Concept Plan SP 2019-068

Understanding the implications of a drying climate on forest ecosystem function to inform and improve climate change adaptation

BCS Ecosystem Science

Project Core Team

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Project status as of Feb. 22, 2024, 3:21 p.m.

X X Update requested

Document endorsements and approvals as of Feb. 22, 2024, 3:21 p.m.

X X
Project Team granted
Program Leader granted
Directorate granted

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Program

BCS Ecosystem Science

Departmental Service

Service 8: Implementation of the Forest Management Plan

Background

The mid-term review of the Forest Management Plan 2014-2023 recommends a continued focus of research towards understanding the implications of a drying climate on ecological function, biodiversity and forest health, through KPI 12: Increased knowledge of trends in climate (performance measure: "new knowledge gained on the impact of changing climate on values. . . " and KPI 13:. . . "integrate research and monitoring programs to inform and improve climate adaptation and mitigation. . . ").

A number of important areas of investigation have been identified for this project:

Understand the implications for forest health, structure, regeneration, composition and function from climate change events, and interactions with wildfire, prescribed burning and harvesting.

- Approach: 1. In areas affected by chronic drought, acute drought/heatwave events, and wildfire, (as represented by Yarloop research sites), which have a range of prescribed burn and harvest histories, determine: A) canopy recovery, ecophysiological health and performance, carbon dynamics and regeneration capacity; B) understorey diversity and response.
- Approach: 2. (Potential) Examine the ForestCheck sites, across the existing precipitation, temperature, SPEI and VPD gradients and long term changes, to investigate vulnerabilities in forest health.

Undertake a desktop review of ecological thinning.

- Approach: Examine data and literature on forest sites that have been thinned to lower basal area and stem density to determine the potential for silvicultural intervention to increase forest health in a drying climate (e.g. Inglehope, Yarragil, Wungong, Well-bucket). Also, use remote sensing indices, such as i35, to examine vegetation trajectories of thinned plots compared with adjacent unthinned plots.

Projection of forest persistence into the future using the Landis II model.

- Approach: This model may help answer questions such as what are the implications of projected climate change on forest composition, pest populations, disease, fire, and can management intervention assist? Work together with the Forest Management Branch to source stand-level data for data from two catchments as a pilot study.

[Potential project] Investigate whether there is genetic adaptation and physiological tolerance to drought and heat for major forest canopy species at drought-affected sites in the Northern Jarrah Forest. These sites may have facilitated sub-populations that have adapted to the local, harsh conditions.

- Approach: Use genotyping by sequencing (GBS) genetic analysis to highlight the adaptive variation in extant trees at drought sites. Also, source seeds from live individuals at drought sites, undertake glasshouse manipulations to examine physiological tolerance to drought and heat.

Aims

The aim of this project is to understand the implications of a drying climate on forest function, biodiversity and health to inform adaptation and mitigation.

Expected outcome

The expected outcome is a clearer understanding of the responses of forest ecosystems to climate change in terms of structure, composition and functioning, and management intervention (such as prescribed burning). For example, this information will allow us to explore mitigation of large-scale forest declines due to climate change, if possible, through management intervention in the future. Outputs will include: journal papers, conference presentations, summary bulletins for stakeholders and the wider community, and other outreach materials as required, or as opportunities arise.

Strategic context

The project aligns with KPI's from the Mid-Term Review of the Forest Management Plan. Furthermore, it aligns with the Science Strategic Plan; Theme: *Impacts of climate change on biodiversity and ecosystem function*. The Strategic Goal (reiterated in the Ecosystem Science Program Plan 2018-21): *Impacts of climate change on biodiversity are better understood and adaptation strategies are incorporated into conservation management and planning*. The project will contribute to these by understanding the responses of the forest ecosystem to climate change, such as recent declines, to inform mitigation strategies.

Expected collaborations

DBCA: Forest Management Branch, remote sensing staff, fire ecologists, foresters. Universities: Forest ecologists, climatologists (Murdoch University).

Proposed period of the project

Sept. 10, 2019 – Dec. 31, 2026

Staff time allocation

to | X | X | X | X |

Role	Year 1	Year 2	Year 3
Scientist	0.5	0.5	0.5
Technical	0.1	0.1	0.1
Volunteer			
Collaborator	0.01	0.01	0.01

Indicative operating budget

to | X | X | X | X |

Source	Year 1	Year 2	Year 3
Consolidated Funds (DBCA)	13	8	8
External Funding			