The 2024 vegetation die-off in the southwest

By Dr William Fowler and Dr Katinka Ruthrof

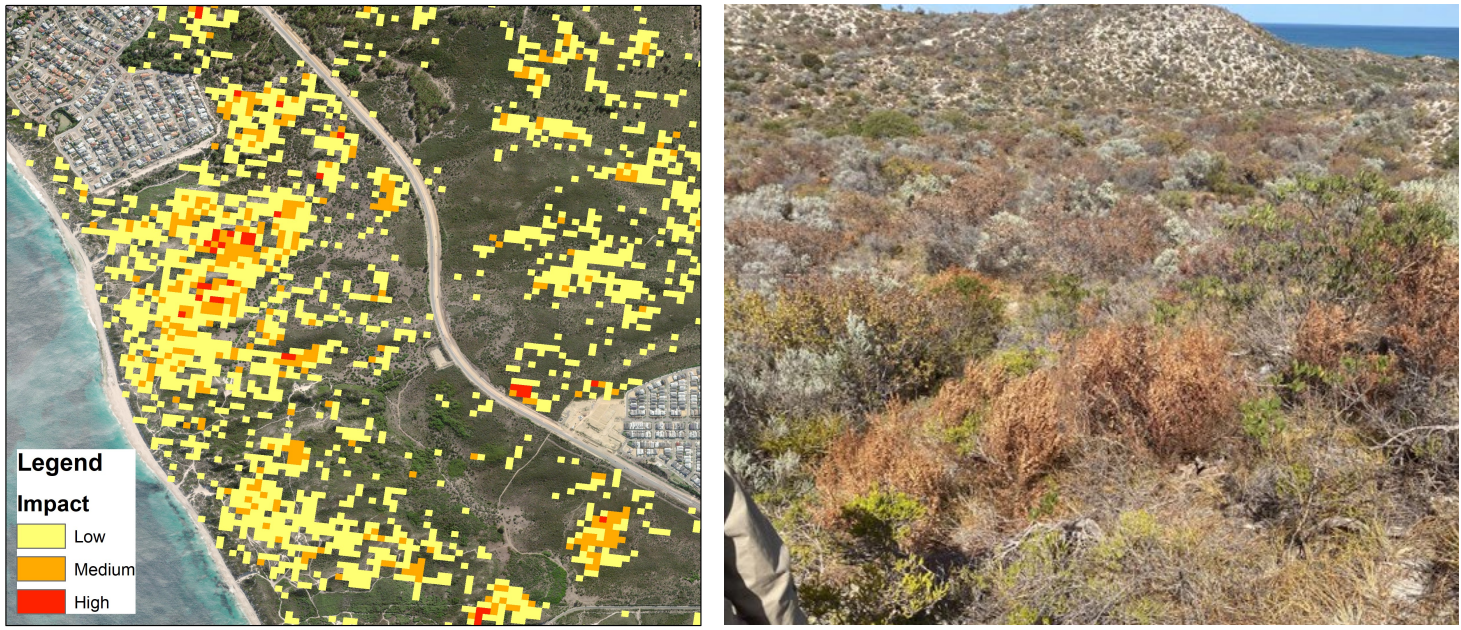
This summer and autumn, you have likely noticed substantial drought and heat-related impacts to vegetation, with many areas of bushland and even streetscapes showing signs of stress and die-off. This die-off event has been reported from as far north as Shark Bay, and as far south as Albany.

For some of you, this may seem familiar, with a previous die-off event having occurred in 2011. Heat waves in summer 2010-2011 coincided with a drought characterised by an extremely dry winter in 2010 (40–50% below the average rainfall).

This year, Western Australia had the warmest summer on record since observations began in 1910. Perth also just had the driest six months (Oct-Mar) since records began in 1910.

DBCA scientists and land managers are working with university researchers and community groups (such as 'Friends of' groups) to monitor and document the impacts of this drought to better understand how vegetation responds to these conditions. Satellite imagery has been used to identify areas of die-off across the south-west, which are then 'ground-truthed' by visiting areas of high, medium, and low impact to verify if and how die-off is occurring in these areas.

Front cover: Die-off affected vegetation at Paganoni swamp during the 2023/2024 drought. Photo – Joe Fontaine, Murdoch University.



Sentinel-2 satellite imagery die-off detection vs. on ground comparison near Yanchep. Photo – Richard Van Dongen and Katinka Ruthrof.

The observed impact of heat and drought conditions varies from location to location. From monitoring that has been undertaken so far, the majority of severe die-off sites seem to occur in shallow soils, such as those near granite outcrops (in the Northern Jarrah Forest) or limestone outcrops (in coastal heath). Die-off has also been recorded in deeper sandy soils of banksia woodland, though.

As different plant species respond to drought and heatwave conditions differently, some species may resprout and recover over the coming winter and spring. Others may not be able to respond in this way and be reliant on recruitment from seed to persist at affected locations.

There is potential for the composition of plant communities to change due to these varying responses, especially if events such as these become regular or more frequent, or act in combination with other stressors such as wildfire. The monitoring currently being undertaken suggests that species affected include jarrah, marri, bull banksia and sheoak in the forest; understorey species in coastal locations including *Spyridium globulosum* and *Banksia sessilis*; and species of Ericaceae such as *Brachyloma preissii*.

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What was learnt from the 2011 die-off?

In 2011, vegetation die-off was mainly seen coinciding with drought and heatwave conditions in the Northern Jarrah Forest but also tuart woodland, banksia woodland, and Eneabba sandplains.

A range of research projects were undertaken into forest health since the 2011 die-off event in the Northern Jarrah Forest. This research focused on investigating the immediate response of vegetation, along with the recovery of key forest tree species such as jarrah and marri. In addition, research efforts have focused on which site factors contributed to drought related die-off and how native fauna responded during these significant events.

There has been much learnt from the 2011 die-off in the Northern Jarrah Forest, including:

- changes in vegetation density and structure towards reduced height but higher stem density
- site properties related to the die-off included rocky soils with low water holding capacity; proximity to rock outcrops; steep slopes; higher elevations; and dry areas
- how other organisms such as fauna, microbes, and insects were impacted by the die-off.
- how some insects and birds benefitted from the die-off. For example, how wood boring insects such as the native *Phoracantha semipunctata* beetle (a long horned borer, which can be heard by a human as it feeds on stressed trees), increased in density, and then became a feed for cockatoos, who strip the bark away in order to reach the larvae.
- implications of die-off for fuel loads: fire modelling suggested a fire rate of spread would be 30% greater in die-off areas.

Die-off impacted understory vegetation in Banksia woodland. Photo – Joe Fontaine, Murdoch University.

Importantly, this research has enabled the development of vulnerability maps which allows land managers such as DBCA to help predict how the jarrah forest might be impacted in future drought and heatwave conditions. Together with the use of predictive models, this mapping has helped inform the development of proactive management strategies in the Forest Management Plan 2024-2033 such as ecological thinning, which aims to reduce drought stress in the forest.

The collaborative field and laboratory research being undertaken around the 2023/2024 die-off event will contribute to understanding the response and thresholds of plant species and communities. This will aid in predicting vulnerability so that adaptive management strategies can be developed and implemented to reduce the future die-off risk in certain circumstances.

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Effects of die-off in Jarrah forest. Photo – Joe Fontaine, Murdoch University.

Die-off impacts at Mount Brown reserve in coastal heath on limestone in autumn 2024, Below: same location in Spring 2015. Photos – William Fowler.

How can you help?

You can help by documenting die-off in your area. The Australian Citizen Science Association has an ongoing project called 'The Dead Tree Detective' where volunteers can report any dead trees one observes. The project aims to collect observations of dead or dying trees around Australia. Knowing where and when trees have died will help researchers to work out what the cause is, identify trees that are vulnerable, and take steps to protect their ecosystems.

You can also consider joining a local conservation group and assisting in caring for your local bushland. You can find your local group on the find a conservation group page.

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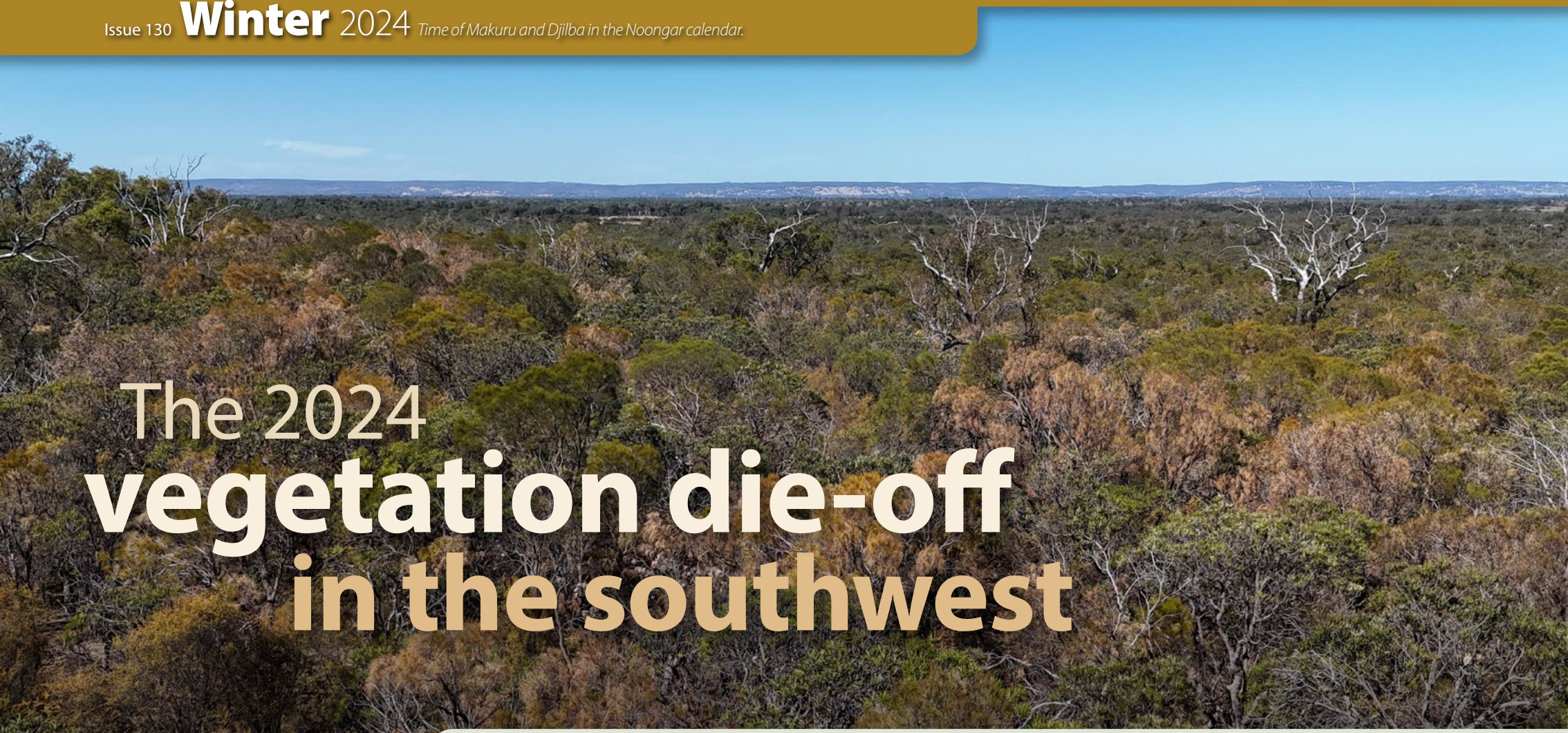

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Photo – Joe Fontaine, Murdoch University.

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