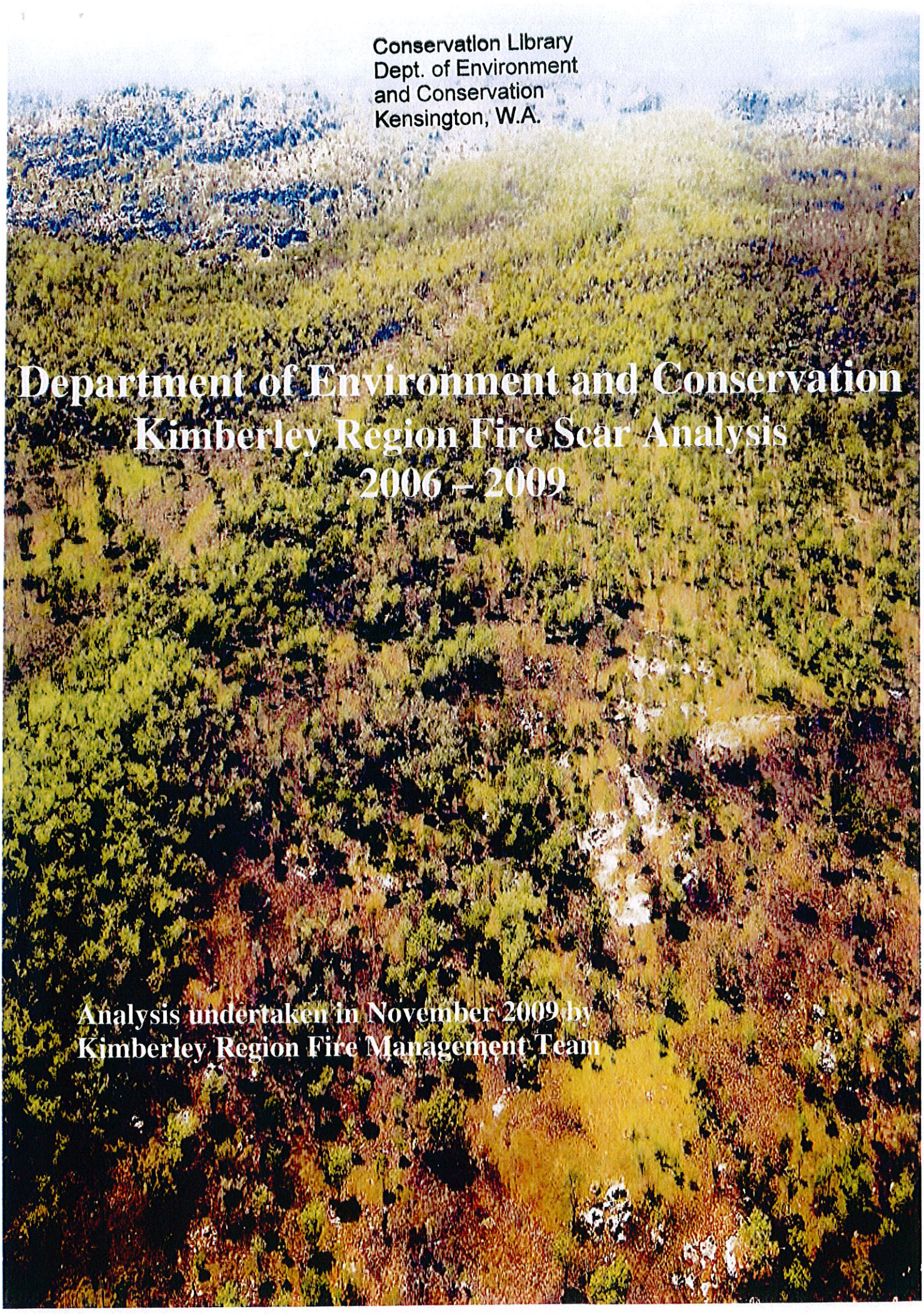

Department of Environment and Conservation

Kimberley Region Fire Scar Analysis 2006 – 2009

Analysis undertaken in November 2009 by
Kimberley Region Fire Management Team

Summary

In October 2009, DEC Kimberley Region fire staff undertook an analysis of fire scars in the North West Kimberley for the years 2006 – 2009 inclusive. From 2008 a deliberate change in fire management practice occurred in the DEC Kimberley fire program whereby there was a shift from buffer burning to landscape mosaic burning. The aim of the analysis was to validate that positive change to fire patterns was occurring as a result of altering fire management practices.

MODIS fire scars at 250m resolution were downloaded for analysis from the North Australia Fire Management (NAFI) website. An individual fire scar was captured in this analysis when a discrete polygon was presented from the NAFI fire scar downloads. The analysis focused on demonstrating that several outcomes were being achieved:

- Overall reduction in the size of fire scars, both prescribed and wildfires.
- Increase in the number of prescribed fire scars.
- Overall reduction in the size of un-burnt areas and increase in number of un-burnt patches

Statistical analysis of the number and size of fire scars for both prescribed burning (early dry season, March – June) and wildfires (late dry season, July – Nov) was undertaken and is represented in a graphical format to reflect trends over time. The analysis is limited to 2006 to 2009. This analysis will continue annually and will build on the work presented in this paper.

In summary, the analysis demonstrates the following trends:

- Mid-to-late dry season fires made-up a smaller proportion of all fires in 2008 and 2009 compared to previous years
- Unplanned fires were much smaller in size post-2007
- The grain size of burnt and un-burnt vegetation was reduced from 2008

The MODIS data at 250m resolution is very coarse and the technology has limitations in capturing the area treated with early fires due to a number of factors including:

- Mild fire behaviour limiting scorch (spectral analysis)
- Rapid greening due to regrowth
- Cooler fire giving less heat signature (infra-red detection)
- Early fires blending into complex land system structure (e.g. Buldiva sandstone)

To improve accuracy into the future, the region will require more detailed imagery such as Landsat to be acquired, processed and analysed. This value adding approach by the region will improve the quality of firescar mapping which will then lead to more accurate and detailed planning, monitoring, analysis and reporting.

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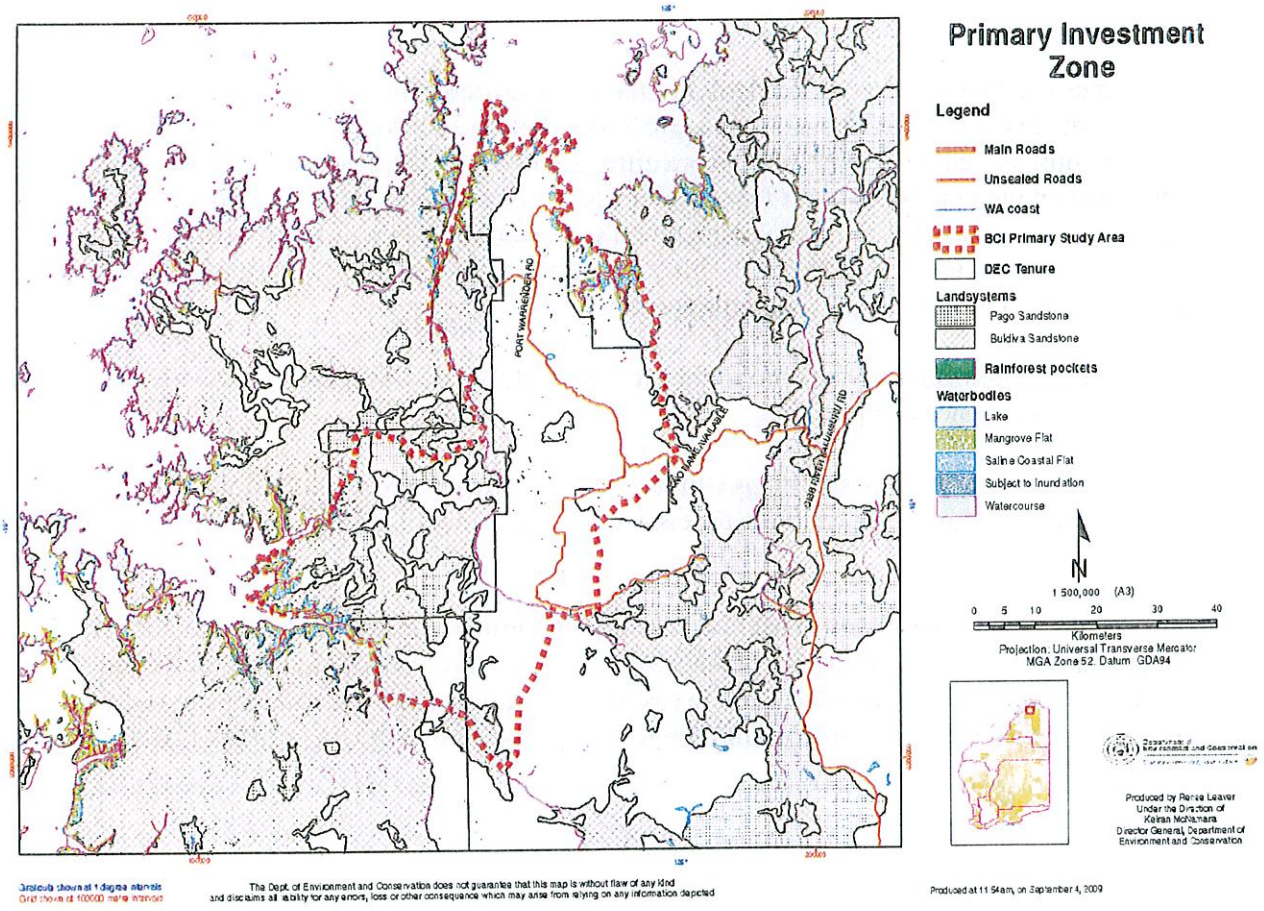
The Study Area

The area selected for analysis was linked to the Primary Investment Zone for the North Kimberley Biodiversity Conservation Initiative. The area covers 311,182ha and has good representation of all vegetation complexes in the North Kimberley. It has detailed fire scar history and has been the major focus of the regional fire program over the past 3 years.

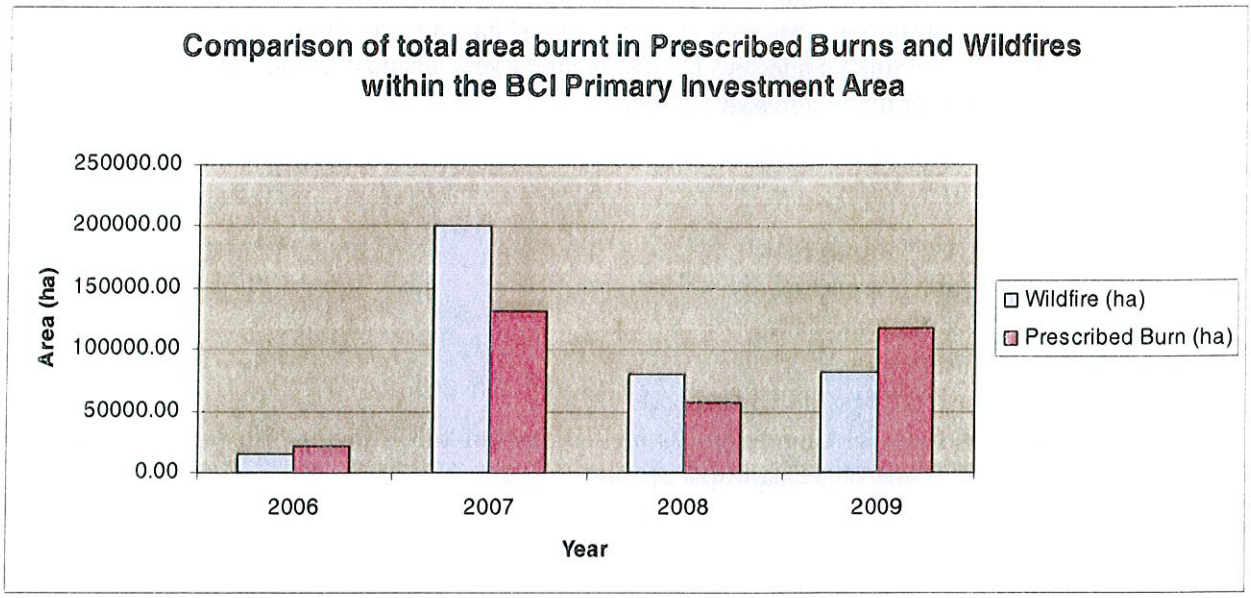
The area consists of:

- Mitchell River National Park
- Prince Regent Nature Reserve
- Lawley River National Park
- Laterite Conservation Park
- Surrounding Unallocated Crown Lands
- Kandiwal Aboriginal Community, which is part of the Uunguu Native Title claim on behalf of the Wunambal Gaambera people.



Analysis of Fire Scar Information 2006 - 2009

Graph 1



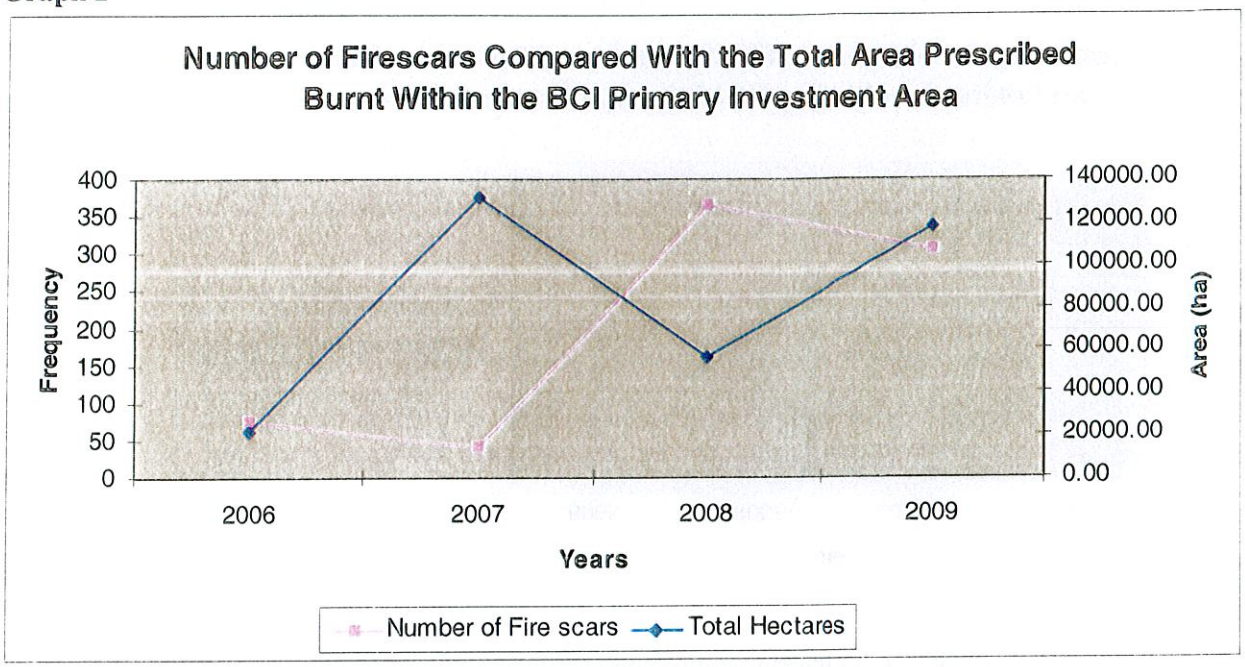
Graph 1 illustrates that there has been a decrease in total wildfire area since 2007. The North Kimberley has been experiencing a 2 year boom/bust cycle since 2003. During 2006 very little of the north Kimberley was burnt by either prescribed fire or wildfire, partly due to the bust cycle of 2005 limiting fuel accumulation on the sandstone matrix (see maps 1 and 2 in Appendix). During 2007 the previous "buffer burning" management technique combined with senescent carry over fuels from 2006 resulted in large and extensive early prescribed fire scars. This was followed by extensive late dry season lightening resulting in a "bust cycle" (see maps 2 and 3 in appendix).

Graph 1 illustrates a stabilization of the "boom / bust cycle" from 2008, which coincided with the introduction of landscape mosaic burning.

Appendices 1-5 of 2005 – 2009 fire scar maps which clearly illustrate the size and distribution of early dry season fire scars and late season wildfires for each year. These maps highlight the boom bust cycle and its stabilization from 2008.

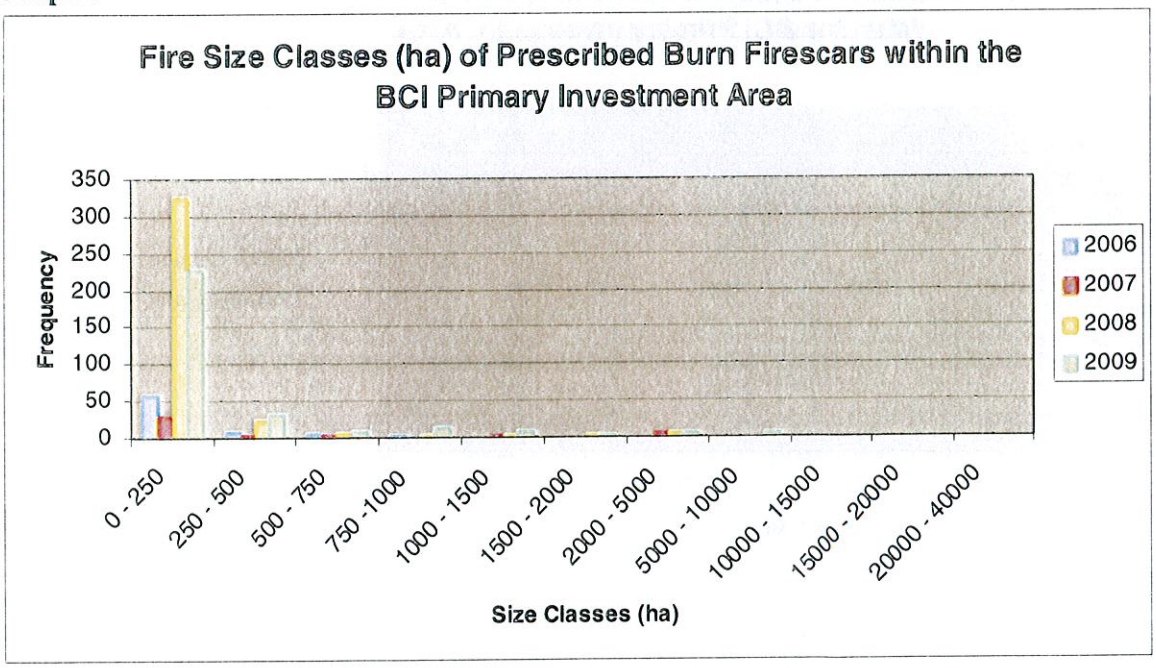
NOTE: The stabilization of the "boom / bust cycle" in the BCI primary investment area did not extend to adjoining tenure in 2009. The bust cycle which was due in 2009 is clearly represented in the tenure adjoining the BCI primary Investment Area to the east which is illustrated on map 5. This area did not experience an intensive landscape mosaic burn regime as implemented in the BCI primary investment area.

Graph 2



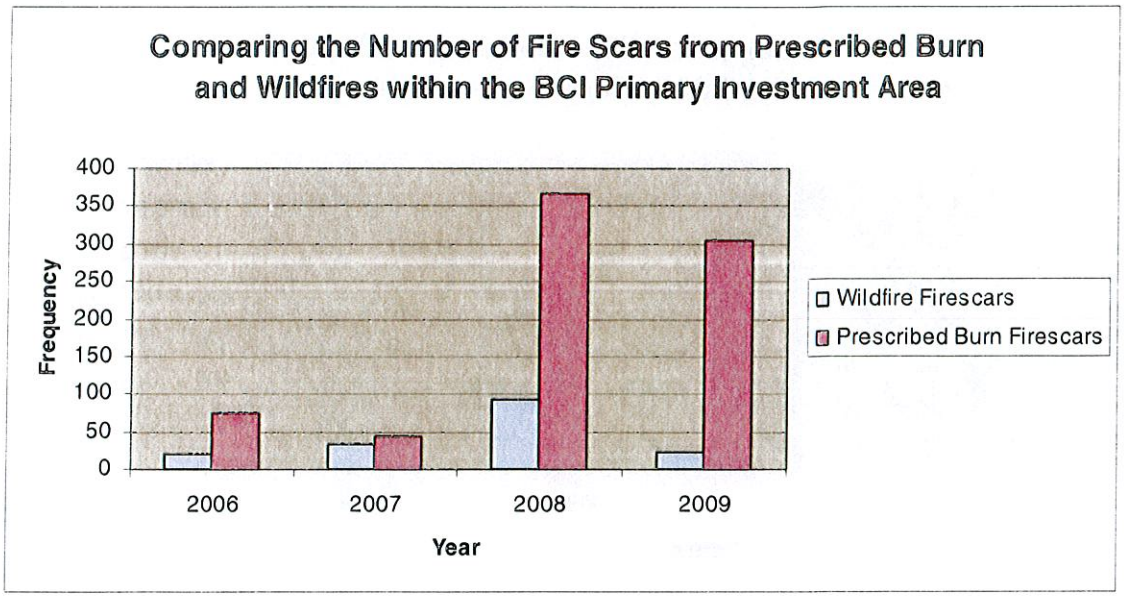
Graph 2 illustrates that the number and area of prescribed burn fire scars has increased since 2008. This illustrates that for the total area burnt in prescribed burning there has been an increase in the number of individual scars i.e. prescribed fires in 2009 resulted in more firescars for the area burnt than in 2007.

Graph 3



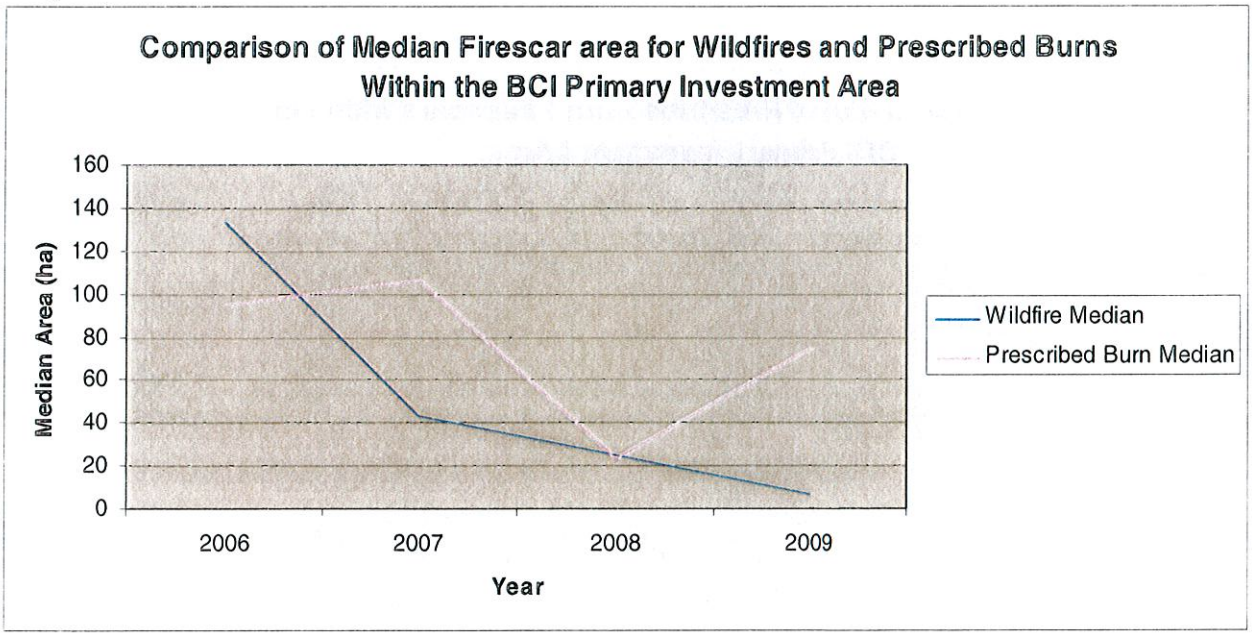
Graph 3 illustrates that the vast majority of individual prescribed fire scars have fallen within the 0-250 hectare range since 2008.

Graph 4



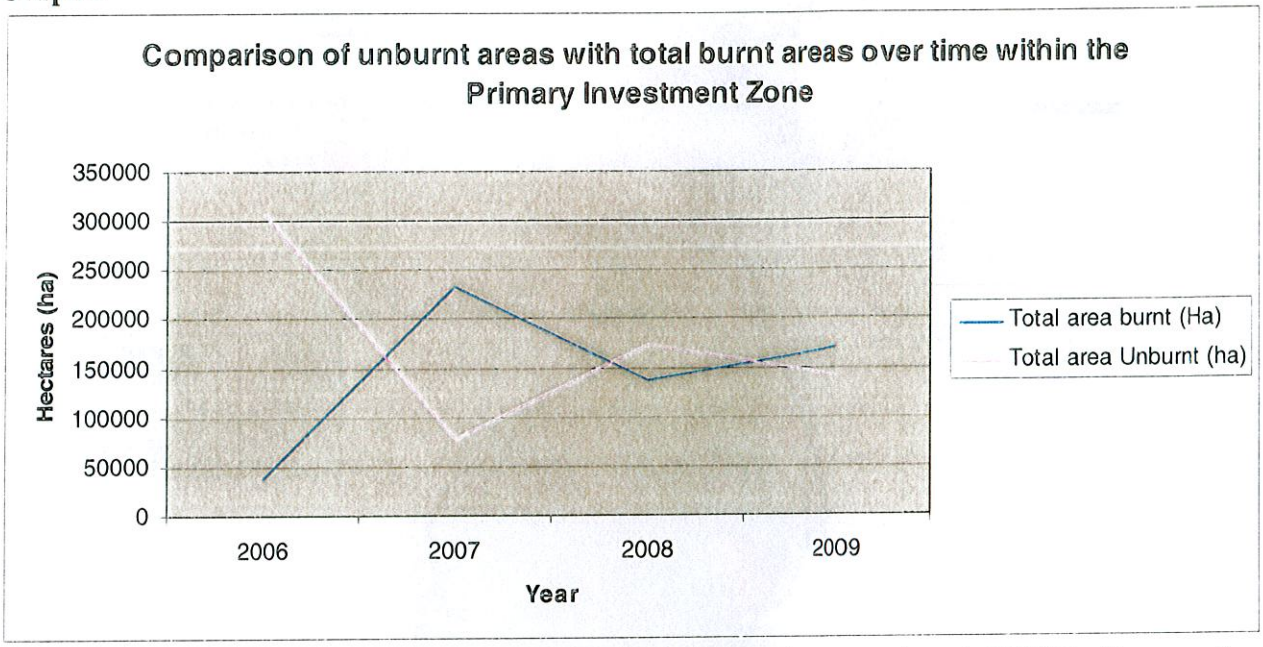
Graph 4 dramatically illustrates the increase in the number of prescribed fire scars since 2007. Wildfire scar frequency has remained relatively stable over the same period.

Graph 5



Graph 5 illustrates that the median wildfire scar size (ha) has dropped significantly since 2007 and over the same period the prescribed fire scar median size (ha) has reduced to below 80 ha.

Graph 6



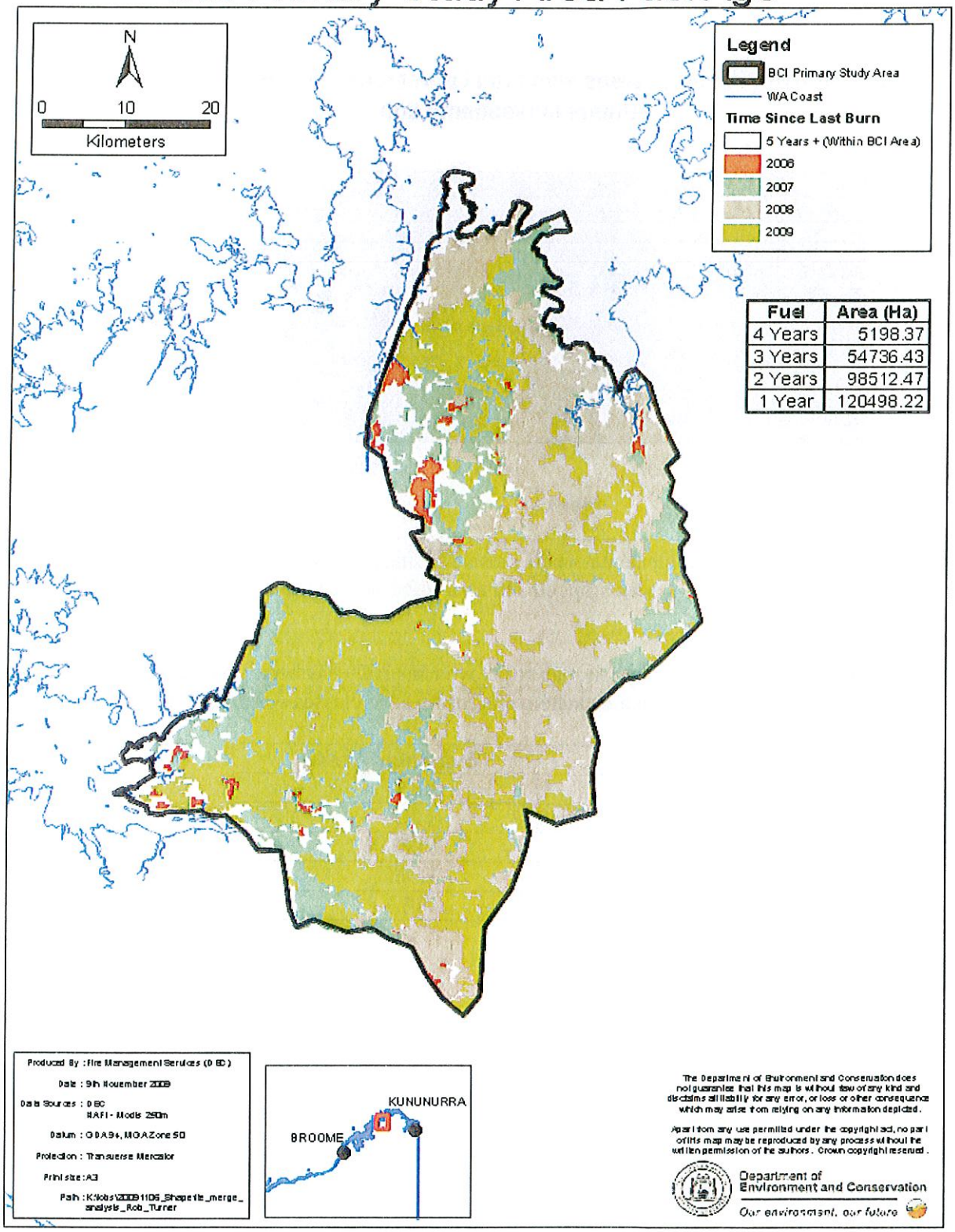
Graph 6 illustrates that since the implementation of mosaic burning operations in 2008 the "boom – Bust Cycle" as seen in 2006 and 2007 has been stopped and total unburnt area has increased from 2007 and stabilized.

On the following page a fuel age distribution map for November 2009 has been presented for the primary investment area. The following area statements for fuel age classes were determined.

Fuel Age	Area (Ha)	% Total Study Area
5 + Years	32,238	10.3
4 Years	5,198	1.7
3 Years	54,736	17.6
2 Years	98,512	31.7
1 Years	120,498	38.7

Map 1

BCI Primary Study Area Fuel Age



Conclusion

Ignition by humans and lightning will occur every year across the Kimberley landscape. While human caused fires are being addressed through community engagement and other means, it is the aim of DEC fire managers to limit the potential development, impact and spread of these fires in any given landscape or vegetation association by having a mosaic of burnt patches to break the fire run.

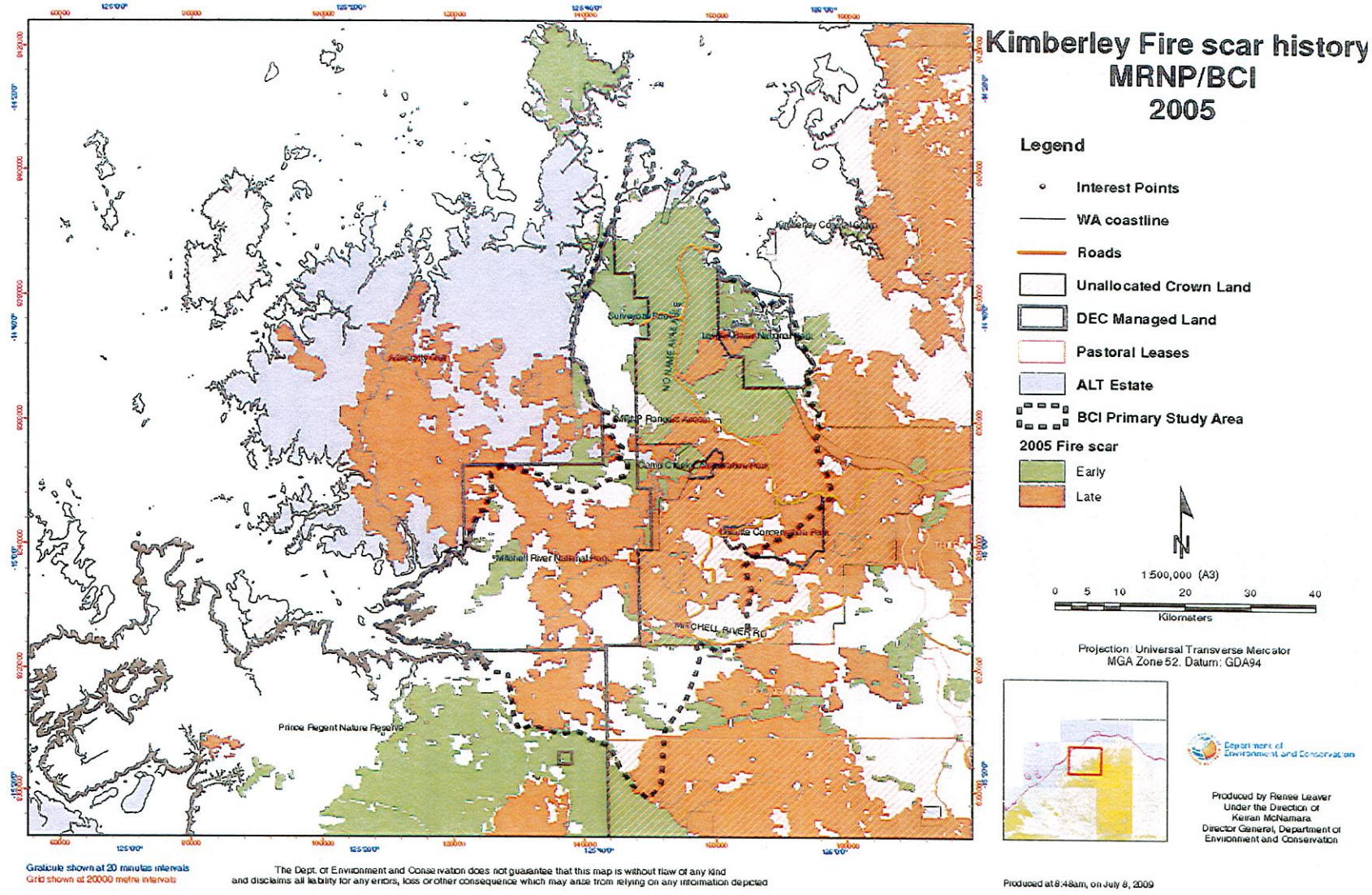
The analysis discussed in this report illustrates that in 2008 and 2009, the number of prescribed burning fire scars was significantly higher than in 2006 and 2007 and the vast majority of scars fall in the 0-250ha range. There has also been a reduction in the total area burnt by late dry season wildfires since 2007. Conversely the total area remaining un-burnt has increased from 2007 and stabilized, however the patch size of the un-burnt areas has decreased over the same period.

These changes have occurred following a shift in fire management practices. It is anticipated that the long term outcome of increasing the number of smaller, patchy fires, will result in limiting the extent of late fires which leads to an increase in patches of longer un-burnt (>2 years) across the landscape.

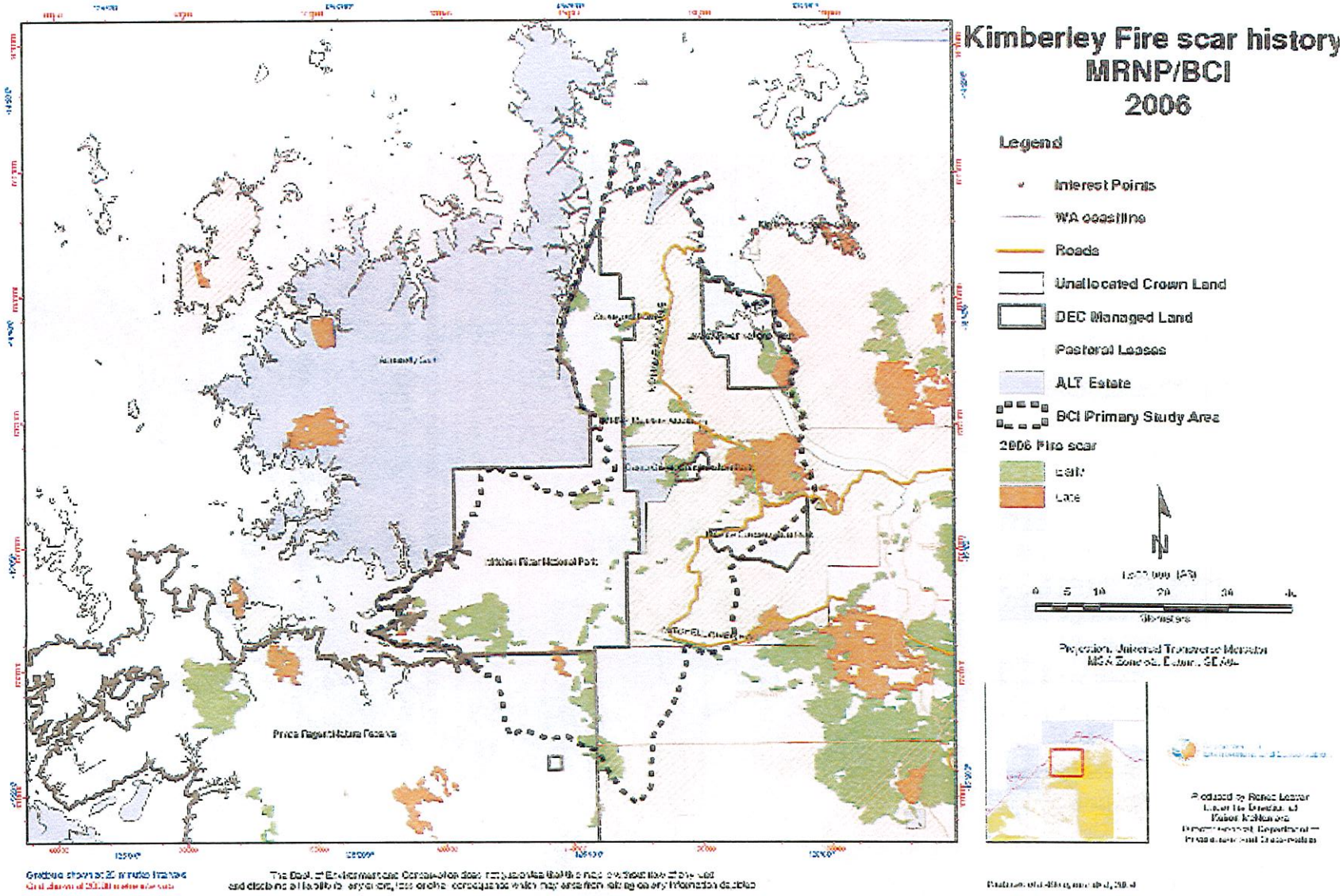
The MODIS technology has limitations in detecting early burns and capturing the area treated by prescribed fire due to the mild fire behaviour, low heat signature, limited scorch, rapid recovery, and early fires blending into the complex land system structure (e.g. Buldiva sandstone). To improve accuracy into the future, more detailed imagery such as Landsat will need to be acquired, processed and analysed. This will lead to more accurate and detailed planning, monitoring, analysis and reporting.

Appendices

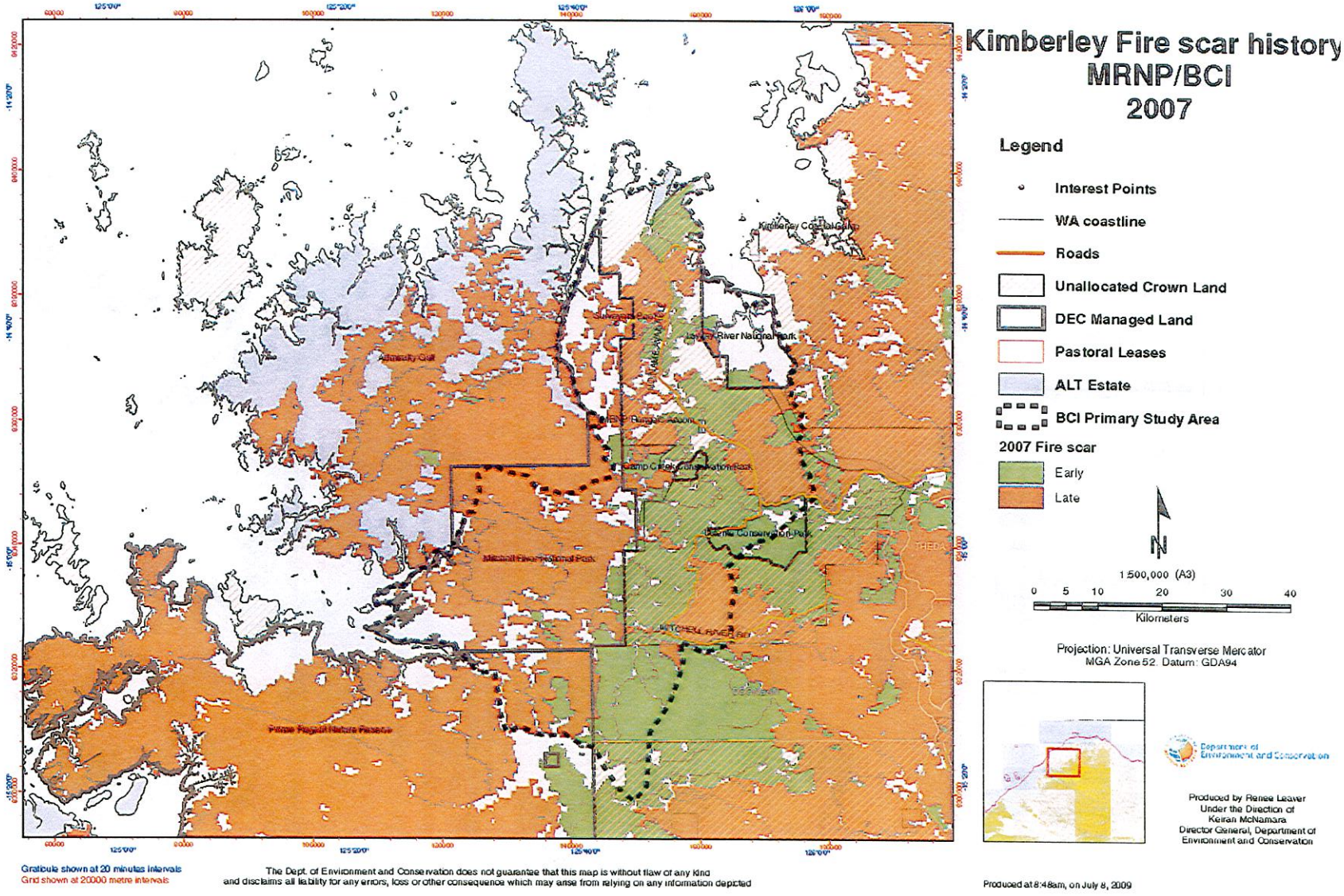
Map 1, 2005 "Bust" Year



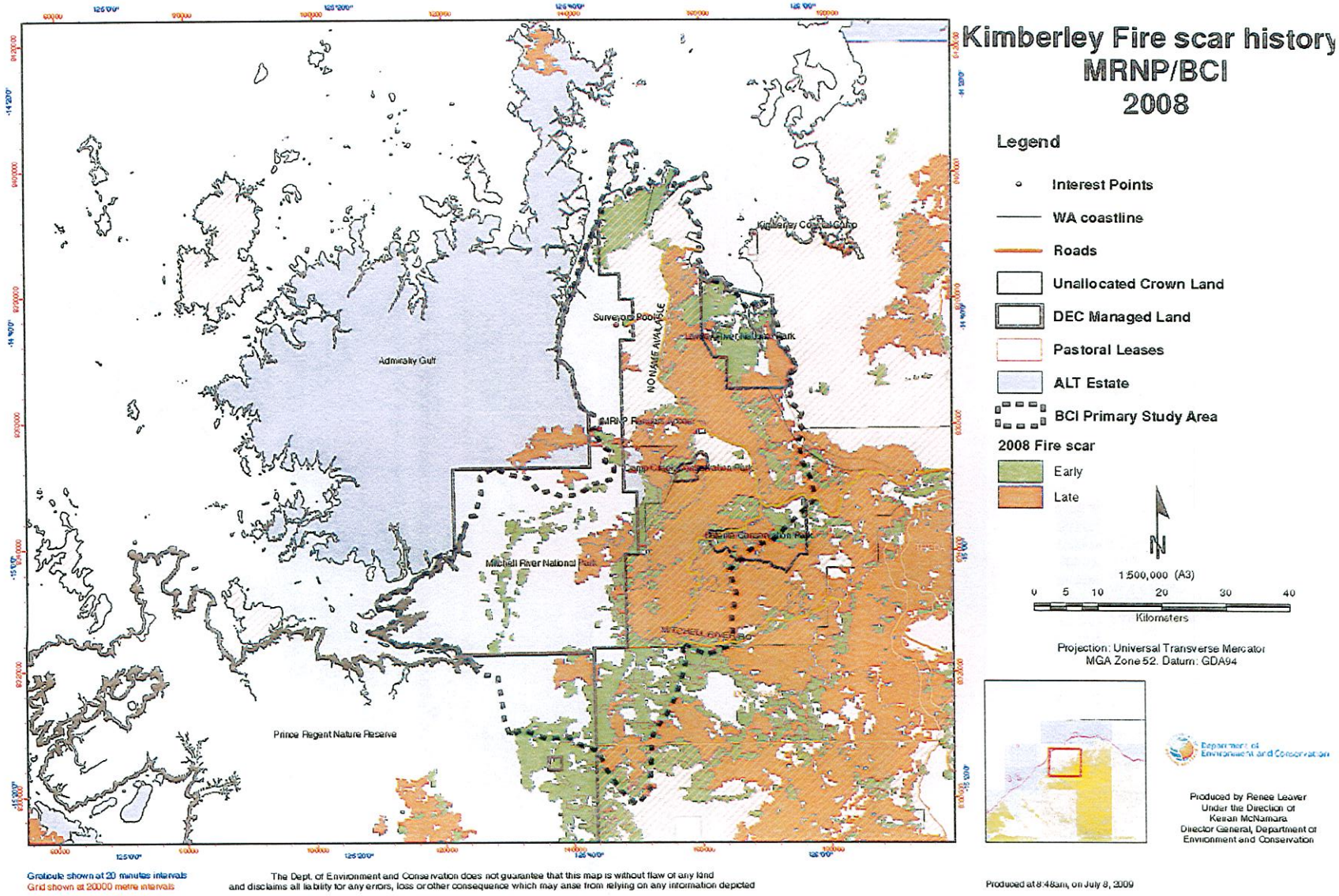
Map 2, 2006 "Boom" Year



Map 3, 2007 "Bust" Year



Map 4, 2008 "Boom" Year



Map 5: 2009 "Boom" Year