Wungong Catchment Trial

Demonstration sites in the Wungong catchment, Jarrahdale Road

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Introduction

A 12 year, $20 million, silviculture trial funded by the Water Corporation in the Wungong catchment aims to enhance water availability, biodiversity and timber values in a 13,000 ha water supply catchment. This will be done by commercial logging, non-commercial thinning of cull trees, control of coppice and excessive regrowth and regular prescribed burning. About 60 percent of the catchment is available for logging and thinning, the remainder is made up of various types of reserves. It is estimated that these silvicultural treatments will yield an additional four to six Gigalitres (4-6 Billion litres) each year. Further details are available on www.watercorporation.com.au/wungong.

Until now, there were no examples in the Wungong catchment of thinning trials that the public could see as a demonstration of what is proposed. Though there are a number of research trials and many thousands of hectares of operational thinning areas in the northern jarrah forest, conveniently located examples of a range of treatments were not available.

Because education is one important aspect at shaping public opinion, the Water Corporation, in liaison with DEC and FPC has established three demonstration/education areas alongside Jarrahdale road, two in native jarrah regrowth and the other in a post 1988 rehabilitated bauxite mine pit, each covering a range of silvicultural techniques.

The criteria for selection of these areas were: good access, visitor safety and reservoir protection. Each plot is square, at least 0.5 hectares and is large enough for monitoring studies. At each site an explanations will be provided to detail the treatments, and their advantages and disadvantages. The sites will help to explain to the public and students how thinned areas can yield useful benefits for water, biodiversity, forest health and timber production. The demonstration sites will also be useful for training Water Corporation, DEC and FPC staff.

1. Demonstration Area 1: Native Regrowth Forest with commercial logging by FPC

Eight plots, each of one hectare have been established to demonstrate 7 silvicultural techniques in a high-quality jarrah forest site, 1100mm rainfall, that is dieback-free, of codominant height 22-24 metres, high-rainfall Dwellingup (Mattiske/Havel) and Havel “s” type, that was last cut-over in the 1940-50 decade.

The different silvicultural treatments compare the following:

- Basal areas ranging from 9 to 57 square metres per hectare
- Stems per hectare from 60 to 560
- Culling of non-commercial trees by either falling or notching
- Retention of non-commercial materials on-site or removal for possible sale
- Preferential retention of larger trees compared to retention of growing-stock

All tree-marking and field operations were supervised by DEC, FPC and Corporation staff. The plots will be prescribed burnt next spring, 2008.

2. Demonstration Area 2: Native regrowth jarrah forest, no commercial logging

These areas are adjacent to some clear-felled and mined bauxite pits and were commercially logged in conjunction with the clear felling of the pits in the late 1980's. Commercial products are not present in sufficient quantity to warrant a logging operation by FPC. However these areas are overstocked with culls and non-commercial species. Each plot is about 0.4 ha in size. This area has a rainfall of 1250mm, was interpreted as understorey affected by dieback and was prescribed burnt by DEC in spring 2006, in advance of treatment.

Three treatments were used that will achieve a similar prescription to some of the plots logged commercially, but without any snig tracks or other logging disturbances.

- Control- no treatment
- Retention of crop and habitat trees to about 12-13 m^2 basal area, by hand falling culls.
- Retention of crop and habitat trees to about 12-13 m^2 basal area, by notching culls.

3. Demonstration Area 3: Rehabilitation in Bauxite Pits with native species.

The area was mined for bauxite and then seeded by Alcoa World Alumina in 1991 with a mixture of native understorey and tree species. It is dominated by healthy jarrah regrowth to a height of 11-14 metres, basal areas over bark of 16-18 m^2 and diameters of 15-20 cms in co-dominants. This area was prescribed burnt by DEC in spring 2006, in advance of treatment. There are six plots, each 0.5 hectares in size.

The following silvicultural treatments are compared.

- Thinning to 350 sph and 600sph with an unthinned control (about 1500 sph)
- Thinning by falling or by notching
- Removal off-site or retention of thinning "waste" on-site
- BAOB range 8 to 18 m2

General comments

The plots cover a wide range of age classes (16 to 70+ years old), of stem numbers (60-1500/ha), of basal areas (8 to 57 m2/ha) and of leaf cover (18 to 75 percent) that will be useful for comparative studies. Data such as basal areas, leaf cover, number of stems and diameters have been collected on each plot.

The Corporation funded the establishment of these demonstration areas, which were then implemented with the assistance of DEC and FPC. Parking areas and walk trails will be constructed by DEC and interpretative materials are also being prepared. There will also now be the opportunity to involve volunteers and students in collection of additional relevant data, such as interception studies, tree growth rates, understorey cover and composition, litter cover, surveys for macro-fungi and orchids.

Native Forest — layout and prescriptions

LAYOUT

WEST…….JARRAHDALE ROAD…….EAST

PLOT 1	PLOT 2	PLOT 3	PLOT 4
PLOT 5	PLOT 6	PLOT 7	PLOT 8

PRESCRIPTIONS

PLOT 1 CONTROL, NO LOGGING

PLOT 2 Mark to retain 15 m^2 ($12m^2$ + 5 habitat)- TB and FJB
Commercial logging by FPC contractor
Cut down all surplus trees, crown the log and remove from site, by FPC contractor

PLOT 3 Mark to retain 15 m^2 ($12m^2$ + 5 habitat)-TB and FJB
Commercial logging by FPC
No further treatment
Note- all of the surrounding area will be treated to this prescription b FPC

PLOT 4 Mark to retain 12 m^2 to a water prescription retaining the larger, habitat trees- KB and FEB
Commercial logging by FPC
Cut down all surplus trees, crown the log and remove from site, by FPC contractor

PLOT 5 Mark to retain 15 m^2 ($12m^2$ + 5 habitat)- TB and FJB
Commercial logging by FPC
Cut down all surplus trees, by FPC contractor, and leave these on sit

PLOT 6 Mark to retain 8 m^2 to a water prescription retaining the larger, habit trees- KB and Feb
Commercial logging by FPC
Cut down all surplus trees by FPC contractor and leave on site

PLOT 7 CONTROL, NO LOGGING

PLOT 8 Mark to retain 15 m^2 ($12m^2$ + 5 habitat)- TB and FJB
Commercial logging by FPC
DEC to notch all surplus trees and leave on site

General notes

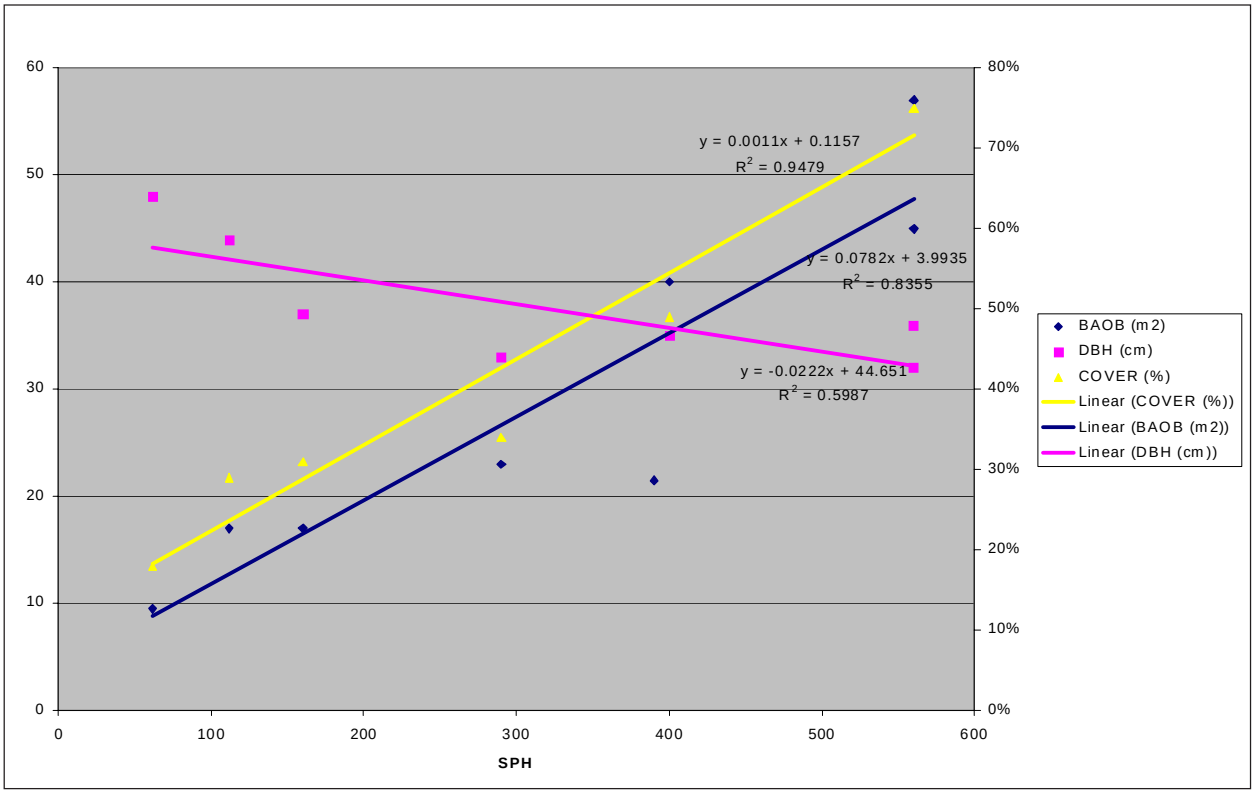
- Each plot is 100m x 100m, one hectare in size, with star pickets at corners and droppers at 50m
- Water Corporation to come to an arrangement with contractor/FPC regarding payment for additional work on four plots (4 hectares)
- Department of Environment and Conservation (DEC) to notch plot 8 in autumn 2007
- Mark boundaries of control plots 1 and 7 with crosses - FB and KB
- A spring burn by DEC in 2007 is desirable
- DEC to control regrowth and coppice from stumps in autumn 2008 (by notching or foliar spray)
- Establish signs and self-guiding walktrails - Water Corporation, in consultation with DEC and FPC
- Water Corporation to enlarge existing carpark in consultation with Main Roads and Shire
- In marking and during logging, retain/ protect good specimens of understorey species such as balga, persoonia, banksia etc, as required in DEC's current prescription
- No landings within trial area
- Contractor is responsible for ensuring crop tree protection by minimising snigging damage and by removing any logs or crowns adjacent to the butts of retained trees
- Existing ground habitat logs to be retained on site
- Contractor to remove all materials to nearest landing for sorting into product classes and possible sale eg firewood.

Summary for Native Forest Demonstration Plots

PLOT No	NOMINAL PRESCRIPTION	BAOB (CROP +HABITAT + CULLS) m2				DBH cm	COVER %	SPH No
7	CONTROL	57				36	75	560
1	CONTROL	45				32	75	560
3	15m^2 no culling	40	18	6	16	35	49	400
2	15 m^2 culls removed	23	16	6	1	33	34	290
8	15 m^2 culls notched	21.5	11.5	8.5	1	NA	NA	390
5	15 m^2 culls felled	17	12.5	4.5	0	37	31	160
4	12 m^2 culls removed	17	12.5	3.5	1	44	29	112
6	9 m^2 culls felled	9.5	6	3.5	0	48	18	62

General comments

- Treemarking by FPC for plots 2,3,5 and 8 and by consultants for plots 4 and 6. All follow-up works by DEC staff
- Plots measured by R Boykett and F Batini. There are four prism plots (BA factor =2) in each one-hectare plot
- Each plot is located in the centre of each 0.25 ha quadrat and is marked with a small wooden peg
- Each tree is recorded by species and class type (crop, habitat or cull)
- Trees are predominantly jarrah, with few marri, Allocasuarina and Persoonia
- Sph are calculated by counting all live stems within 8 metres and multiplying by 50
- Leaf cover is estimated by spherical densitometer, two in each sub-plot, N and S
- Top height was measured as 26 m and co-dominant height as 22 m
- 16 sample points taken from four plots indicated an average of 37 old, large stumps and 150 recent stumps on each hectare.
- FPC target basal areas were 10 m^2 of crop tree and 5 habitat trees/ha (about 2 to 3 m^2) ie should have been 12 to 13 m^2/ha
- FPC treemarked plots averaged 20 m^2, of which 14 m2 were retained as crop trees and 6m^2 as habitat trees, both higher than desirable.
- As stem numbers increase:
  - basal area also increases
  - crown cover also increases, and
  - average diameter decreases.



Control Plot 7 SW

Control (NW) Plot 1

FPC (NW) Plot 3

FPC + fell/remove Plot 2 (NE)

WCorp 12m² (NE) Plot 4

WC 8½ m² (SE) Plot 6

FPC + notch (SE) Plot 8

FPC + fell/leave (SW) Plot 5

Post 1988 Rehabilitation — layout and prescriptions

LAYOUT

PLOT 1	PLOT 2	PLOT 3
PLOT 4	PLOT 5	PLOT 6

WEST……JARRAHDALE ROAD……EAST

Each plot is one-half a hectare in size, about 71 by 71 m, with star pickets painted orange at the corners. (The rehabilitation is dense and some additional flagging along the plot boundaries will be necessary.)

PRESCRIPTIONS

ALL PLOTS- TREE SELECTION

Stands will be treemarked prior to thinning by a DEC officer using the following criteria:

- Preference for retention – dominant and co-dominant trees with good form and a long bole capable of extension (avoid trees with low forks)
- Have regard to spacing at least at the level of 150 spha (8 x 8 m)
- Give preference to jarrah crop trees but 20-30% of the retained trees to be marri or blackbutt where it exists
- Retain a minimum of 20% of crop trees as jarrah where it exists
- It may be necessary to retain some sub-dominant jarrah to meet the above criteria
- Do not retain trees of exotic species, should they occur
- Check density of treemarked trees using tessellated triangle plots.

PLOT 1
Treemark to retain 350 sph. Notch the surplus trees with herbicide at the recommended rate in autumn 2007. Where a surplus tree is within one metre of a retained tree, fall the surplus tree but don't paint the stump. Assess the need for regrowth control after six and twelve months and if needed control this regrowth with foliar spray or by notching.

PLOT 2
Treemark to retain 600 sph. Fall surplus trees with chainsaw and immediately paint the stump with herbicide at recommended rates in March-April 2007. Where a surplus tree is within one metre of a retained tree, fall the surplus tree but don't paint the stump. Leave all material on-site. Assess the need for regrowth control after six and twelve months and if needed control this regrowth with foliar spray or by notching.

PLOT 3 CONTROL, LEAVE UNTREATED

PLOT 4 CONTROL , LEAVE UNTREATED
(Note: about 0.1 ha of this plot in the SW corner falls within native forest, not rehabilitation).

PLOT 5
Treemark to retain 600 sph. Notch the surplus trees with herbicide at the recommended rate in autumn 2007. Where a surplus tree is within one metre of a retained tree, fall the surplus tree but don't paint the stump. Assess the need for regrowth control after six and twelve months and if needed control this regrowth with foliar spray or by notching.

PLOT 6
Treemark to retain 600 sph. Fall surplus trees with chainsaw and immediately paint the stump with herbicide at recommended rates in March-April 2007. Where a surplus tree is within one metre of a retained tree, fall the surplus tree but don't paint the stump. Crown the log at a top end diameter of 10 cm and remove the logs offsite with suitable equipment to an approved area where it may then be used for firewood if approved by DEC, assess the need for regrowth control after six and twelve months and if needed control this regrowth with foliar spray or by notching.

ALL PLOTS

Carry out crop tree protection by removing any logs or stems > 10 cm from within one metre of the butt of a retained stem.

All plots have been advance burnt in spring 2006.

Assess the need to prescribe burn the plots to remove slash, in spring 2007 or 2008- DEC

All field work to be carried out by DEC crews

Establish signs and self-guiding walktrails- Water Corporation

Water Corporation to arrange for the construction of a safe carpark, in consultation with main roads and the shire.
(probably the better option is for DEC to widen the existing track on the southern boundary, developing this as a one-way access from west to east).

Plots will be assessed using the proposed monitoring procedures, currently being reviewed by Dr Rayner, following thinning.

Summary for Post 1988 Demonstration Plots

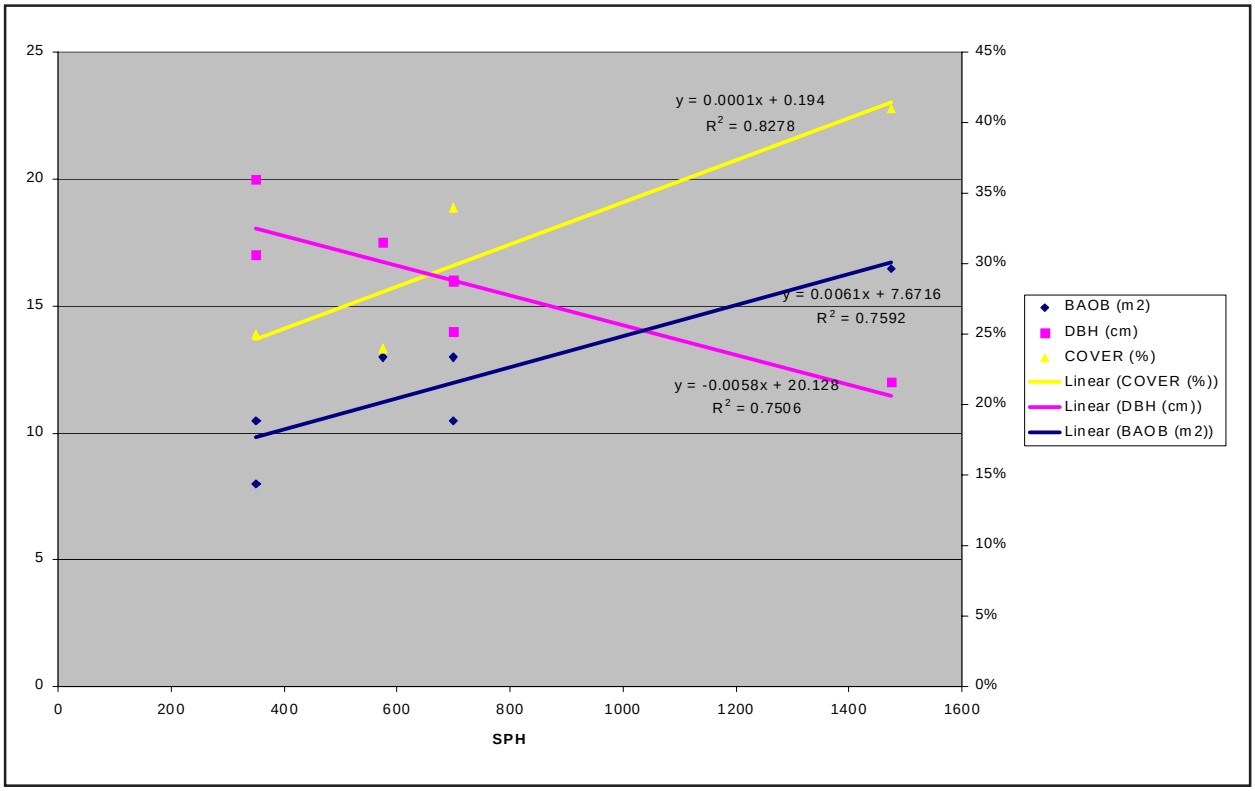
PLOT No	NOMINAL PRESCRIPTION	BAOB m^2	DBH cm	COVER %	SPH No	HEIGHT m
3	CONTROL	16.5	12	41	1475	14.5, 11
5	600 notch	10.5	14	NA	700	14, 11
2	600 felled	13	16	34	700	13.5,11
6	600 felled	13	17.5	24	575	14,11
4	350 felled	10.5	20	25	350	13,11
1	350 notch	8	17	NA	350	14,11.5

General comments

- Both top height and codominant height were measured and are shown above
- There are two prism plots (BA factor=1) in each 0.5 ha plot
- The first plot is 30 m from the SW corner and the second is 70 m from the corner
- The exception is plot No 4 where the starting point is the SE corner
- Each plot centre is marked with a small wooden peg
- Photos are taken from the SW corner, except for plot 4 (SE)
- Trees are predominantly jarrah, few marri and blackbutt
- Notching efficiency is high, >90%
- Very few treated stumps are coppicing
- There is minimal flashback, <2%
- Bark on a few stems was damaged during log extraction
- Some fire damage occurred during advance burn in plots 2 and 3
- Leaf cover in plots 1 and 5 needs to be assessed once dead leaves have fallen
- Germination of both eucalypts and understorey species is now occurring
- The form of eucalypts is poor with a lot of forking and short bole lengths.
- Thinning improves the average bole length (73% of trees in plots thinned to 350 sph have a bole > 4 metres as against 60% at 650 sph and 55% in the control). However, one-third of the retained trees, about 150 sph have a bole length >6 metres
- As stem numbers increase:
  - basal area increases
  - crown cover increases
  - average diameter decreases, and
  - co-dominant height and top height remain unchanged

These relationships are as expected.

Graphs have been prepared and regressions calculated by M Loh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R2 = 0.8278
y = 0.0061x + 7.6716
R2 = 0.7592
y = -0.0058x + 20.128
R2 = 0.7506
BAOB (m2)
DBH (cm)
COVER (%)
Linear (COVER (%))
Linear (DBH (cm))
Linear (BAOB (m2))
SPH
0
200
400
600
800
1000
1200
1400
1600
0
5
10
15
20
25
0%
5%
10%
15%
20%
25%
30%
35%
40%
45%

Plot 6 thinned to 600 sph taken from SW corner

Plot 3 control

Plot 5 notched to 600 sph

Plot 2 thinned to 600 sph from SW corner

Plot 2 fire damage

Plot 4 thinned to 350 (SE)

Plot 4 from SE corner

Plot 1 notched to 350 sph(s

(no vertical photo)

Further work required

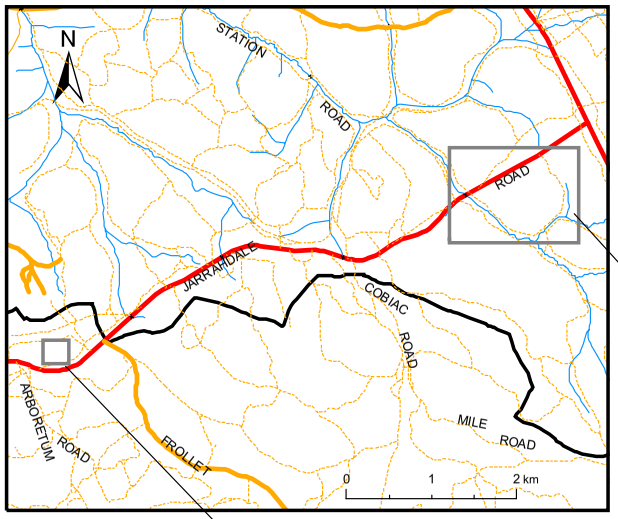
The following actions are still required before the demonstration plots can be regarded as having been completed and available for access by the public. The actions will also show who is responsible and an indicative timeline for completion.

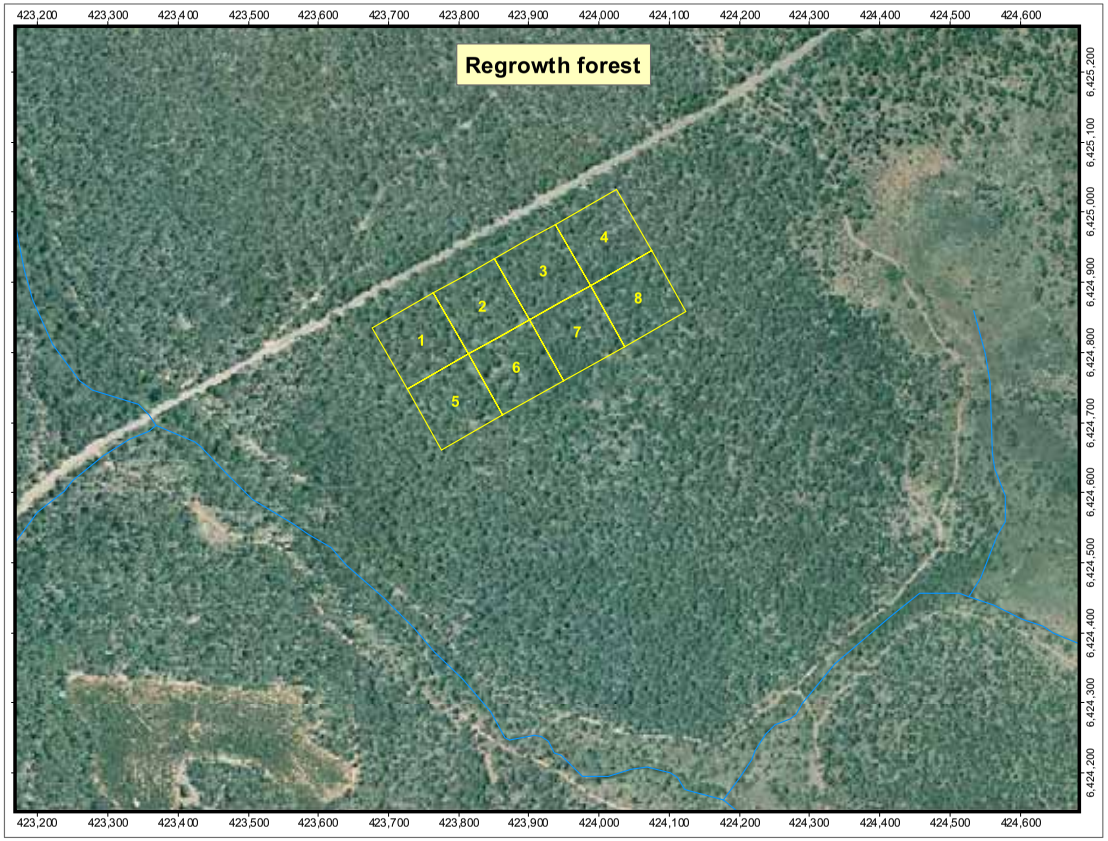
Action Required	Action By	Due date	Done
Silvicultural Work Required			
Plot 3 in demonstration area number 2 needs to be notched	DEC (Perth Hills District)	Nov 2007	
Plot 8 in demonstration area number 1 requires additional notching treatment	DEC (PHD)	March 2008	
Post 1988 rehabilitated plots numbers 2 and 5 have a higher retention than prescribed. An additional 50 stems will need to be treated in each plot	DEC (PHD)	March 2008	
All native forest plots have not achieved the required prescription, as too many habitat trees and crop trees have been retained. Further commercial logging of these plots will be necessary during summer 2007/2008. Check treemarking Log	FEB and FJB FEB in liaison with FPC and contractor.	Summer 2008	
Monitoring and Audit Activities			
Plots 1 to 3 in demonstration area number 2 need to be measured and photos taken	FEB and RB	March 2008	
Plots 1 and 5 in post 1988 demonstration area 3 need to be remeasured and photos taken	FEB and RB	March 2008	
All plots in demonstration area 1 to be remeasured and photographs taken.	FEB and RB	March 2008	
Design and Construction			
Carpark design and entry to be designed	DEC (LURP)	Jan 08	
Design and location requires confirmation and siting by engineer – traffic management specialist	DEC and W/Corp	Jan 08	
Shire S-J approval to proceed	W/Corp and Shire	Feb 2008	
Notification sent to SWLSC	W/Corp	Feb 2008	
DEC approval for disturbance operations	W/Corp & DEC	March 2008	
Two car parks need to be constructed before wet weather	W/Corp/DEC assistance	March 2008	
Two walking trails need to be designed and constructed	DEC	June 2008	
Suitable interpretive materials and signs need to be prepared	W/Corp and DEC	April 2008	
Interpretative information to be installed	DEC	June 2008	

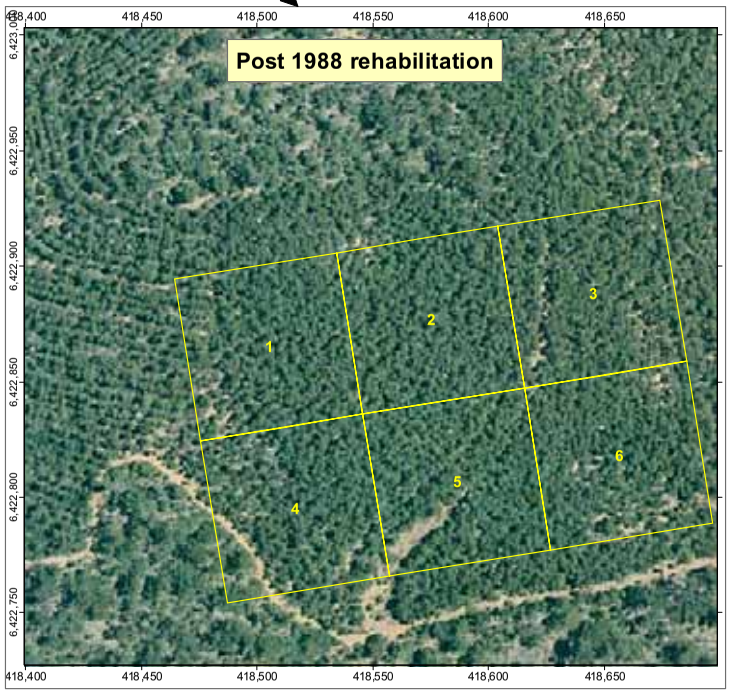
Demo Area 1 – native commercial
Demo Area 2 – native non-commercial
Demo Area 3 – post-88 rehabilitation

Frank Batini
26-11-2007

Overview - Demonstration sites







Proposed demonstration sites