

Project Plan SP 2000-003

Hydrological response to timber harvesting and associated silviculture in the intermediate rainfall zone of the northern jarrah forest

Ecosystem Science

Project Core Team

Supervising Scientist	Joe Kinal
Data Custodian	
Site Custodian	

Project status as of Dec. 19, 2018, 9:55 a.m.

Approved and active

Document endorsements and approvals as of Dec. 19, 2018, 9:55 a.m.

Project Team	granted
Program Leader	granted
Directorate	granted
Biometrician	required
Herbarium Curator	not required
Animal Ethics Committee	not required

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Biodiversity and Conservation Science Program

Ecosystem Science

Departmental Service

Service 8: Implementation of the Forest Management Plan

Project Staff

Role	Person	Time allocation (FTE)
Supervising Scientist	Joe Kinal	0.6
Technical Officer	Graeme Liddelow	0.1

Related Science Projects

Proposed period of the project

None – None

Relevance and Outcomes

Background

There has been a large number of studies of catchment hydrology in the forests of south-west Western Australia and these studies have provided an adequate understanding of hydrologic processes and the impact of forest management on catchment hydrology. A review of these studies was undertaken as a part of developing the current Forest Management Plan and changes in practice were adopted as a result. The current practices represent a conservative, precautionary approach to the management of forests to ensure the protection of potable water supplies. Nevertheless, there have been no catchment studies on the hydrologic impacts of the current silvicultural practices in jarrah forest. Three research catchments in the Yarragil Brook catchment area in the IRZ in the northern jarrah forest are available in which monitoring of groundwater level, stream flow, stream salinity, and salt load is ongoing and for which records good exist for at least the previous ten years. More limited records exist going back to the mid 1970's. Unfortunately, the Water and Rivers Commission who were monitoring these catchment, have recently ceased this monitoring. CALM now undertakes monitoring of hydrologic variables in these catchments. Two of the catchments, 4X and 6C, occur in areas subject to logging in the near future. This project aims to impose logging treatments in 4X and 6C, to use the third catchment, Wuraming, as a control, and to continue the hydrological monitoring. The logging prescription proposed for 4X is the standard prescription for the IRZ. This is a more conservative prescription than that applied to the high rainfall zone, and includes the retention of at least 30% of the catchment at a basal area of at least 15m²ha⁻¹ for a period of at least 15 years after harvesting the remainder of the catchment. The experimental prescription proposed for 6C is less conservative than the standard, i.e. omit the requirement for the retention of 30% of the catchment with a basal area of 15m²ha⁻¹ but still retain the standard stream reserves. It is anticipated that the hydrologic response to the standard prescription (in 4X) will be minimal. The purpose of testing the less conservative treatment proposed for 6C is to promote a greater hydrologic response and therefore to provide more information on which to model forest hydrology and develop improved future practices.

Aims

1. To develop an improved understanding of the impacts of timber harvesting in the intermediate rainfall zone of the jarrah forest.

2. To determine the impacts of the current logging prescription in the intermediate rainfall zone of the jarrah forest on stream salinity.
3. To provide information that can be used to model the impacts of timber harvesting on forest hydrology and contribute to improved future management practices.

Expected outcome

The study will provide records of stream flow, salinity, and salt load, and vegetation density, before- and after-treatment which will enable an estimation of changes to the hydrology in relation to changes in vegetation density.

Knowledge transfer

State Forest Resources Business Unit. Internal report to SFRBU on outcomes of project.

Tasks and Milestones

Date

Comments

1/06/1999
Obtain historical hydrological records from Water & Rivers Commission

1/10/1999
Mark out vegetation survey transects

1/01/2000
Pre-logging vegetation surveys 4X & 6C - replace W&RC hydro monitoring equipment with CALM equipment - logging treatments of 4X&6C

1/04/2000
Vegetation survey Wuraming

1/06/2000
Post-logging vegetation surveys 4X&6C

1/01/2001
Analysis of results

1/10/2002
Interim compliance report

References

Study design

Methodology

The study is an experiment. The dependent variables are annualised streamflow, stream salinity, and salt load. Design is BACI, i.e., Before, After, Control, Impact, using three experimental catchments with no replication. Wuraming, 4X, and 6C are long term hydrology research catchments which have been maintained and data collected and archived by CALM and the Water & Rivers Commission.

- (i) Wuraming catchment: Control will remain unlogged for the duration of the study
- (ii) 4X catchment: Logged according to the standard phased logging prescription for second order catchments in the intermediate rainfall zone of the jarrah forest. This prescription specifies that at least 30% of each second order catchment has a retained basal area of $>15\text{m}^2\text{ha}^{-1}$ for a period of at least 15 years after harvesting the remainder of the catchment.
- (iii) 6C catchment: Logged to a less conservative prescription than the standard, by omitting the retention of 30% of the catchment with a basal area of $>15\text{m}^2\text{ha}^{-1}$.

To assess changes to streamflow in response to the treatment the catchments are calibrated by establishing a regression between the treated catchment and the control for annual streamflow. Annual values of streamflow are then predicted from the regression post-logging and the response to logging calculated as the difference between observed and predicted.

To assess changes to stream salinity and salt load, each variable is calibrated against streamflow for the pre-logging period for each treated catchment. The regressions are then used to predict post-logging stream salinity and salt load from predicted streamflow for each catchment. The response to logging is calculated as the difference between observed and predicted

Biometrician's Endorsement

required

Data management

No. specimens

Herbarium Curator's Endorsement

not required

Animal Ethics Committee's Endorsement

not required

Data management

EXCEL spreadsheets, archived on floppy disk, stored at Dwellingup Research Centre

Budget

Consolidated Funds

Source	Year 1	Year 2	Year 3
FTE Scientist			
FTE Technical			
Equipment			
Vehicle			
Travel			
Other			
Total			

External Funds

Source	Year 1	Year 2	Year 3
Salaries, Wages, Overtime			
Overheads			
Equipment			
Vehicle			
Travel			
Other			
Total			