure 31: Area (ha) within 10km of Human Settlement Areas that exceeded 3,000kW/m of maximum BRAM head fire intensity in Years 1, 3 and 5 of fuel treatment.

The scenarios had less significant effects on reducing fire size, with significant reductions under the Public and Private Land scenarios burning 5% & 2.5% of treatable fuels (FMAC_PPT, FMAC_PPT_HF, STATE_PPT, STATE_PPT_HF in figure 32), and the Public Land Only scenario burning 5% of treatable fuel, using the FMA Selection method (FMAC_PT). These results suggest that all of the fuel reduction burning scenarios except for the 2.5% Public Land Only scenario significantly reduced fire behaviour to more manageable levels when compared to no fuel treatment. While fire size did not change as significantly, the greatest effect was a reduction in fire intensity.

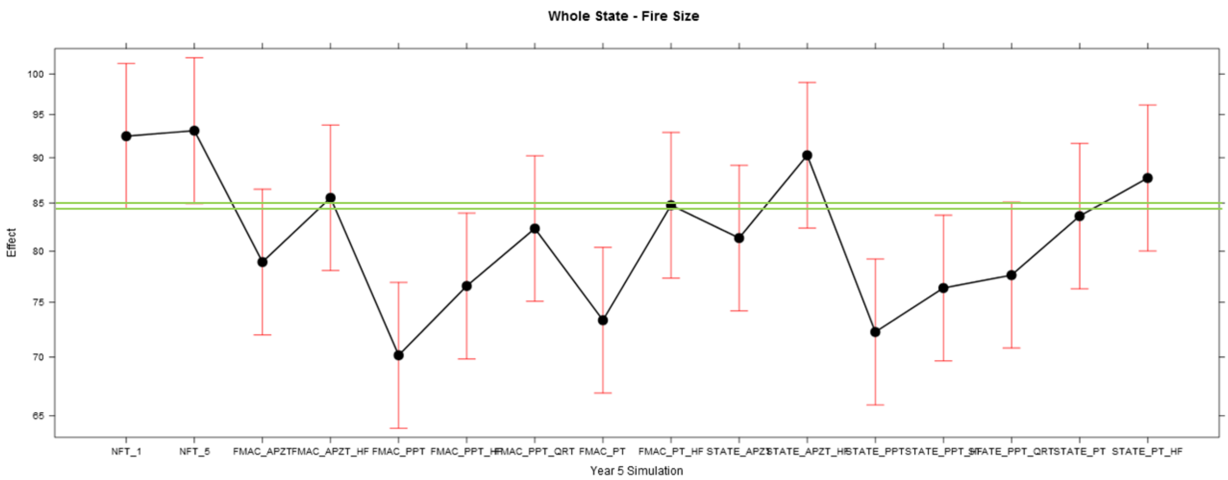

Figure 32: Comparison of area burnt per ignition after Year 5 for each fuel reduction burning scenario, modelled in PHOENIX RapidFire.

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Southern Fire Management Area

In the Southern FMA, relative risk remained near the maximum level (100%) for the entire period between 2003 and 2013. The Southern FMA had the greatest potential for Human Settlement Area impacts of all the FMAs, as well as the greatest potential to reduce Human Settlement Area impacts through fuel reduction. In comparison to other FMAs, Southern FMA still had considerable Human Settlement Area where fuel reduction would be unlikely to reduce potential impacts. The dotted line in Figure 33 shows the theoretical minimum relative risk for the hypothetical scenario of burning all treatable vegetation in the Southern FMA, which is 20% of the total number of potential impacts under maximum fuel conditions. However 20% still represents a large amount of Human Settlement Area (1454 200m^2 grid cells) when compared to most other FMAs, which have much lower densities of Human Settlement Area. It should be noted the HSA impacted area might be counted cumulatively if multiple fires impact on the same Human Settlement Area.

There was a considerable difference in the rates of reduction in Human Settlement Area impact between the State Selection method (Figure 33) and the Fire Management Area selection method (Figure 34). The increased reduction rates in the Southern FMA confirm that the State Selection method using the BRAM Risk Score was effectively identifying high risk areas for treatment.

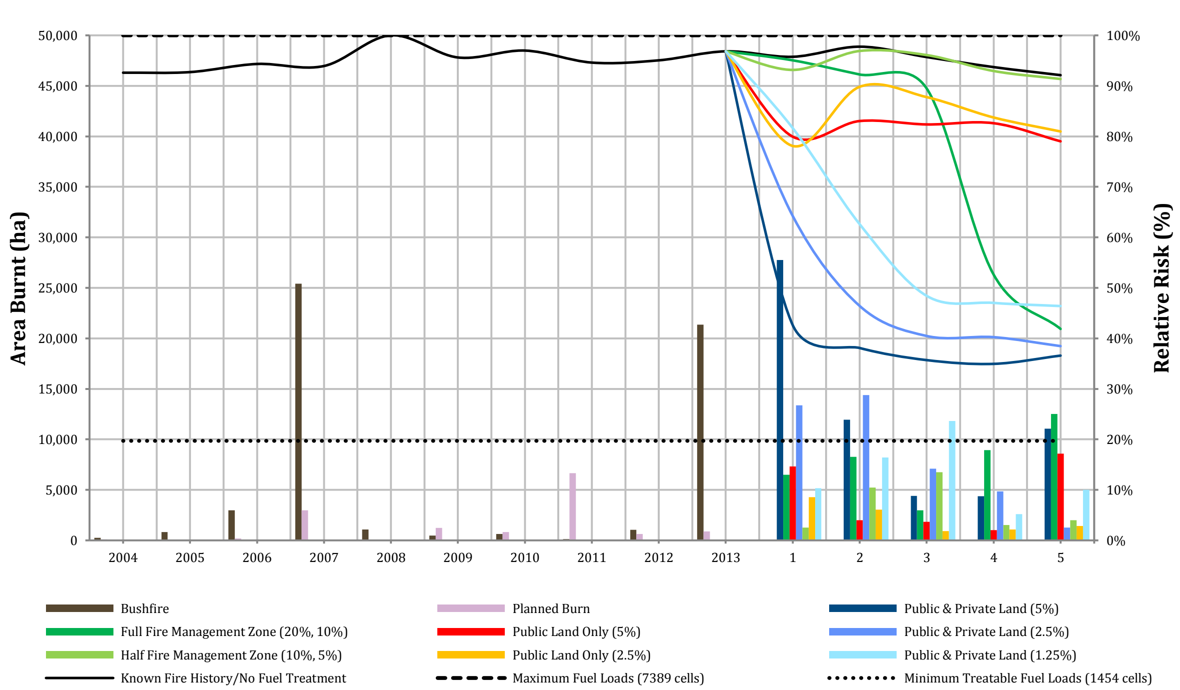

Figure 33: Relative risk profile for Southern Fire Management Area using the State Selection method to reduce bushfire risk.

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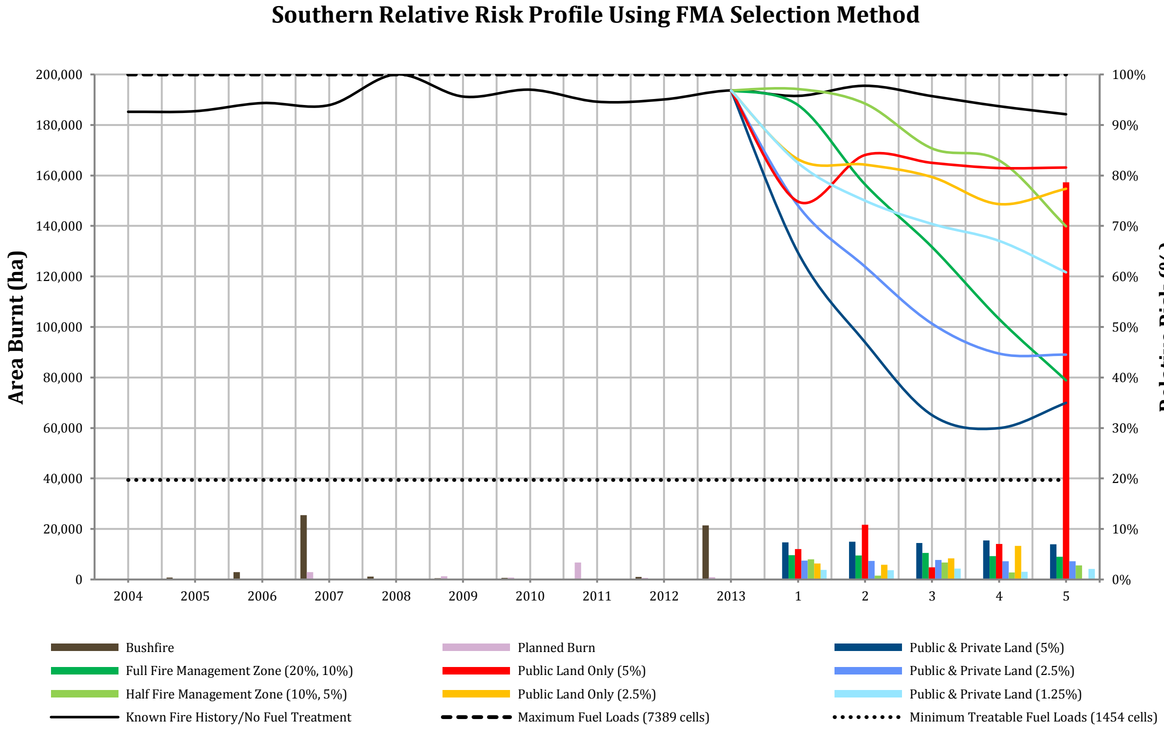

Figure 34: Relative risk profile for Southern Fire Management Area using the Fire Management Area selection method to reduce bushfire risk.

Table 5 provides a summary of the fuel reduction burning scenarios that resulted in statistically significant reductions in HSA impacts, fire intensity and fire size. All of the Public and Private Land scenarios reduced HSA impacts. Fire intensity and size were significantly reduced in all of the 5% and 2.5% scenarios on Public and Private Land. The 1.25% scenario using the state selection significantly reduced fire intensity but not fire size. The Full Fire Management Zone scenarios significantly reduced impacts, but with no significant reductions in fire intensity and fire size.

Table 5. Statistically Significant Reductions in Human Settlement Impacts, Fire Intensity and Fire Size after Year 5 of Treatment in the Southern Fire Management Area.

Treatment Scenarios	Human Settlement Area Impacts	Fire Intensity	Fire Size
FMA Full Fire Management Zone (20%, 10%)	X		
FMA Half Fire Management Zone (10%, 5%)			
FMA Public and Private Land (5%)	X	X	X
FMA Public and Private Land (2.5%)	X	X	X
FMA Public and Private Land (1.25%)	X		
FMA Public Land only (5%)		X	X
FMA Public Land Only (2.5%)			
State Full Fire Management Zone (20%, 10%)	X		
State Half Fire Management Zone (10%, 5%)			
State Public and Private Land (5%)	X	X	X
State Public and Private Land (2.5%)	X	X	X
State Public and Private Land (1.25%)	X	X	
State Public Land only (5%)			
State Public Land Only (2.5%)			

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HOBART FIRE MANAGEMENT AREA

In the Hobart FMA, fires in the decade leading up to 2003 resulted in the relative risk profile moving from around 70 to 90% (Figure 35). The sudden drop in relative risk in Year 2 of No Fuel Treatment and the Fire Management Zone scenarios appears to be coincidental. Complex relationships between different vegetation types, slope, major roads, and wind changes affected the timing of peaks in fire intensity, rate of spread and spotting, resulting in fewer impacts in Year 2 for a single fire modelled between Hobart and Kingston, even though no burning occurred in that area.

The Hobart FMA had a very high potential for Human Settlement Area impacts under current fuel conditions, as well as a high potential to reduce Human Settlement Area impacts through fuel reduction (Figure 35 and Figure 36). In comparison to other FMAs, Hobart FMA had considerable Human Settlement Area impacts where fuel reduction would probably not reduce potential bushfire impacts, although not as many as in the Southern or Tamar FMAs.

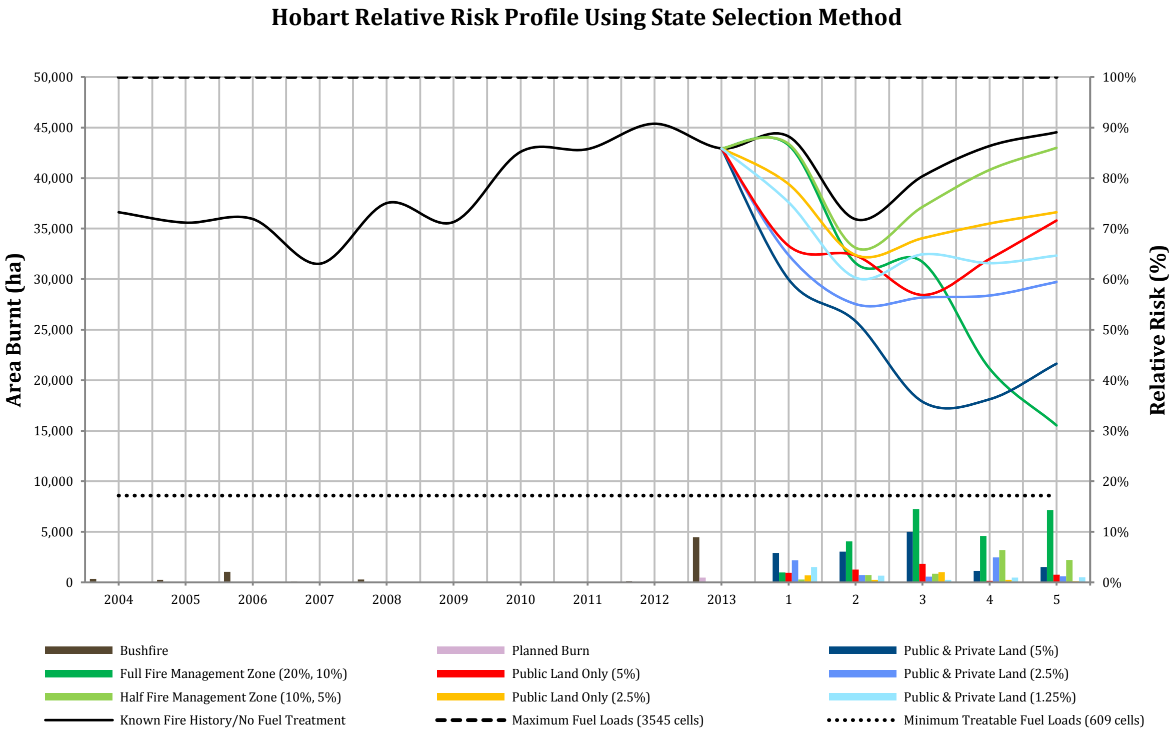

Figure 35: Relative risk profile for Hobart Fire Management Area using the State Selection method to reduce bushfire risk.

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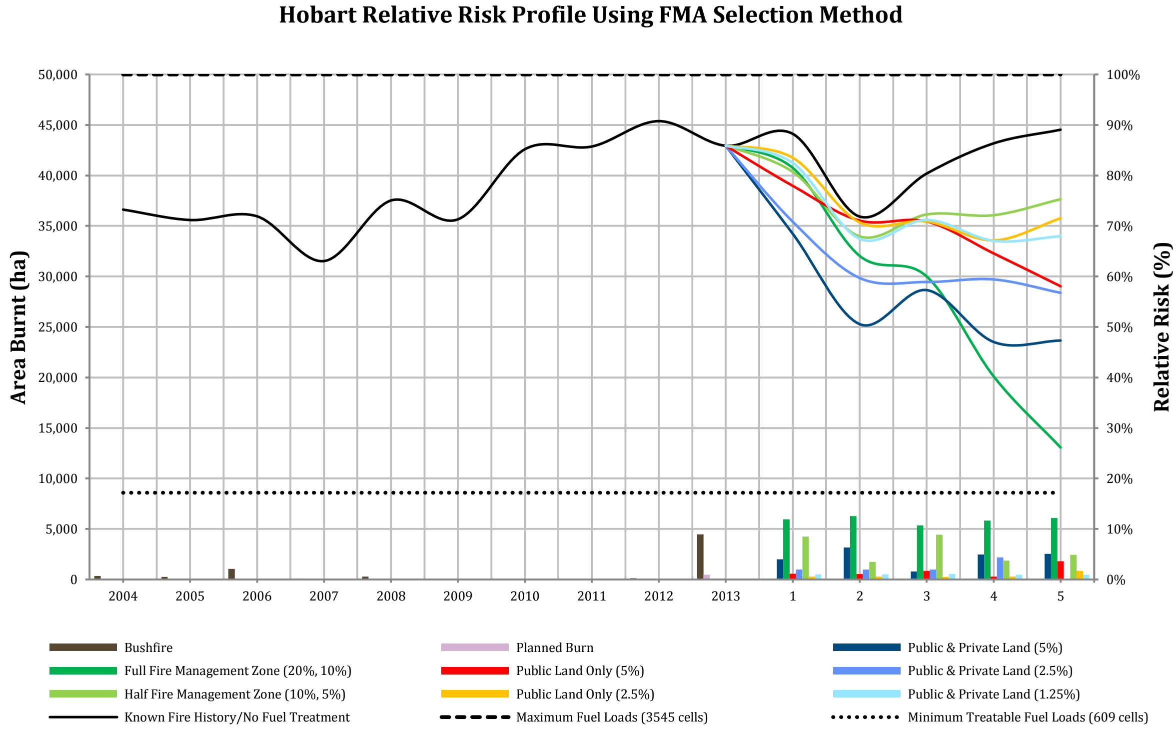

Figure 36: Relative risk profile for Hobart Fire Management Area using the Fire Management Area selection method to reduce bushfire risk.

Impacts were reduced significantly under the Full Fire Management Zone and the 5% Public and Private Land scenarios. The 1.25% Public and Private Land and 5% Public Land Only scenarios also appear to have considerably reduced bushfire impacts to below 70%. In the Half Fire Management Zone scenario, the FMA Selection method resulted in more reductions to Human Settlement Area impacts compared to the State Selection method because considerably more burning occurred within the FMA in Years 1 and 2. High intensity fire behaviour was only reduced significantly by the Full Fire Management Zone scenario. Fire size was only significantly reduced under the Full Fire Management Zone scenario using the FMA Selection method.

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TAMAR FIRE MANAGEMENT AREA

When compared to other FMAs, Tamar had a very high number of potential Human Settlement Area impacts under minimum treatable fuel load conditions (Figure 37), second to the Southern FMA. Tamar also had the lowest potential to reduce bushfire impacts with fuel reduction when compared to other FMAs like North East, Midlands and Hobart, considering that 48% (68,600 ha) of the vegetation mapped in the area is considered to be treatable (Figure 22 and Figure 23). This result indicates that a relatively high proportion of Human Settlement Areas are located within the vicinity of either untreatable vegetation or agricultural land with the potential to carry high intensity fire, compared to other FMAs.

The Full Fire Management Zone scenario significantly reduced asset impact, fire intensity and fire size. The Half Fire Management Zone using the State Selection method and the 5%, 2.5% and 1.25% Public and Private Land scenarios using the FMA Selection method reduced relative risk, but not so far as to be statistically significant.

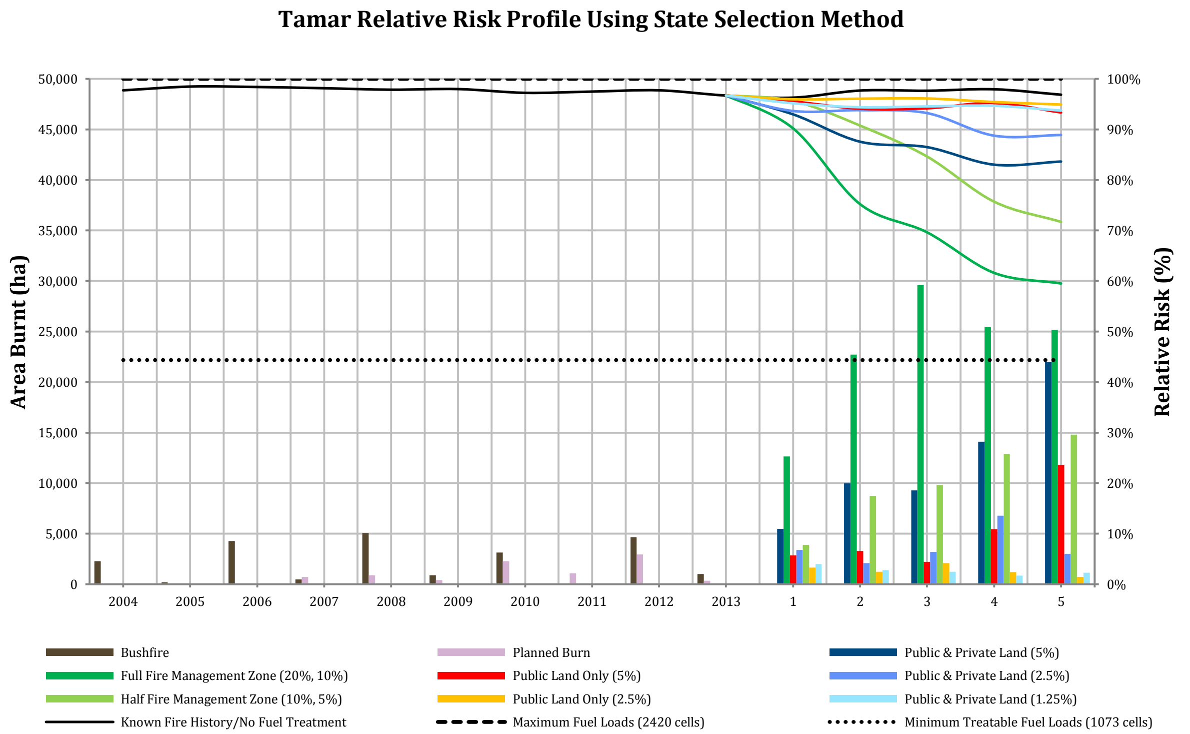

Figure 37: Relative risk profile for Tamar Fire Management Area using the State Selection method to reduce bushfire risk.

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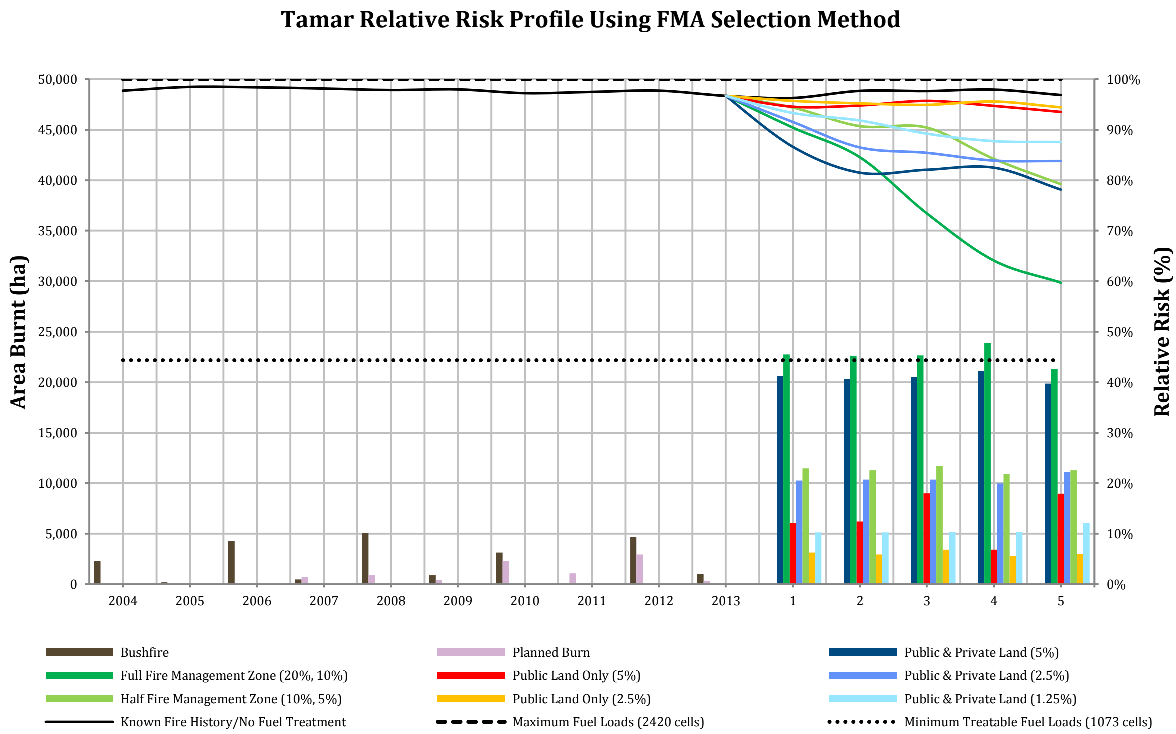

Figure 38: Relative risk profile for Tamar Fire Management Area using the Fire Management Area selection method to reduce bushfire risk.

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CENTRAL NORTH FIRE MANAGEMENT AREA

In the Central North FMA, the relative risk has reached its maximum potential. Central North only has around 5,500 ha (21%) of treatable vegetation within the entire FMA (Figure 23), much lower than most other FMAs. Despite this, there appears to be reasonable potential to reduce Human Settlement Area impacts with fuel reduction. The Full Fire Management Zone scenarios and the 5% Public and Private Land scenario using the State Selection method resulted in significant reductions in Human Settlement Area impacts. Furthermore, the remaining Public and Private Land scenarios, the Half Fire Management Zone scenarios and the 5% Public Land Only scenario using the State Selection method reduced impacts, but to a lesser extent (Figure 39 and Figure 40).

Fire intensity and fire size were significantly reduced in the 5% Public and Private Land scenario using the State Selection method. Using the same selection method, the 2.5% Public and Private Land scenario and the 5% Public Land Only scenario significantly reduced fire intensity, but not fire size.

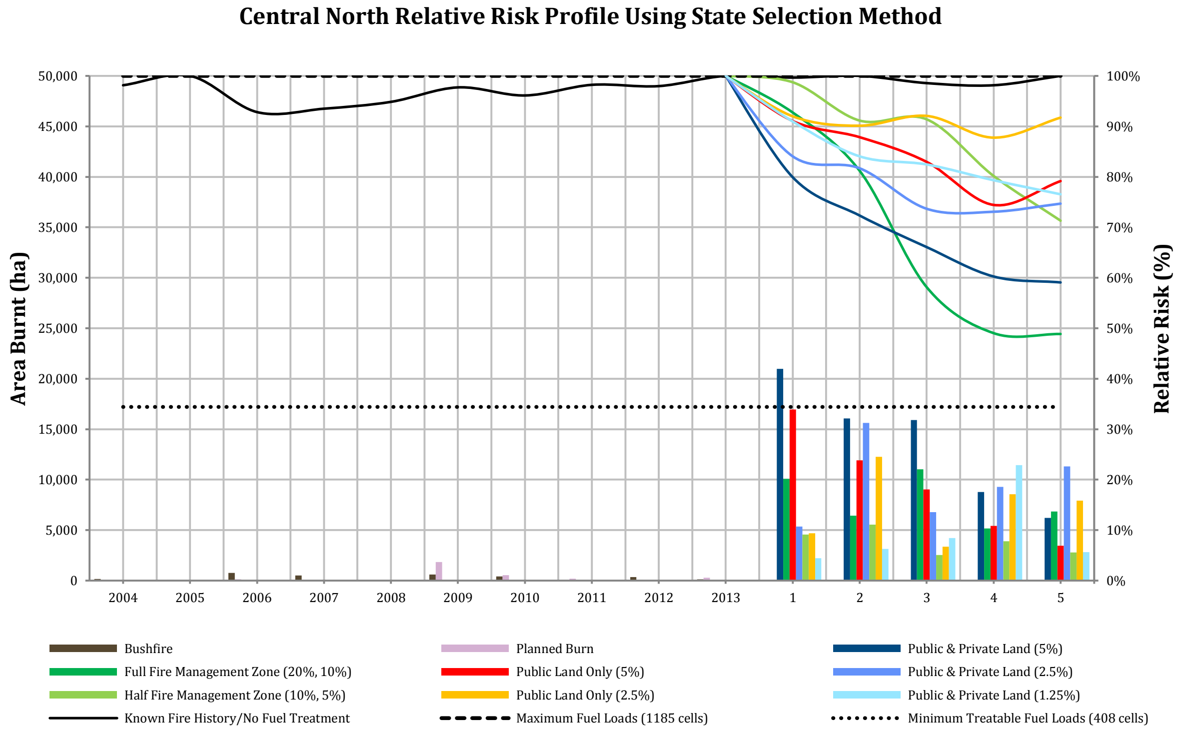

Figure 39: Relative risk profile for Central North Fire Management Area using the state management area selection method to reduce bushfire risk.

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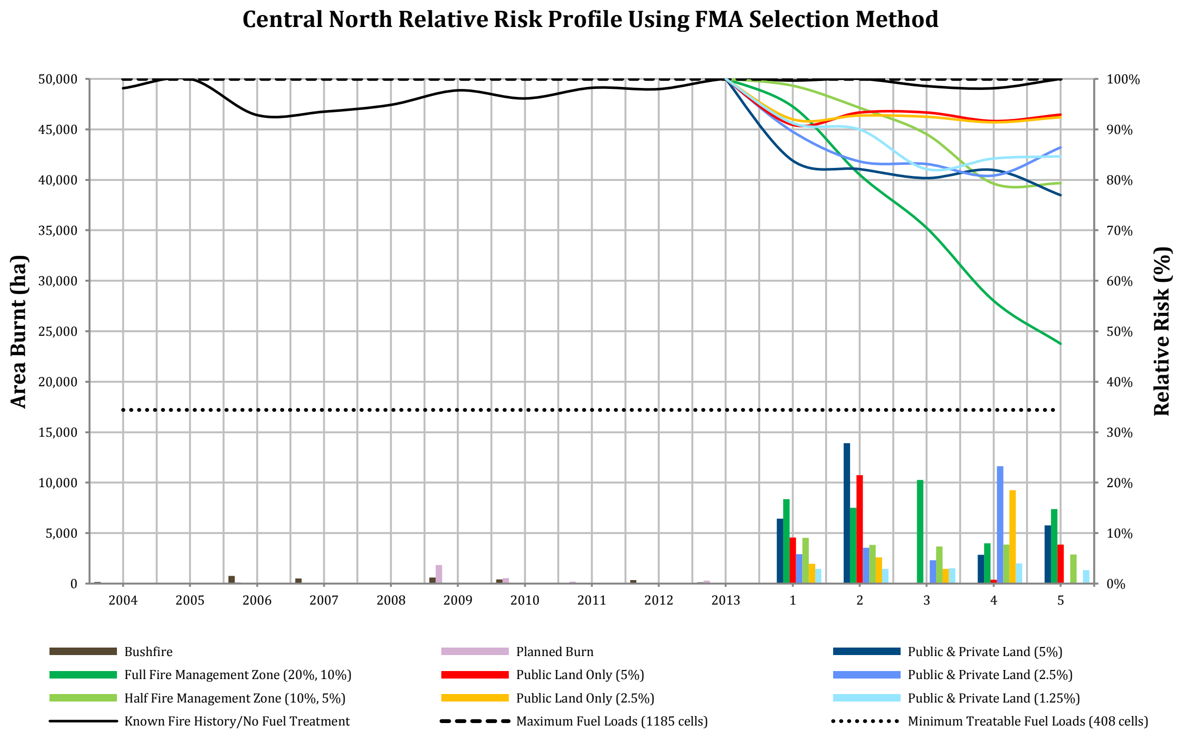

Figure 40: Relative risk profile for Central North Fire Management Area using the Fire Management Area selection method to reduce bushfire risk.

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EAST COAST FIRE MANAGEMENT AREA

Relative risk is currently at maximum levels in the East Coast FMA, largely because of the potential for fires to impact on Orford. This FMA has high potential to reduce impacts with fuel reduction, with a high proportion of area available for burning (63% or 23,000 ha) and the theoretical potential to reduce impacts to very low levels of around 14% (Figure 41). The Forcett-Dunalley fire in 2013 had very little impact on the relative risk profile for the area, because the modelled 99th percentile weather profile used in the modelling was far less severe resulting in a small number of modelled impacts, and only on the fringes of Human Settlement Areas. In comparison, the conditions experienced on the 4th of January 2013, were unusually severe and the worst ever recorded for the area. The analysis would have had to use weather profiles representing the worst-case scenario, rather than the 99th percentile, to replicate the impacts that occurred in the area.

By Year 5, relative risk reductions were quite similar, although there was a more pronounced reduction caused by the Full Fire Management Zone scenario using the FMA Selection method to reduce bushfire risk (Figure 42). The Full Fire Management Zone scenario produced significant reductions in Human Settlement Area impacts, with the 5%, 2.5% and 1.25% Public and Private Land scenarios reduce impacts considerably. Fire intensities and fire size were significantly reduced per ignition point by the 5% Public and Private Land scenarios, and the 2.5% Public and Private Land scenario using the State Selection method.

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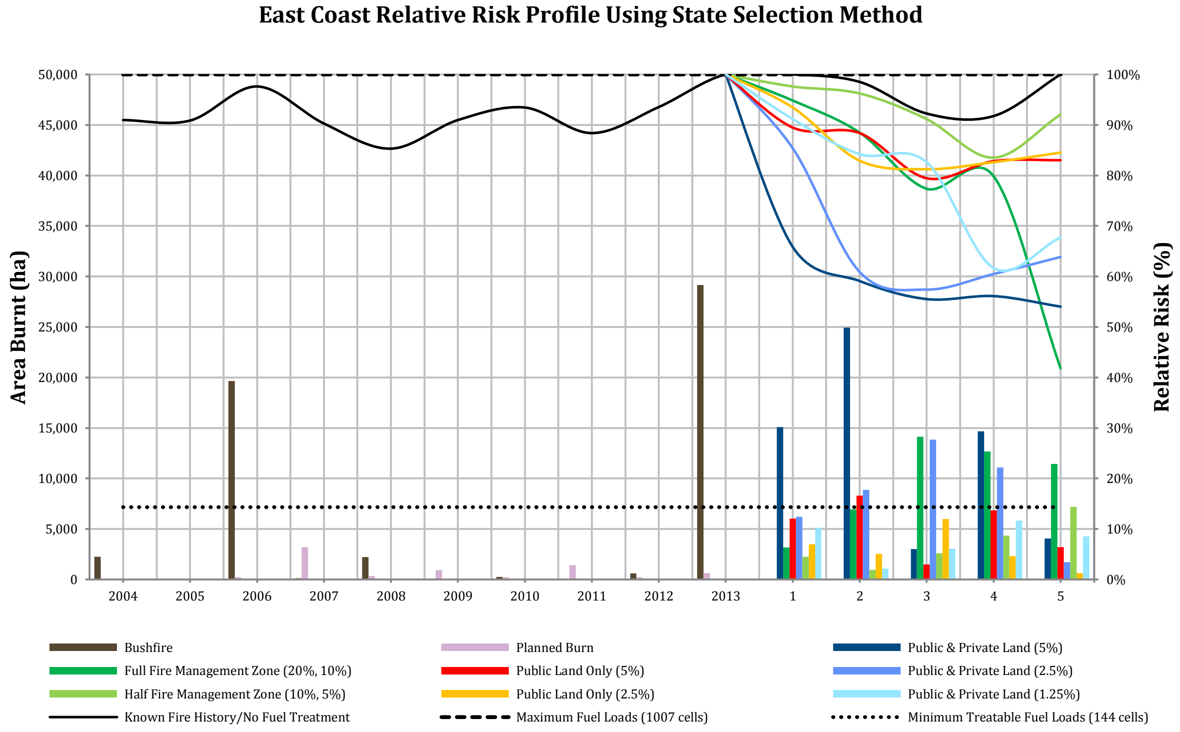

Figure 41: Relative risk profile for East Coast Fire Management Area using the State Selection method to reduce bushfire risk.

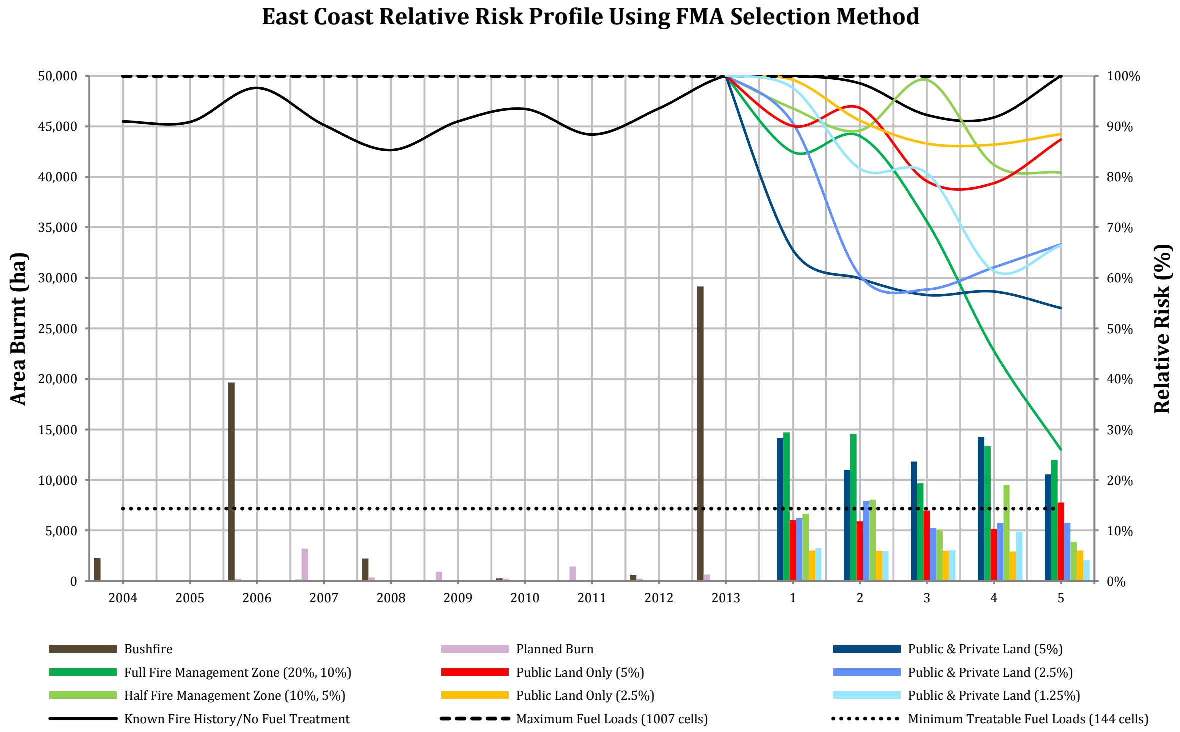

Figure 42: Relative risk profile for East Coast Fire Management Area using the Fire Management Area selection method to reduce bushfire risk.

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NORTH EAST FIRE MANAGEMENT AREA

Large areas of the North East FMA were burnt over the last 20 years, resulting in a relative risk that dropped to its lowest levels after the St Marys fire in 2006 (Figure 43). The relative risk profile has gradually increased since then, to the same level as before the St Marys fire at around 75%. If no further bushfires or fuel reduction occurred, predicted impacts to Human Settlement Areas are predicted to be near their maximum level in 2018. Northeast still has good potential to reduce Human Settlement Area impacts with fuel reduction. 45% or 38,000 ha of the vegetation is mapped as potentially treatable.

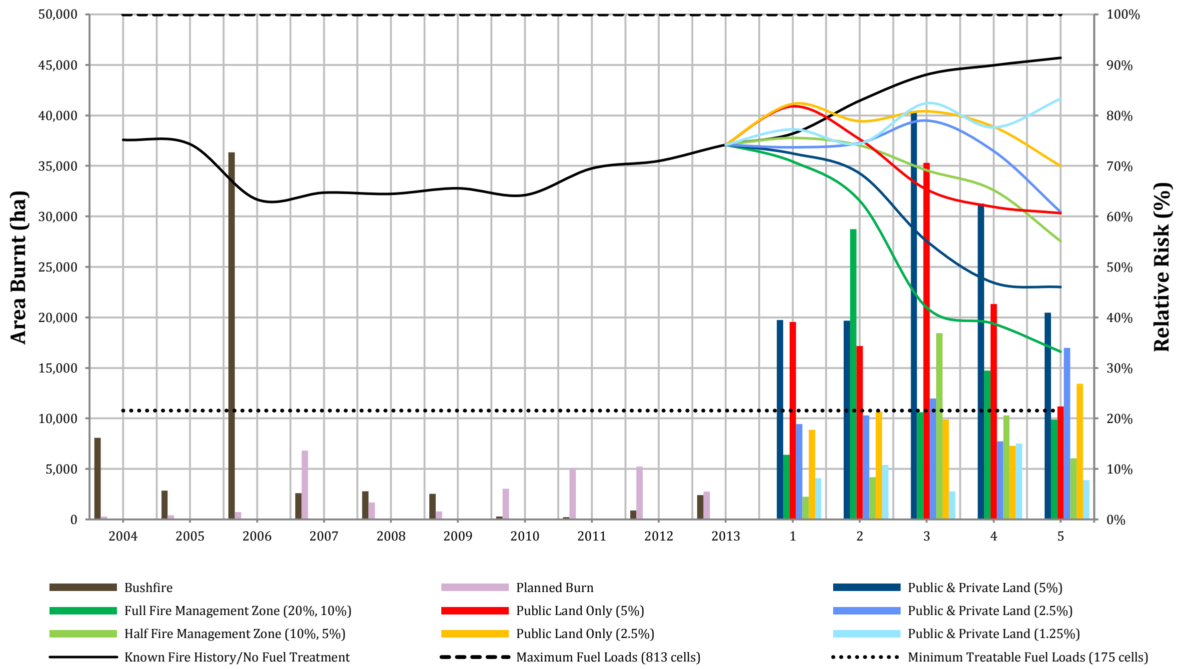

Figure 43: Relative risk profile for North East Fire Management Area using the State Selection method to reduce bushfire risk.

Over the five years of treatment, all scenarios either reduced impacts to lower than predicted under current fuel conditions or (as for the 2.5% Public Land Only and 1.25% Public and Private Land scenarios) resulted in bushfire impacts maintaining or increasing at slower rates than under the No Fuel Treatment scenario (Figure 43, Figure 44). The 5% Public and Private Land scenario using the State Selection method significantly reduced Human Settlement Area impacts, fire intensity and fire size. In contrast, the 5% Public Land Only scenario significantly reduced fire intensity and fire size, but without a significant reduction in Human Settlement Area impacts. Further reductions are summarised in Table 6.

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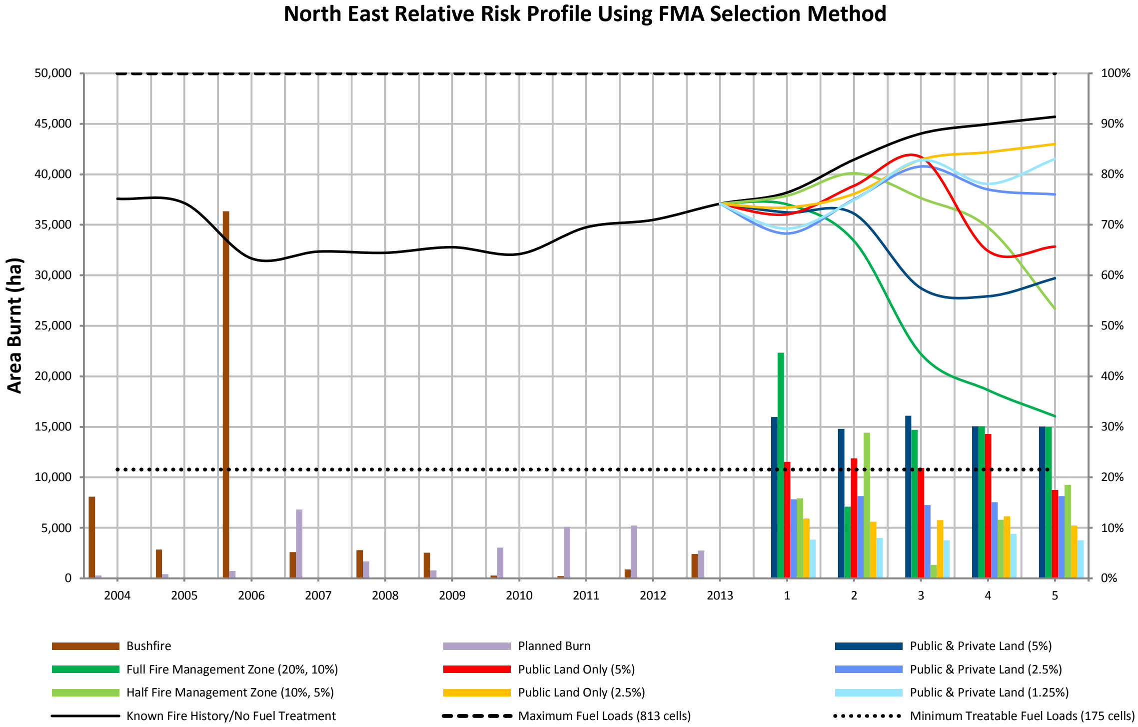

Figure 44: Relative risk profile for North East Fire Management Area using the Fire Management Area selection method to reduce bushfire risk.

Table 6: Statistically Significant Reductions in Human Settlement Impacts, Fire Intensity and Fire Size after Year 5 of Treatment in the North East Fire Management Area.

Treatment Scenarios	HSA Impacts	Fire Intensity	Fire Size
FMA Full Fire Management Zone (20%, 10%)	X	X	
FMA Half Fire Management Zone (10%, 5%)	X		
FMA Public and Private Land (5%)			
FMA Public and Private Land (2.5%)			
FMA Public and Private Land (1.25%)			
FMA Public Land only (5%)			
FMA Public Land Only (2.5%)			
State Full Fire Management Zone (20%, 10%)	X	X	
State Half Fire Management Zone (10%, 5%)	X		
State Public and Private Land (5%)	X	X	X
State Public and Private Land (2.5%)			
State Public and Private Land (1.25%)			
State Public Land only (5%)		X	X
State Public Land Only (2.5%)			

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Midlands Fire Management Area

The relative risk for the Midlands FMA is currently close to its maximum potential. However there is good potential to reduce risk using fuel reduction. All fuel reduction scenarios measured considerable reductions in Human Settlement Area impacts, with the greatest reductions resulting from all of the Fire Management Zone and the 5% Public and Private Land scenarios (Figure 45, Figure 46). Midlands is characterised by considerably smaller and more fragmented Human Settlement Areas than the FMAs mentioned previously in this section.

The most effective fuel reduction scenario was the 5% Public and Private Land scenario using the State Selection method, significantly reducing Human Settlement Area impacts, fire intensity and fire size (Table 7).

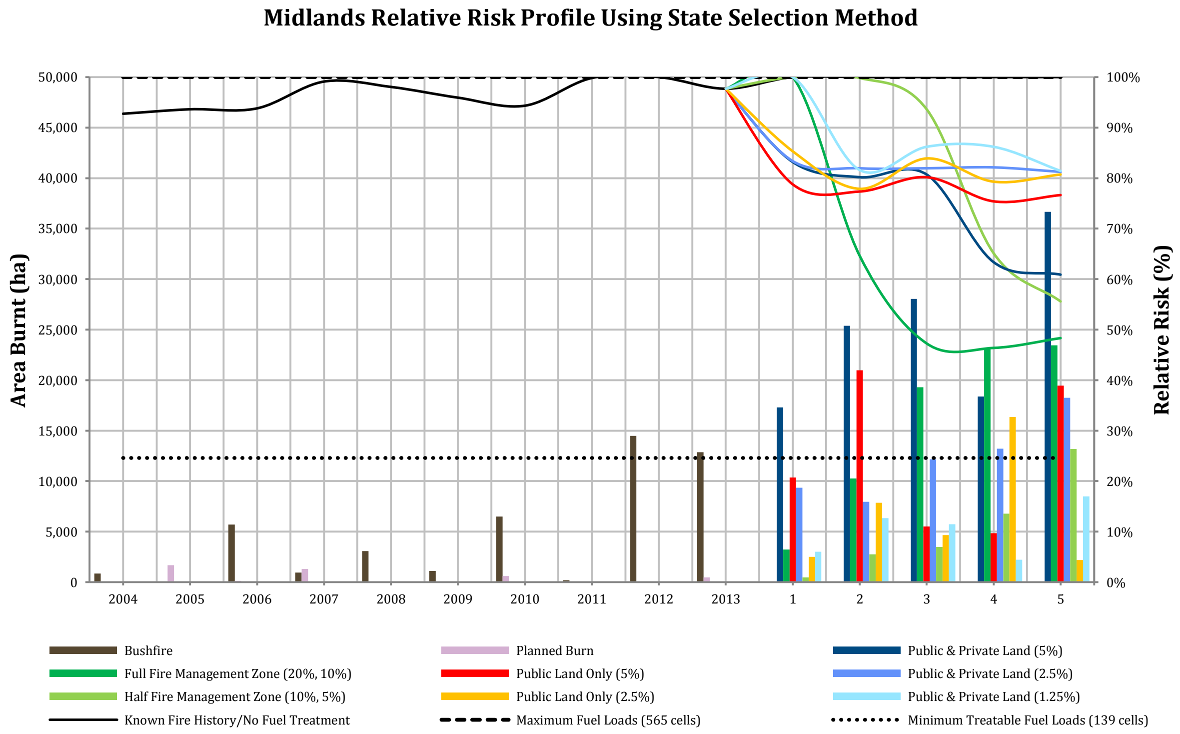

Figure 45: Relative risk profile for Midlands Fire Management Area using the State Selection method to reduce bushfire risk.

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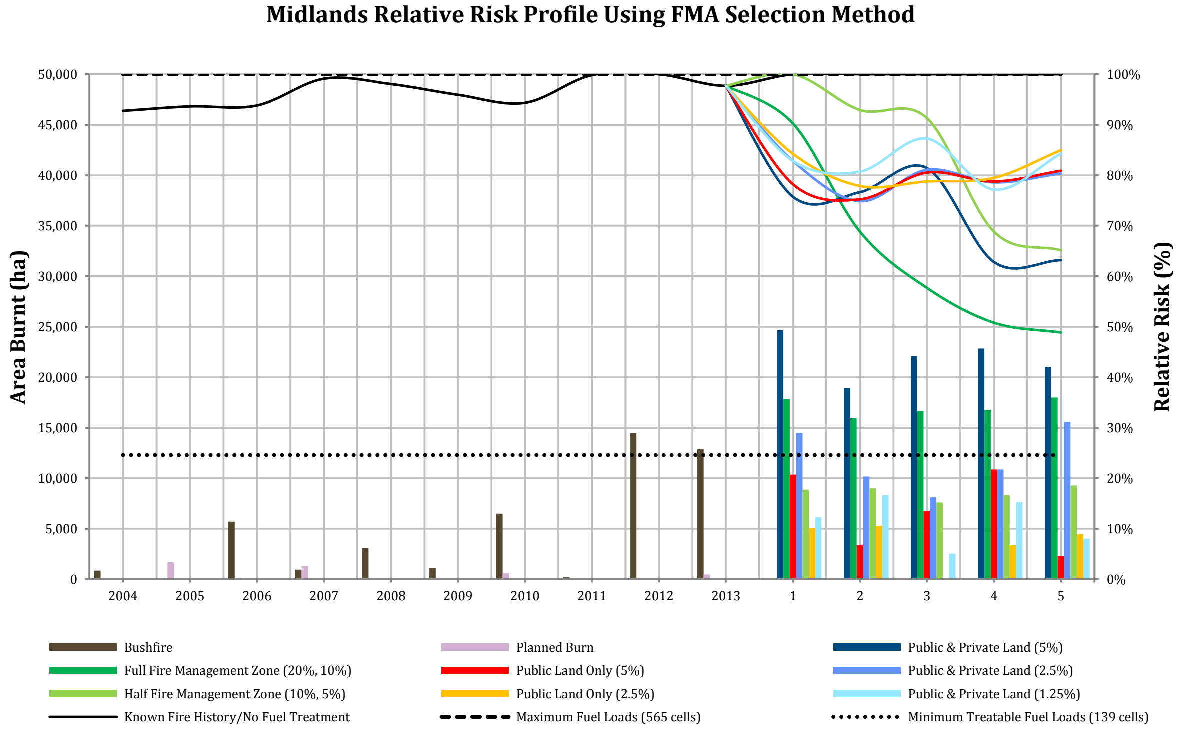

Figure 46: Relative risk profile for Midlands Fire Management Area using the Fire Management Area selection method to reduce bushfire risk.

Table 7: Statistically Significant Reductions in Human Settlement Impacts, Fire Intensity and Fire Size after Year 5 of Treatment in the Midlands Fire Management Area.

Treatment Scenarios	HSA Impacts	Fire Intensity	Fire Size
FMA Full Fire Management Zone (20%, 10%)	X		
FMA Half Fire Management Zone (10%, 5%)			
FMA Public and Private Land (5%)		X	X
FMA Public and Private Land (2.5%)			
FMA Public and Private Land (1.25%)			
FMA Public Land only (5%)			
FMA Public Land Only (2.5%)			
State Full Fire Management Zone (20%, 10%)	X		
State Half Fire Management Zone (10%, 5%)			
State Public and Private Land (5%)	X	X	X
State Public and Private Land (2.5%)			
State Public and Private Land (1.25%)			
State Public Land only (5%)			
State Public Land Only (2.5%)			

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WEST COAST FIRE MANAGEMENT AREA

The relative risk graphs and statistical results are summarised here for the West Coast FMA. However given the nature of the vegetation types and weather profiles for the area, there is relatively low confidence in these results and a different approach to assessing relative risk in the West Coast FMA should be considered.

According to the residual risk profile, relative risk is currently close to its maximum potential. Large areas have been burnt over the last 40 years, although most of the burning has not been close to Human Settlement Areas. The scenarios indicate relatively small reductions in relative risk after five years of treatment overall, however the reductions appear to be about a quarter to a third of the maximum potential reduction to relative risk indicated by the dotted line (Figure 47, Figure 48). None of the fuel reduction burning scenarios produced statistically significant reductions in Human Settlement Area impacts, fire intensity or fire size.

West Coast Relative Risk Profile Using State Selection Method

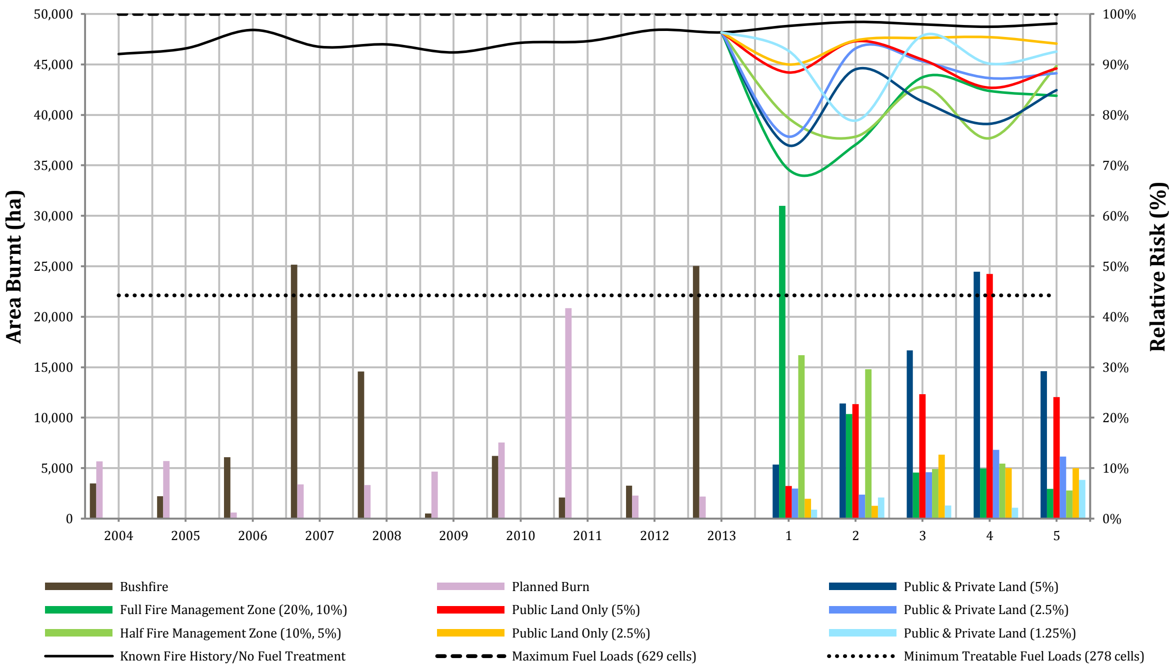

Figure 47: Relative risk profile for West Coast Fire Management Area using the State Selection method to reduce bushfire risk.

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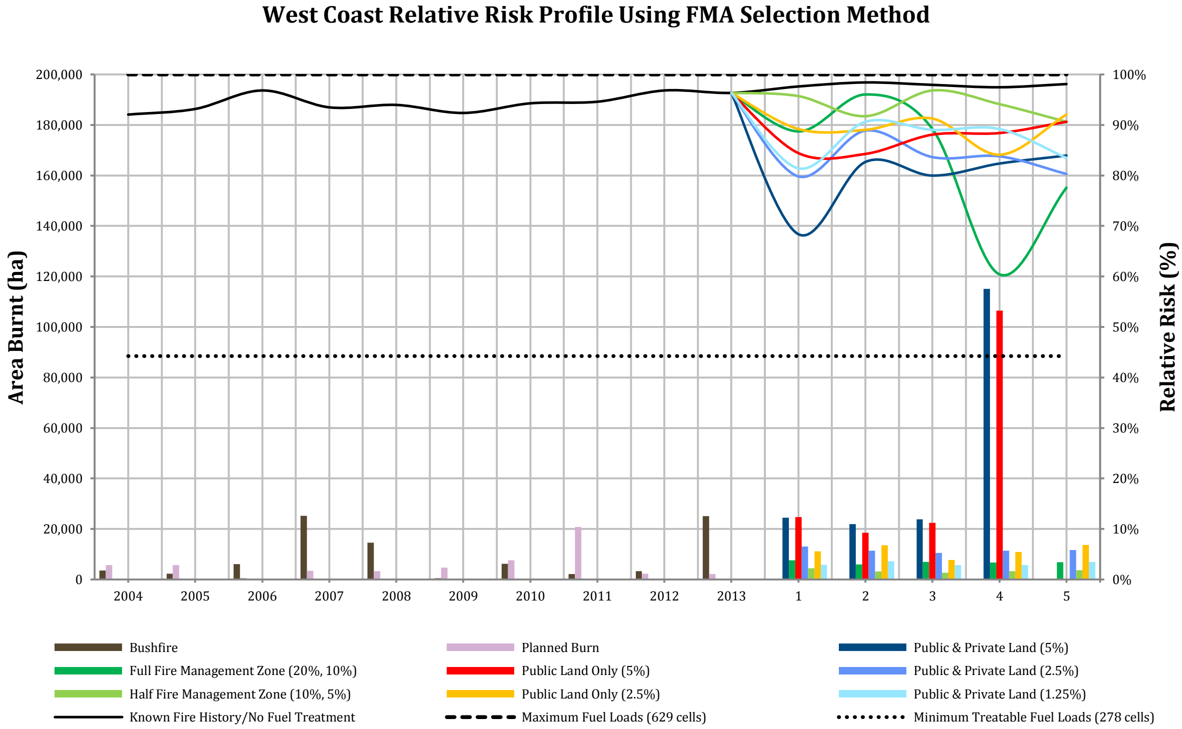

Figure 48: Relative risk profile for West Coast Fire Management Area using the Fire Management Area selection method to reduce bushfire risk.

An analysis of the BRAM HFI in the West Coast FMA (showed a steady potential increase in fire intensity over time, indicating that currently a considerable area of fuels in the West Coast FMA have not currently reached their maximum potential accumulation, due to the role that fire has played in the FMA up until now. These results that the 5% Public Land Only scenario had the greatest effect on reducing the rates of fuel accumulation, and therefore increases in fire intensity.

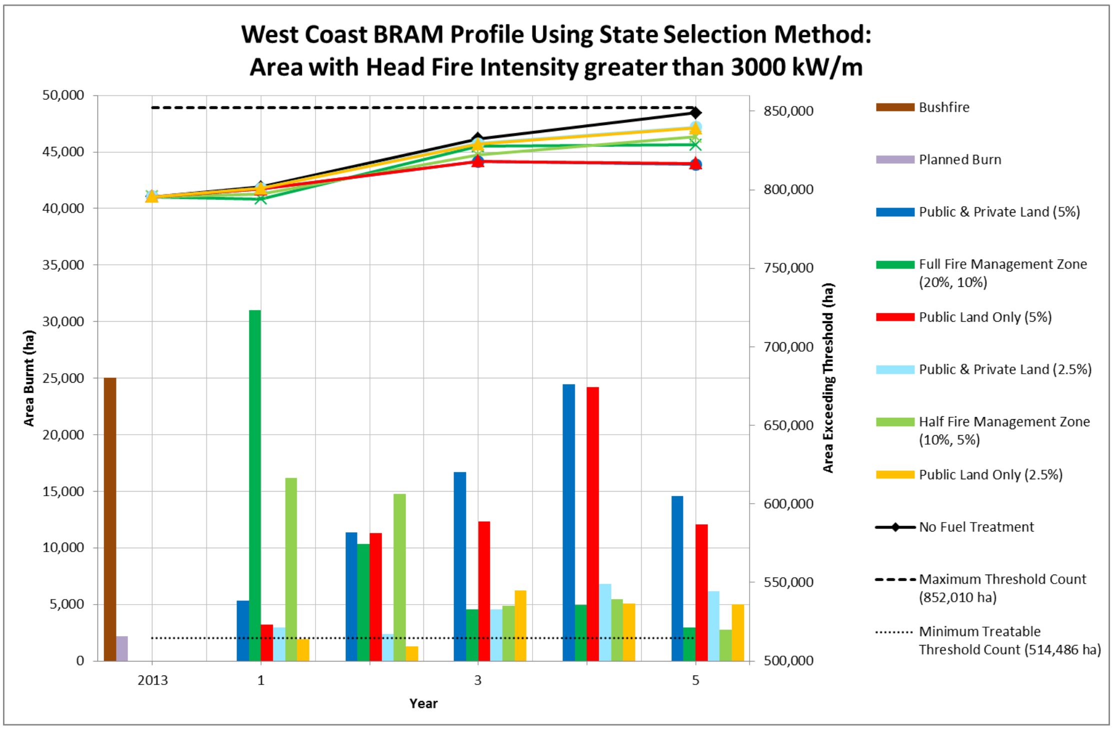

Figure 49. Area (ha) that exceeded 3,000kW/m of maximum Bushfire Risk Assessment Model head fire intensity in Years 1, 3 and 5 of fuel treatment in the King Island Fire Management Area.

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FLINDERS FIRE MANAGEMENT AREA

Six Human Settlement Areas were identified on Flinders Island. At Lady Barron, 21 Human Settlement Area grid cells were impacted under current and maximum fuel load conditions, with only 2 impacted under minimum fuel load conditions (Figure 50, Figure 51). These results indicate that there is potential to use fuel reduction to treat potential bushfire risk in the area directly north of Lady Barron. Reductions in 2011 and Year 2 of No Fuel Treatment appear to be coincidental, affecting only one grid cell. Each of the tenure-blind scenarios reduced impacts by at least 20% by Year 5 of treatment. By Year 5 the Public Land Only scenarios had very little effect, only reducing impact to one grid cell.

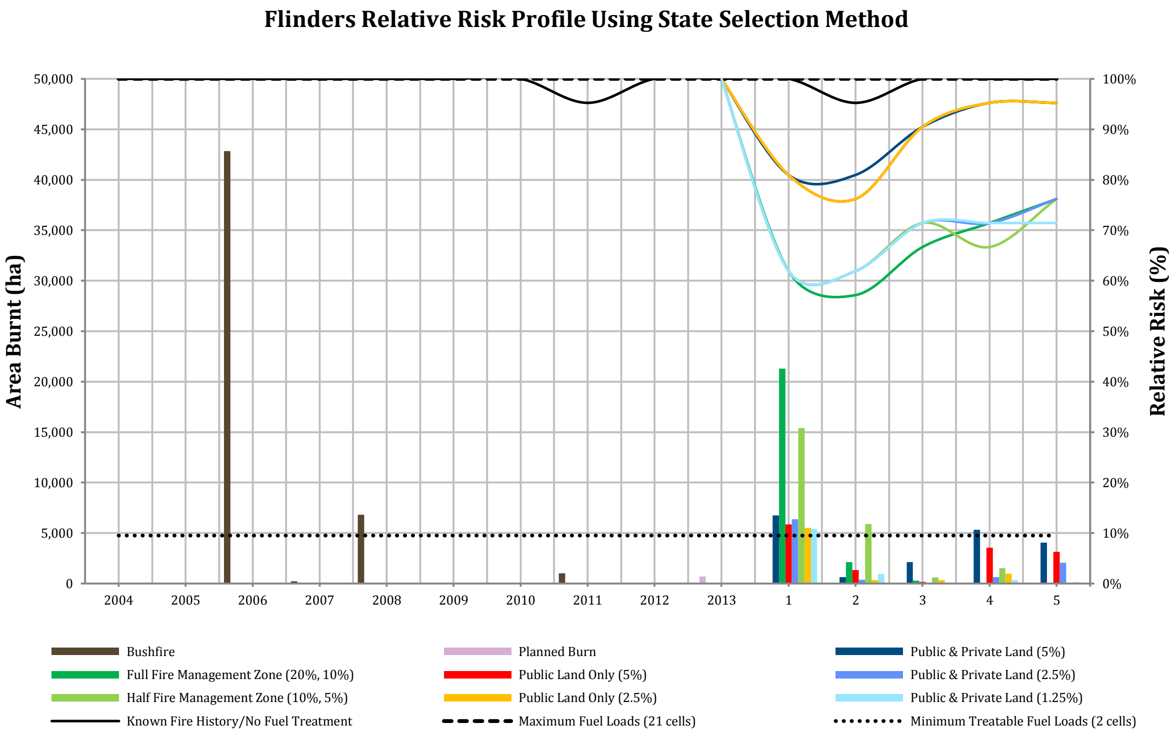

Figure 50: Relative risk profile for Flinders Fire Management Area using the State Selection method to reduce bushfire risk.

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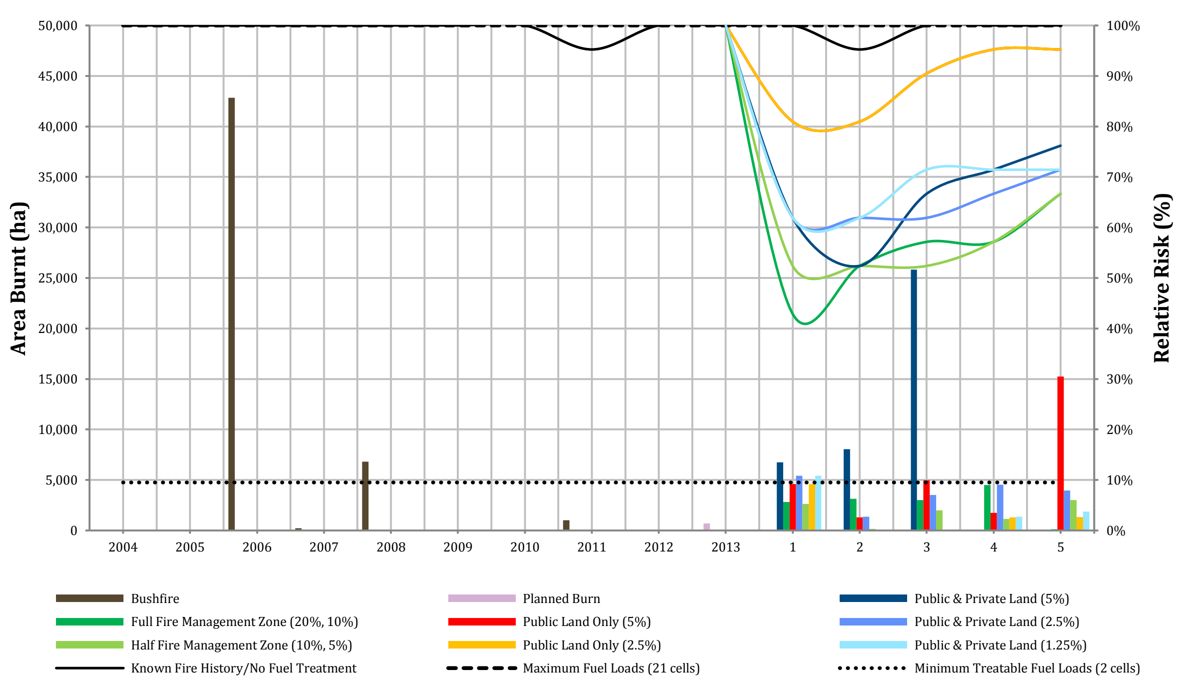

Figure 51: Relative risk profile for Flinders Fire Management Area using the Fire Management Area selection method to reduce bushfire risk.

The sample size was too small to perform a statistical analysis. The Public Land Only scenarios appear to have some small reduction in fire intensity into the more manageable category (i.e. below 3000kW/m), approximately 25 hectares of the modelled fires by Year 5. The No Fuel Treatment scenario saw a small increase in high intensity fire by Year 1 (Figure 52).

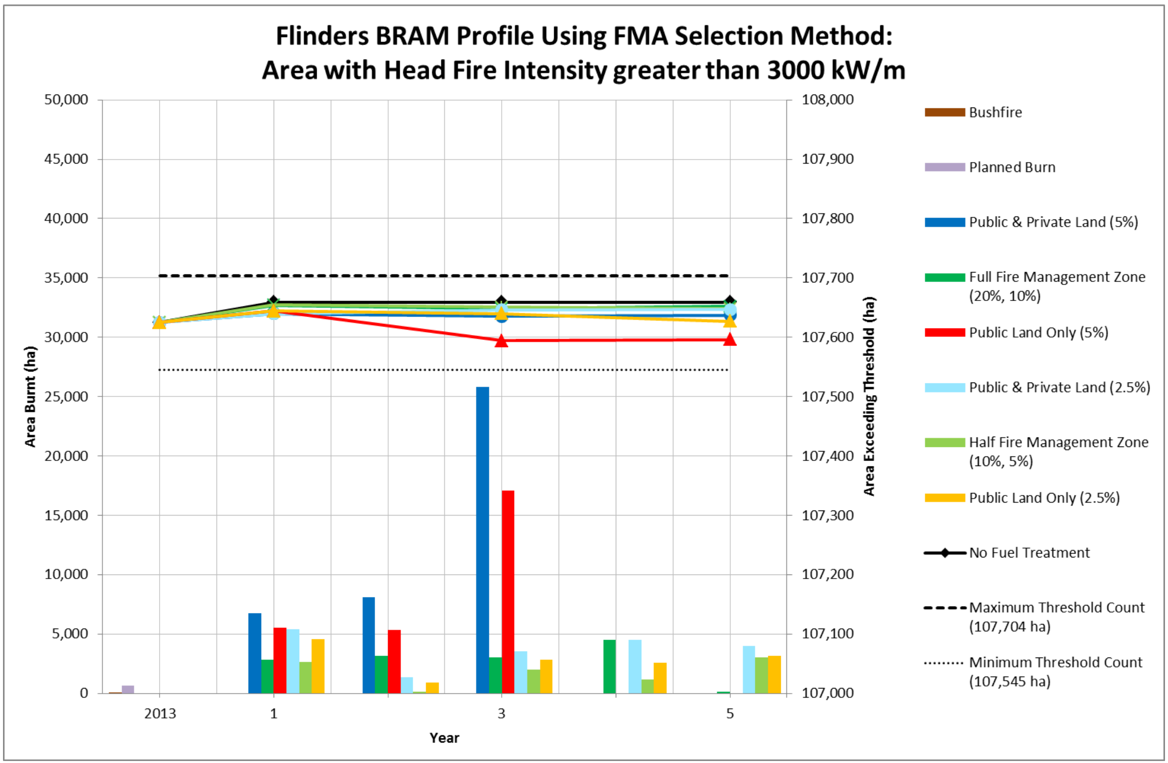

Figure 52: Area (ha) that exceeded 3,000kW/m of maximum Bushfire Risk Assessment Model head fire intensity in Years 1, 3 and 5 of fuel treatment in the Flinders Fire Management Area.

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KING ISLAND FIRE MANAGEMENT AREA

Fuel reduction burning scenarios were developed for King Island; however the fire modelling in Phoenix did not result in any impacts to the Human Settlement Areas identified on the island. Relative risk profiles could not be generated to measure how impacts change over time.

The reductions in fire intensity were plotted in Figure 53 and Figure 54 to see how the burning scenarios reduced fire intensities to more manageable levels. Considerable reductions in fire intensity were predicting using BRAM HFI, where several thousand hectares of area was reduced into the more manageable potential fire intensity category in Years 1 and 5 when the fuel reduction burning used the FMA Selection method.

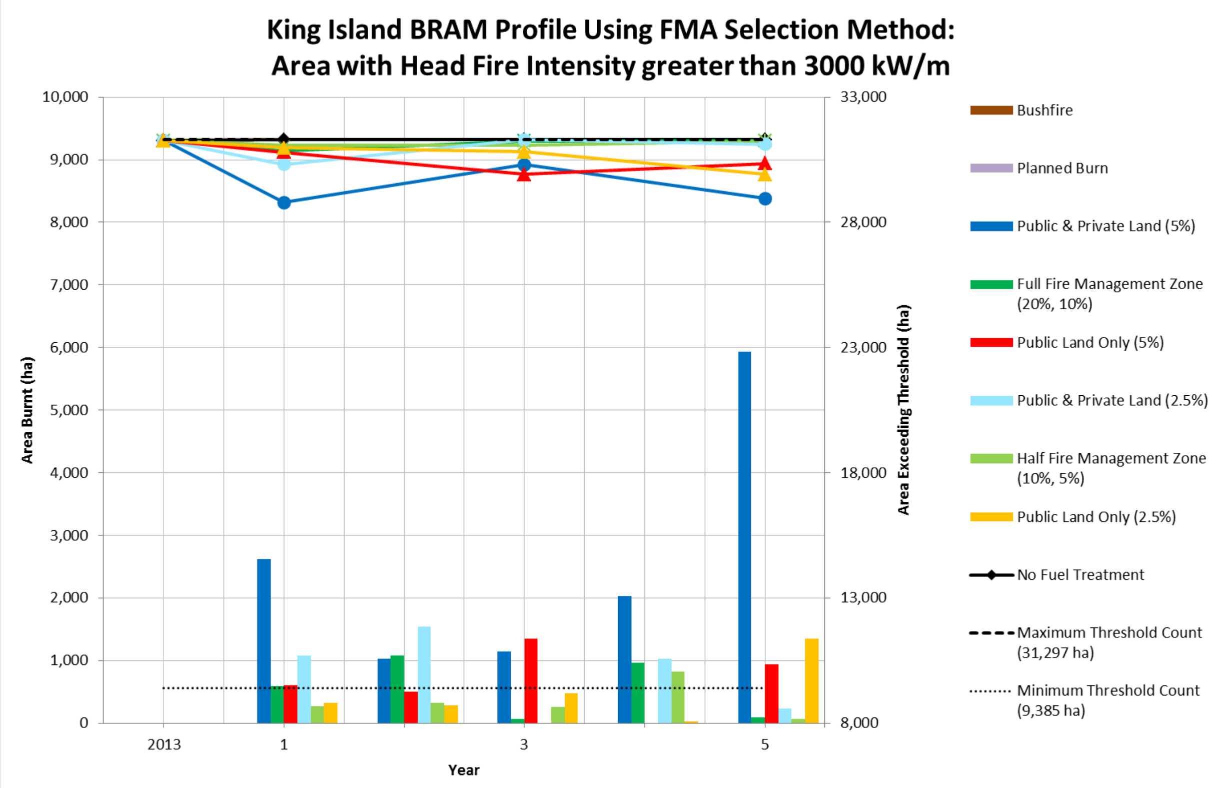

Figure 53: Area (ha) within 10km of Human Settlement Areas that exceeded 3,000kW/m of maximum Bushfire Risk Assessment Model head fire intensity in Years 1, 3 and 5 of fuel treatment in the King Island Fire Management Area.

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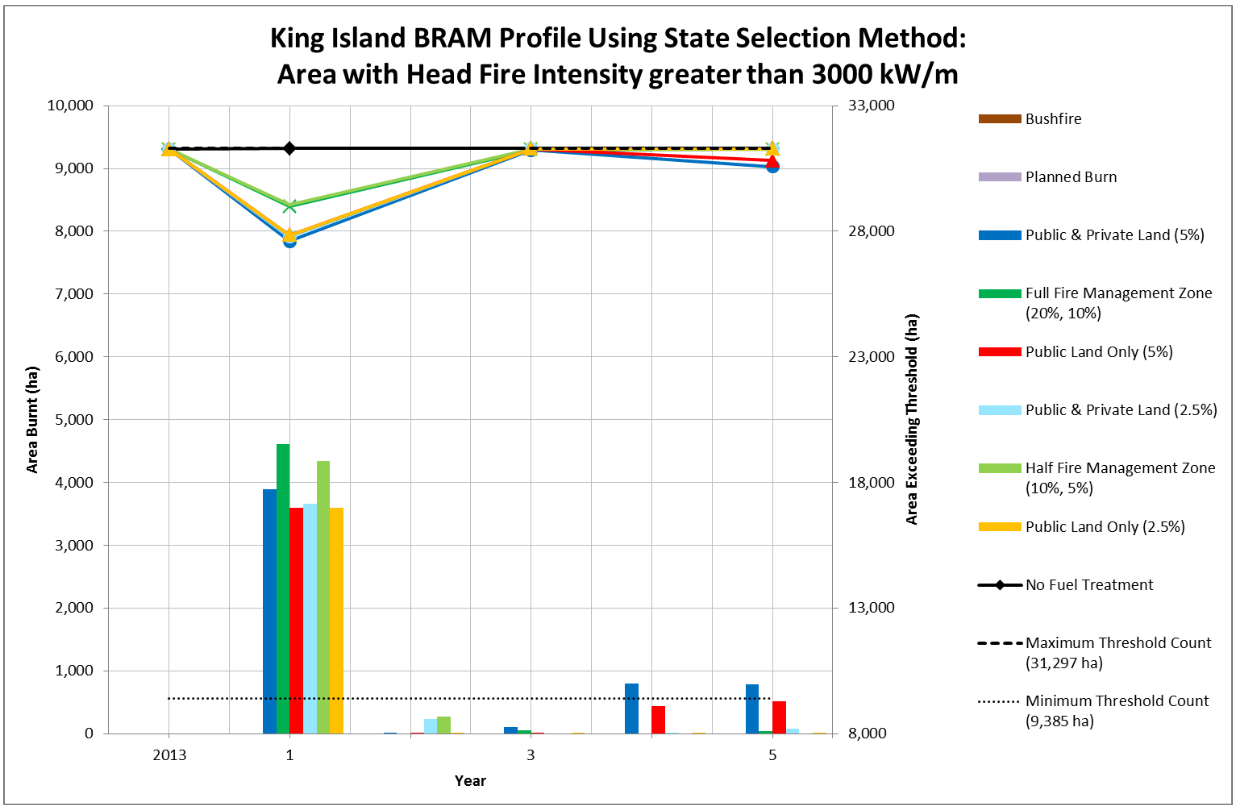

Figure 54: Area (ha) that exceeded 3,000kW/m of maximum Bushfire Risk Assessment Model head fire intensity in Years 1, 3 and 5 of fuel treatment in the King Island Fire Management Area.

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