

Concept Plan SP 2022-042

Forest ecosystem resilience and silviculture

BCS Ecosystem Science

Project Core Team

Supervising Scientist

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Project status as of Aug. 5, 2022, 2:26 p.m.

New project, pending concept plan approval

Document endorsements and approvals as of Aug. 5, 2022, 2:26 p.m.

Project Team

granted

Program Leader

granted

Directorate

required

Forest ecosystem resilience and silviculture

Program

BCS Ecosystem Science

Departmental Service

Service 8: Implementation of the Forest Management Plan

Background

The State Government announced in Sept. 2021 that from 2024, timber taken from native forests will be limited to forest management activities that improve forest health. In addition, through the End Term Review of the FMP 2014-2023, considerations for the next FMP (2024-2033) were that the Department will seek to continue to investigate the response of forest vegetation cover to climate change events, including drought and heatwaves, and to further investigate, with external agencies and research institutions, the ecological impacts of forest thinning.

This project supercedes and expands on SPP 2000-003 (Hydrological response to timber harvesting and associated silviculture in the intermediate rainfall zone of the northern jarrah forest) which will be closed.

The scope of research for forest thinning includes:

Forest ecohydrology, climate change and silviculture

- Quantify hydrological responses (groundwater, surface water and evapotranspiration) to thinning and declining rainfall in experimental catchments (underway) and examine how forest structure regulates streamflow volumes/quality at landscape scales (underway). Apply novel technologies, geophysics, remote sensing, water tracers and soil analyses to measure these responses.
- Develop models for landscape-scale assessment of ecohydrology responses to climate change and silvicultural management.

Forest responses to climate change and silviculture

- Examine responses of thinned forest, riparian zones, dense regrowth, and old growth, during drought/heatwaves using remote sensing (e.g., NDVI, i35, LAI) (underway: FEF).
- Examine, using remote sensing and geophysics, depth to groundwater and bedrock, when and where forest cover changes are occurring, to identify key thresholds and inform silviculture (some of this in 2022/23)
- Mine FORESTCHECK data for relationships between biological diversity, composition and stand density, e.g., examine the temperature and precipitation gradient across the forest to show impacts of a drying and warming climate on forest structure, composition, and function.
- Maintain, periodically monitor (5–10yrs), and report on silvicultural measurements, e.g., population and health, for long-term trials in jarrah (Yarragil 4L, 4X, 6C, Wungong, Inglehope, Munro) and karri forest (Warren, Treen Brook, Sutton blocks).
- Identify the effects of thinning on forest function (e.g., soil carbon, nutrients, microbes), and soil disturbance (movement, compaction), and understorey diversity (Wungong, Munro) (underway).
- Quantify herbicide residue following thinning operations (underway).

Fauna responses to silviculture

- Examine habitat values and use (foraging, roosting, nesting) of thinned and unthinned catchments (e.g., Wungong) by fauna (key species and broader diversity measures) using novel techniques (e.g., eco-acoustics, camera traps, eDNA) and compare with traditional methods.

Forest responses - disease

- Examine the responses of *Phytophthora cinnamomi*-affected forest, in thinned and unthinned areas using remote sensing techniques, validated with in situ data logging (underway).

Forest responses - carbon

- Examine carbon dynamics of thinned and unthinned catchments and ForestCheck plots and clarify allometrics and provide more accurate above and below ground carbon accounting.

Fire interactions

- Examine the vulnerability of thinned and unthinned forest blocks to high severity fire (underway: DBCA/DFES collaborative project).
- Quantify fuel loads following different methods of thinning using standard and publishable fuels surveys, for older (e.g., Wungong) and newly thinned sites (e.g., Munro, Hamilton).

Social licence

- Quantify current attitudes regarding forest thinning. Repeat the Beckwith et al. (2010) study from Wungong to determine attitudes to longer-term forest development after thinning (underway: FEF).
- Assist with demonstration sites to increase understanding of forest thinning (underway: FEF).

Note: FEF = Forest Enhancement Fund; DFES = Dept Fire and Emergency Services.

Aims

The aim of this project is to examine the potential of silviculture to maintain or increase forest ecosystem resilience and inform management for forest adaptation to climate change.

Expected outcome

A clearer understanding of the responses of forest ecosystems to climate change with and without silvicultural intervention. Findings will be shared with EHB and FMB as part of the FMP implementation via guidelines, manuals, and procedures. Outputs will include journal papers, presentations, science notes, etc., as required.

Strategic context

The project aligns with KPI's from the ETR of the current FMP. Furthermore, it aligns with the Science Strategic Plan (2022- 2025); Strategy: *Develop adaptive management tools to promote ecosystem resilience to the impacts of climate change and other threats*. The project will contribute to this Strategy by understanding the responses of forest ecosystems to climate change to inform management. Forest thinning is also a prominent management tool proposed under the 2024-2033 Forest Management Plan.

Expected collaborations

This project will be jointly implemented by Ecosystem Science and Remote Sensing and Spatial Analysis Programs. Collaborators within DBCA will include Fire Science program, Forest Management Branch, fire ecologists and foresters. Collaborations are expected with universities including through student supervision.

Proposed period of the project

July 25, 2022 – None

Staff time allocation

Role	Year 1	Year 2	Year 3
Scientist	1.2	1.2	1.2
Technical	0.55	0.55	0.55
Volunteer			
Collaborator			

Indicative operating budget

Source	Year 1	Year 2	Year 3
Consolidated Funds (DBCA) re-allocated from existing forest projects	29	4	4
External Funding	188	133	0