Mapping fire history
for the Great Victoria Desert

A recent partnership between the Great Victoria Desert Biodiversity Trust and the Department of Biodiversity, Conservation and Attractions has developed a better way of mapping fire scars in this remote and vast desert biome.

by Dorian Moro, Jaume Ruscalleda Alvarez and Richard van Dongen

The Great Victoria Desert is Australia's largest desert, covering an area of approximately 42.2 million hectares. This bioregion extends across Western Australia and South Australia and is divided into six floristic sub-regions.

The Western Australian extent of the Great Victoria Desert covers an area of 21.8 million hectares, primarily managed by Traditional Owners, Pastoral and mining leases cover parts of the desert.

The landscape is dominated by spinifex grasslands and mallee eucalypts, which present a highly flammable environment after heavy rainfall and during dry periods.

FIRE PATTERNS

The contemporary fire pattern in the Great Victoria Desert is characterised by cycles of large areas burnt by hot bush fires in spring and summer. In this regard, intense bushfire is one of the critical threats facing this bioregion.

While fire has always been part of the deserts, the scale and intensity of fire in the Great Victoria Desert has increased at a dramatic rate in recent years.

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Main Great Victoria Desert.
Photo – Jiri Lochman
Inset Great Victoria Desert cool season burn.

Above Great Victoria Desert landscape.
Photos – DBCA

Great Victoria Desert

An analysis of aerial photography from the Great Victoria Desert in 1960 to 1961 showed mean and maximum fire scars of 11 hectares and 3953 hectares, respectively.

However, analysis of more recent fire scars using satellite imagery showed a mean and maximum fire scar size of 3699 hectares and 1,033,121 hectares.

INDIGENOUS KNOWLEDGE

Fire management is a necessary tool to maintain diversity in desert environments. While cultural burning practices have been widely disrupted over a number of generations, there is a growing recognition of the value of returning these practices to the desert country for cultural and biodiversity reasons.

Cultural burning practices have resulted in 'patchy' burns that reduce the effects of large-scale bushfires. Traditional Owners are now taking ownership of their land management practices through

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Indigenous Protected Area management planning.

MAPPING FIRE HISTORY

Identifying which areas in the landscape to patch burn is pivotal to burn planning, and subsequent fire management operations. Management actions need to be informed by fire history maps that are sufficiently accurate at the scale of the area that is being managed.

Satellite imagery is useful to identify fire history boundaries and to predict and manage bushfire risk in the area.

The Northern Australian Fire Information (NAFI) uses MODIS satellite imagery to generate fire scar maps with 250-metre resolution. NAFI was originally designed to detect fire patterns in northern parts of Australia; however, its accuracy is less reliable in the desert and rangeland environments.

These errors have a considerable impact when attempting to define fire
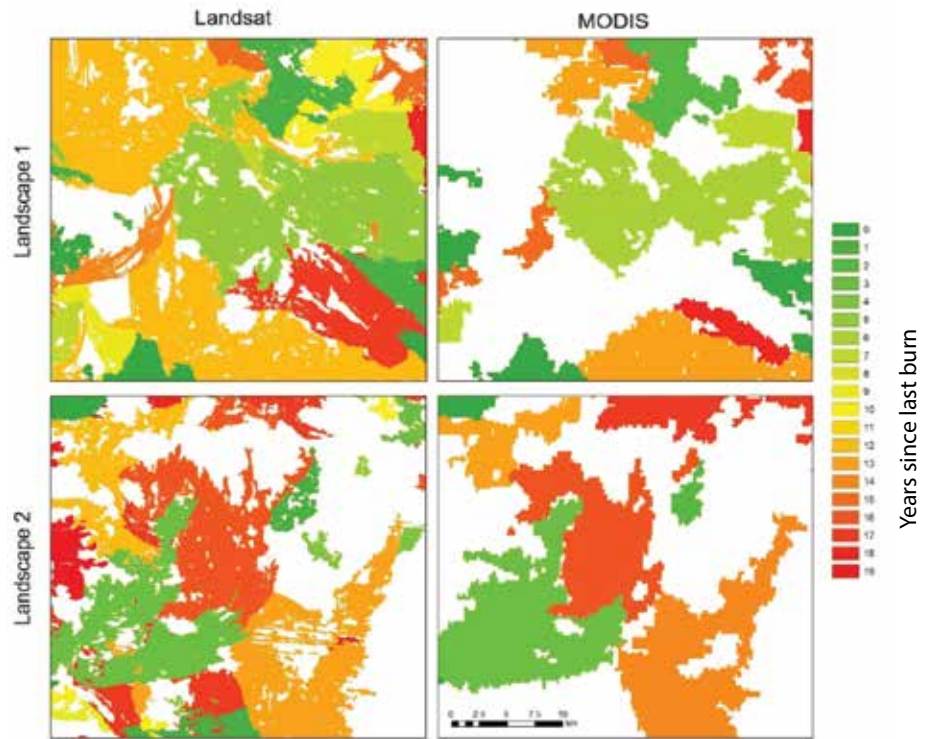
Figure 1. Landscape-scale level comparison of years since last burn maps, using Landsat and MODIS fire scar maps. Areas that appear white are considered unburnt from1995 to 2019.

boundaries for planning operational burns, and for identifying long-unburnt habitat that may support conservation significant species.

The Great Victoria Desert Biodiversity Trust partnered with the Remote Sensing and Spatial Analysis program at the Department of Biodiversity, Conservation and Attractions (DBCA) to develop a more accurate way to map fire boundaries.

Landsat imagery is better suited to mapping the distribution of fire across the desert landscape of the Great Victoria Desert with 30-metre resolution.

Satellites measure different wavelengths of infrared light that are undetectable by the human eye.

Top Sandhill dunnart *(Sminthopsis psammophila)*.
Photo – Jeff Turpin

Above left Honeysuckle grevillea (*Grevillea juncifoli*a).
Photo – Garry Middle

Above Great Victoria Desert.
Photo – DBCA

This higher resolution imagery across several spectral bands helps identify differences in vegetation health and map historically burnt areas (see Figure 1 on page 51).

Landsat imagery detected and profiled fire scars with relatively lower errors than MODIS. At the habitat scale, we were able to show that Landsat can be confidently used to estimate burn areas as small as 500 square metres.

MANAGEMENT IMPLICATIONS

Improving the accuracy of satellite-derived fire maps for these desert biomes has practical implications for fire management planning. In the Great Victoria Desert, retaining vegetation 12-24 years since fire is important to protect spinifex (*Triodia* sp.) habitat for conservation-significant species such as sandhill dunnarts (*Sminthopsis psammophila*). Similarly, reducing the flammability around mulga (*Acacia aneura*) patches at least 18 years since fire helps to conserve malleefowl (*Leipoa ocellata*) nesting and breeding sites.

WHAT'S NEXT

This work serves as a precursor to a broader assessment of the fire history and vegetation fire parameters of the landscape across the Great Victoria Desert, and for delivering ecologically sustainable fire management in this bioregion.

Traditional Owners can use the maps to help decide which areas to burn and which to protect. Maps also offer a useful tool for future opportunities such as carbon farming surveillance under the Australian Emissions Reduction Fund to manage landscapes and habitats for fire.

The information also has application for fire managers with an interest in planning prescribed burns to protect important fauna habitats.

Above left An example of old growth spinifex (*Triodia* sp.) in the Great Victoria Desert.
Photo – DBCA

Above Large-fruited mallee (*Eucalyptus youngiana*.)
Photo – Garry Middle

Below After a hot summer fire in the desert.
Photo – Great Victorian Desert Biodiversity Trust

Dr Dorian Moro worked as manager of the Great Victoria Desert Biodiversity Trust to support the development and initiation of projects for landscape management and species conservation. He now manages the Wiluna Martu Rangers Program for the Matuwa Kurrara Kurrara Indigenous Protected Area. He can be contacted at environment@tmpac.com.au.

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