

## **Progress Report SP 2019-048**

# **Investigating the causes of change in forest condition**

**Ecosystem Science**

### **Project Core Team**

<b>Supervising Scientist</b>	Katinka Ruthrof
<b>Data Custodian</b>	Katinka Ruthrof
<b>Site Custodian</b>	

### **Project status as of Dec. 11, 2019, 2:19 p.m.**

Approved and active

### **Document endorsements and approvals as of Dec. 11, 2019, 2:19 p.m.**

<b>Project Team</b>	granted
<b>Program Leader</b>	granted
<b>Directorate</b>	granted

# Investigating the causes of change in forest condition

K Ruthrof, D Tarrant, R Van Dongen

## Context

A decline in vegetation density in the northeast of the forest management plan area was noted in *Mid-term review of performance of the Forest Management Plan 2014-2023*. Forest die-off is particularly concerning, given the importance of the forest ecosystem for carbon sequestration, timber production, recreation, habitat, and a range of ecosystem services, including water. The decline is broadly consistent with climate change prediction models, although other factors may also be contributing. Previous research in the eastern part of the forest suggests that *Eucalyptus wandoo* has been undergoing a series of declines associated with drought and increasing temperatures. In addition, *E. wandoo* has been affected by a Buprestid beetle (*Cisseis fascigera*). An associated fungal pathogen is also suspected in the decline of this eucalypt but has not yet been identified and described. Other key canopy species, *Eucalyptus marginata* and *Corymbia calophylla*, have been reported to be susceptible to frost in certain sites, and vulnerable to acute drought and heatwave events at water-shedding sites with shallow soils.

More information is needed about the landscape, site and stand characteristics that predispose forest to decline. Without this, we cannot predict how and where the forest will respond to a hotter and drier climate in the future. This project will build on the information available and investigate the contributing factors. This will provide a greater understanding of the vulnerability of the forest to climate change and assist in developing evidence-based management intervention techniques. The project has four key areas: 1) investigation of the decline trend maps; 2) forest validation via a forest survey; 3) investigating trajectories in recovery post-fire using satellite imagery; and 4) investigating climatic influences.

## Aims

Investigate the cause of decline in vegetation density and further examine contributions by other factors.

## Progress

- Examined the origins of the satellite imagery that indicated a decline in vegetation cover in the mid-term Forest Management Plan review, and discussed the underlying process of image creation.
- Field reconnaissance was undertaken to a number of the forest ecosystem types that were shown to be declining in cover to identify potential associations of decline.
- Developed a stratified decline map, highlighting areas with the highest level of decline.
- Designed a rapid field assessment technique to examine and capture the landscape, stand and tree level variables that could be associated with vegetation decline.
- Examined the wood boring insect and fungus that appears to be associated with *E. wandoo* decline.
- Examined image analysis methods to evaluate post-fire recovery.

## Management implications

- Knowledge gained from this study will be incorporated into forest management policy and planning for biodiversity conservation, and also contribute to the mapping of forest health and reporting for the next Forest Management Plan (FMP).

## Future directions

- Undertake field work in areas where decline is being shown by the satellite images and investigate landscape, stand and plant variables associated with the decline.
- Investigate the recovery of key forest ecosystem types from different levels of fire severity, using indices appropriate for use in the next FMP.

- Investigate climatic variables that are could be associated with vegetation decline.