

# 2022

## VEGETATION SURVEY

Thornton/Harris property Manjimup



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## Summary

Clearing permit: To be allocated

Permit applicant: Jamie Thornton, Amanda Harris

Permit duration: To be determined

Location: Lot 10900 Lady Croft Road, Glenoran. 44.5 hectares

Clearing area: 14 ha with additional 17.9 ha parkland cleared

The land is within the Manjimup Shire and is zoned as priority agriculture.

This survey is to support the application for the clearing of a portion of Thornton's farm property described above. Previous owners of this property have applied various land use activities which include tree harvesting for timber and fencing materials and grazing with cattle. These activities have impacted on the forest leaving it highly modified.

## Desk top survey

Mapping of the various units was under taken;

Cleared paddock was 8.0 ha in area

Marri stand on the north west corner 9.8 ha

Karri regen marked for clearing (parkland) 11.3 ha

Exclusion area, lower slopes and creek line 15.3 ha

## 1.0 Introduction

Karri forest occurs in the Warren biogeographic region and is a tall open forest type dominated by Karri (*Eucalyptus diversicolor*), with approximately 35 per cent of the forest occurring as pure karri and the remainder occurring mixed with marri (*Corymbia calophylla*) and to a lesser extent with jarrah (*Eucalyptus. marginata*) (Bradshaw 2015). Karri forest occurs where the long-term median rainfall exceeds 1000mm per annum and the summer evaporation is less than 500mm (Gentilli 1989). Karri occurs on the red earths (commonly referred to as karri loams) in the deeply incised valleys of the Donnelly River and its tributaries. Mixtures of karri/marri occur on the podsollic soils of the mid-slopes, giving way to jarrah on the lateritic gravels of the uplands (Bradshaw 2015). Biological diversity is managed by taking into account maintenance of landscape heterogeneity, maintenance of connectivity, retaining key structures as legacy elements, regeneration and compositional diversity (Forest Products commission 2020). A thick understorey of shrubs and herbs germinates within 1-2 years of harvest or fire, climbing plants quickly establish, and a mid-storey of large shrubs and small trees develop over time (Christensen 1992). The karri forest is not particularly flora rich and there are few endemic and no rare flora confined to the karri forest itself (Bradshaw 2015). The Mediterranean climate of hot dry summers and cool moist winters makes the karri forest

vulnerable to fire and left unburnt, the karri forest will accumulate up to 60 tonnes of flammable litter per ha after 60 years (McCaw et al. 2002).

The jarrah-marri forest occurs uniformly on lateritic soils throughout the south-west where annual rainfall ranges from 700mm to 1100mm. The sclerophyllous understorey vegetation superficially appears uniform, but in reality, it is a complex multi-dimensional continuum of species responding to a number of environmental variables. The jarrah forest has been mapped according to vegetation associations (Mattiske and Havel 1998, 2000, Beard *et al.* 2013). The climate of the South West of Australia, with hot dry summers and cool moist winters make this a very fire prone environment and fires occur in most vegetation systems. Species richness and species diversity have been observed to increase following fire, peaking at 3-5 years post fire (Bell and Koch 1980). Peet (1971) concluded that mild intensity fires promoted a richer ground flora whereas, high intensity fires resulted in a predominance of leguminous fire weeds, *Bossiaea aquifolium*, *Acacia browniana*, *Acacia pulchella*. Vegetation complexes of the jarrah forest are considered to be relatively stable and resilient to natural disturbances such as fire. In most circumstances, and in time, species that were present before disturbance are generally present after the event, although abundances may temporarily change.

### 1.1 Site inspection

A site inspection was undertaken on 24<sup>th</sup> November 2021. The northern half of the block was mostly upland and contained mixed marri and jarrah forest, which has been highly modified by harvesting. The southern half of the property slopes away to the South east and forms part of the Donnelly River valley. This area is dominated by karri regeneration. Harvesting of the property may have occurred in sections from 30 to 50 years ago and for the northern portion, the regeneration has produced an almost pure marri stand, with a very occasional karri, but no jarrah evident. The north east quarter of the property has been previously cleared and was planted with a crop of barley, by the previous owners. A thin strip of trees along the eastern boundary and along the road reserve on the northern edge are remnant parts of the original forest and should be retained. These remnant pieces indicate the type and quality of the original forest and provides a sink of ecological diversity. Old logs laying through out had some charring and appears that fire may have followed the harvesting. Very heavy litter and trash on the forest floor indicates a long absence of fire and suggests that there has probably been no further fire since the tops disposal burn post logging. The trees were widely spaced and ground flora was sparse and clumped. This is also indicative of a long absence of fire.

### 1.2 Purpose of the survey

The survey was under taken to satisfy the conditions of the clearing permit CPS (to be allocated) and to ensure that there are no threatened or priority species within the proposed clearing site. Associated with the vegetation survey was an assessment of habitat suitable for black cockatoos. The application to clear is under section 51E of the *Environmental Protection Act 1986*. A survey of the 45.5159 ha of lot 10900 was undertaken on 24<sup>th</sup> and 25<sup>th</sup> November 2021.

## 2.0 Method

### 2.1 vegetation transects

Targeted transects were used to locate and identify all plant species. (See species list Appendix 1). Two north south transects (lines 1 and 2) were placed in the marri regenerated stand and five east west lines through the karri stand (Figure 1). A coordinate was taken at the beginning and end of each line with a GPS unit. A compass was used to track along the transect. All species were recorded along the transect and any species that couldn't be identified were sampled and taken back to the laboratory. The unknown species were keyed using taxonomic keys. Taxonomy of all species was checked using Florabase to ensure all names and families were current (DPAW 2021).

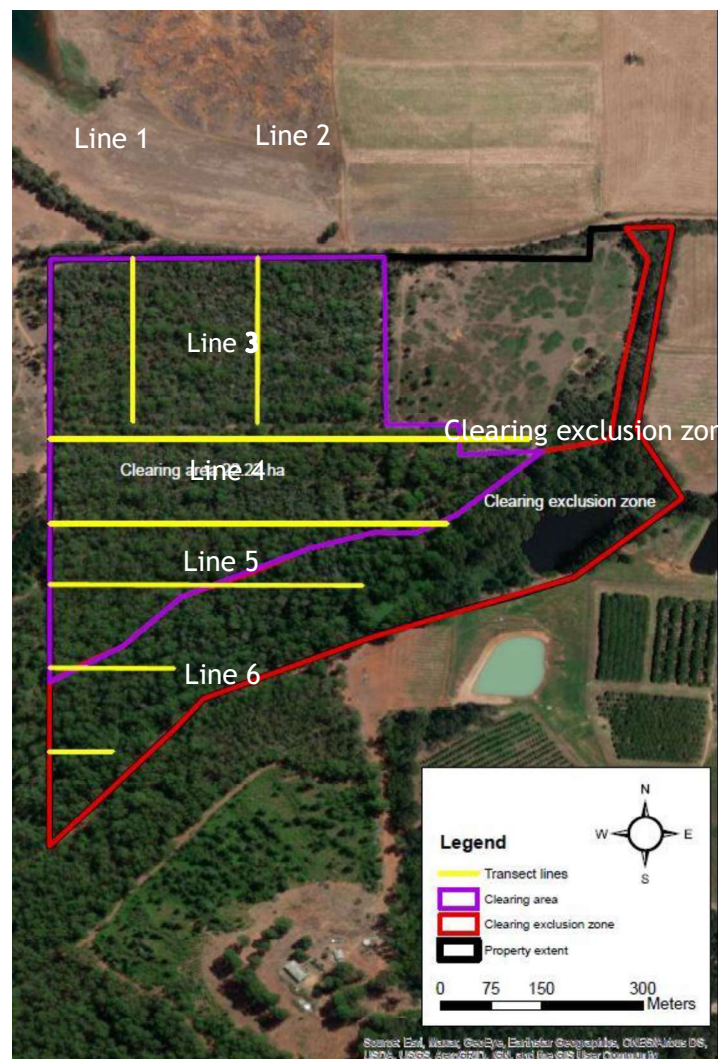


Figure 1 Map of the Thornton property in 2021, showing location of assessment lines and proposed exclusion areas from clearing



The coordinates for the ends of the assessment lines are as follows

		Latitude	Longitude
Line 1	North end	34°12'07" S	115°57'17" E
Line 1	South end	34°12'14" S	115°57'17" E
Line 2	North end	34°12'07" S	115°57'23" E
Line 2	South end	34°12'07" S	115°57'23" E
Line 3	West end	34°12'16" S	115°57'13" E
Line 3	East end	34°12'07" S	115°57'36" E
Line 4	West end	34°12'20" S	115°57'12" E
Line 4	East end	34°12'20" S	115°57'32" E
Line 5	West end	34°12'23" S	115°57'12" E
Line 5	East end	34°12'23" S	115°57'28" E
Line 6	West end	34°12'27" S	115°57'12" E
Line 6	East end	34°12'27" S	115°57'12" E
Line 7	West end	34°12'31" S	115°57'11" E
Line 7	East end	34°12'31" S	115°57'16" E

## 2.2 Opportunistic sampling

Opportunistic sampling, although a more informal way of collecting species data was used to ensure that all species were represented. Areas between assessment lines was targeted and any additional flora species that were located by the opportunistic search were added to the species list.

## 2.3 Cockatoo habitat

As part of the flora survey an assessment of the trees that would form potential cockatoo habitat were assessed. The criteria used, was that trees must exceed 32 500 mm in diameter and contain hollows suitable for cockatoo habitat.

## 3.0 Results

### 3.1 Flora survey

A total of 72 species were recorded representing 33 families, which included 19 weed species. The most common species in the marri site was *Tremandra stelligera*, which tended to be clumped. Whereas the karri site was dominated by hazel (*Trymalium odoratissimum*), which had a high proportion of dead plants. This occurs with a long absence of fire and as a self-thinning process. The high number of weeds (19) is about 7 to 8 times higher than an undisturbed forest (Ward 2011).

The flora species were found to be made up of 47% of plants that rely on seed for regeneration and 53% that resprout from underground organs (Table 1). These proportions are within the range of normal plant communities, which may vary according to its successional stage.

Table 1 Regeneration strategy of plants species detected with a flora survey at Thornton's property, November 2021.

Regeneration strategy	Number of species
Soil stored seed	28
Seed stored on plant (serotinous)	6
No seed on site	0
From epicormics	0
woody rootstock/lignotuber	20
Fleshy underground organ (bulb, rhizome)	18

When plant species were examined by life form categories, small and large woody shrubs form the majority of the species assemblage (43%). Herbs accounted for about 25%, while grasses added a further 11%. The plants fell into one of ten life form categories (Table 2). Geophytes were under represented (4%), which is about one third of the number when compared with other jarrah sites.

Table 2 Plants organised by life form categories for Thornton's property November 2021.

Life form	Number of species
Shrub (> 30 cm tall)	20
Dwarf shrub (< 30 cm tall)	11
Herb	18
Grass	8
Geophyte	3
Vine	3
Tree	5
Sedge	2
Fern	1
Cycad	1

The plant species were made up of mostly perennial plants (82%) and the remainder were annual species (18%), which is consistent with 5 other jarrah sites in the south west (Ward 2011). Although, many of the annual species were introduced exotic weeds.

Table 3 comparison of perennial and annual species from the flora survey of Thornton's property November 2021.

Life Style	Number of species
Perennial species	59
Annual species	13

### 3.2 Vegetation Condition

The assessment of the vegetation condition was determined from a condition scale (adapted from Keighery 1994 and Trudgen 1988). The Thornton property vegetation condition was rated at good to degraded. The jarrah/marri area has been converted to almost pure marri and the ground vegetation is

sparse and clumped. This is inconsistent with normal jarrah vegetation and is likely the result of past land use. The karri on the mid and upper slopes has been harvested in the past and now has widely spaced karri regen with a number of trees being epicormics off the old stumps. The ground flora appears consistent with karri vegetation but is highly senescent with many species missing. The steeper lower slopes appear to have been avoided and remained unharvested but is infested with blackberry.

### 3.3 Cockatoo habitat

The harvested areas in the jarrah/marri and the karri contain young trees ranging in age from 30 to 50 years and is unsuitable for cockatoo habitat. However, the unharvested lower slopes and creek line contain mature trees with the potential for tree hollows. This area has been excluded from the clearing area along with an unharvested strip on the eastern edge of the property. Since all potential cockatoo habitat is outside of the proposed clearing area, there is no need for a dedicated cockatoo survey.

## 4.0 Discussion

The vegetation survey of the Thornton property was prompted by an application to clear some sections of trees and vegetation and to ensure that there were no rare or priority plants involved. The survey revealed a low number of plant species (72), which is at odds with 48 harvested sites across the main biogeographical range of the jarrah forest. In each of the harvested sites plant species numbers were in the range of 150 to 200 plant species (Ward 2011). At the Thornton property where there was a mix of Jarrah and Karri sites, we expected there to be potentially more species than for jarrah alone. However, combined we found less than half the species expected for just a jarrah site. One explanation which would explain some reduction is that the vegetation is in the late stage of succession and many of the short-lived plant species have died and exist only as propagules.

The karri site had a layer of deep litter and trash, which had built up on the forest floor burying many other plants. The litter layer was covering small logs up to 100 mm in diameter and the trash made up of twigs and small branches were elevated forming a tangled mass, difficult to walk through. McCaw (2002) stated that the karri forest may accumulate up to 60 tonnes of flammable litter per ha after 60 years. Fuel measurement was not undertaken at this site, but is consistent with a long absence of fire. Even in the Jarrah/marri site litter was quite deep and may explain the clumped nature of the vegetation.

The low number of plant species at Thornton's property may also be the result of previous activities perhaps harvesting and grazing. Kikoti (2015) in montane forests in Tanzania showed that heavy grazing in forested areas had a negative effect on species diversity. Similarly, Pettit et al (1997) found in jarrah forest that species richness and diversity was significantly reduced at sites exposed to heavy grazing by livestock.



The modification of the forest stands and the loss of vegetation species produced a vegetation condition rating of good, ranging to degraded.

## Conclusion

- The vegetation on the condition scale was rated as good ranging to degraded.
- Previous harvesting has modified the stand structure converting jarrah/marri forest to almost pure marri. The karri had widely spaced regeneration with many coppiced stumps.
- There were no rare and endangered or priority species detected by the survey  
The vegetation was highly senescent and the plant community was well advanced in successional stages.

## Recommendations

- The steeper lower slope and creek system be excluded from clearing. This area contains many mature trees and may be suitable cockatoo habitat. The riparian strip forms an important barrier to erosion and provides habitat for water rat, bandicoot, and quokka
- The remnant strip of jarrah/marri along the eastern boundary be retained and excluded from clearing. This remnant piece of forest provides an important sink of ecological diversity for the area.
- Control the infestations of blackberry which have established in the creek system and are spreading up slope.

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## Appendix 1 Species list organised by family

* Alien	SpCode	Current Species Name	Family	Lifeform	LifeStyle	Fire Resp
	DAUGLO	<i>Daucus glochidiatus</i>	<u>Apiaceae</u>	H	A	A1
	LOMINT	<i>Lomandra integra</i>	Asparagaceae	DS	P	B3
	LOMPAU	<i>Lomandra pauciflora</i>	Asparagaceae	DS	P	B2
*	ERIBON	<i>Erigeron bonariensis</i>	<u>Asteraceae</u>	S	A	A1
*	HYPGLA	<i>Hypochaeris glabra</i>	<u>Asteraceae</u>	H	P	B3
*	SONOLE	<i>Sonchus oleraceus</i>	<u>Asteraceae</u>	H	A	B3
*	CARTEN	<i>Carduus tenuiflorus</i>	<u>Asteraceae</u>	H	A	B3
*	PSE	<i>Pseudognaphalium</i>	<u>Asteraceae</u>	H	A	B3
	LAGHUE	<i>Lagenophora huegelii</i>	Asteraceae	GP	P	B3
*	CENERY	<i>Centaurium erythraea</i>	<u>Gentianaceae</u>	H	A	A1
	LEPLEP	<i>Lepidosperma leptostachyum</i>	Cyperaceae	Z	P	B3

NETCAP	<i>Netrostylis capillaris</i>	Cyperaceae	Z	P	B3
PTEESC	<i>Pteridium esculentum</i>	Dennstaedtiaceae	F	P	B2
HIBAMP	<i>Hibbertia amplexicaulis</i>	Dilleniaceae	S	P	B2
HIBMON	<i>Hibbertia montana</i>	Dilleniaceae	S	P	B2
TRESTE	<i>Tremandra stelligera</i>	Elaeocarpaceae	S	P	B3
LEUCAP	<i>Leucopogon capitellatus</i>	Ericaceae	S	P	B2
LEUPRO	<i>Leucopogon propinquus</i>	Ericaceae	S	P	B2
LEUVER	<i>Leucopogon verticillatus</i>	Ericaceae	S	P	B2
AMPSIM	<i>Amperea simulans</i>	Euphorbiaceae	DS	P	B2
ACAURO	<i>Acacia urophylla</i>	Fabaceae	S	P	A1
BOSAQU	<i>Bossiaea aquifolium</i>	Fabaceae	S	P	A1
BOSLIN	<i>Bossiaea linophylla</i>	Fabaceae	S	P	A1
LOTSUB	<i>Lotus subbiflorus</i>	Fabaceae	H	A	A1
CALLAN	<i>Callistachys lanceolata</i>	Fabaceae	S	P	A1
CHO SP	<i>Chorizema</i> sp.	Fabaceae	S	P	A1
CHONAN	<i>Chorizema nanum</i>	Fabaceae	DS	P	A1
HARCOM	<i>Hardenbergia comptoniana</i>	Fabaceae	V	P	B2
HOVELL	<i>Hovea elliptica</i>	Fabaceae	S	P	B2
KENCOC	<i>Kennedia coccinea</i>	Fabaceae	V	P	A1
* TRICAM	<i>Trifolium campestre</i>	Fabaceae	H	P	A1
DAMLIN	<i>Dampiera linearis</i>	Goodeniaceae	H	P	A1
DAMHED	<i>Dampiera hederacea</i>	Goodeniaceae	S	P	A1
GOOEAT	<i>Goodenia eatoniana</i>	Goodeniaceae	DS	P	A1
SCAMIC	<i>Scaevola microphylla</i>	Goodeniaceae	DS	P	A1
SCASTR	<i>Scaevola striata</i>	Goodeniaceae	DS	A	A1
ANIFLA	<i>Anigozanthos flavidus</i>	<u>Haemodoraceae</u>	H	P	B3
AGRSCA	<i>Agrostocrinum scabrum</i>	<u>Haemodoraceae</u>	H	P	B3
PATUMB	<i>Patersonia umbrosa</i>	Iridaceae	DS	P	B3
* ROMROS	<i>Romulea rosea</i>	Iridaceae	GP	P	B3
* WATFUL	<i>Watsonia fulgens</i>	Iridaceae	GP	P	B3
CORCAL	<i>Corymbia calophylla</i>	Myrtaceae	T	P	A2
EUCDIV	<i>Eucalyptus diversicolor</i>	Myrtaceae	T	P	A2
EUCMAR	<i>Eucalyptus marginata</i>	Myrtaceae	T	P	A2
AMPAMP	<i>Amphipogon amphipogonoides</i>	<u>Poaceae</u>	GR	P	B2
* PINRAD	<i>Pinus radiata</i>	<u>Pinaceae</u>	T	P	A2

*	LYSARV	<i>Lysimachia arvensis</i>	Primulaceae	H	A	A1
	THECRI	<i>Thelymitra crinita</i>	<u>Orchidaceae</u>	H	P	B3
*	OXACOR	<i>Oxalis corniculata</i>	<u>Oxalidaceae</u>	H	P	B2
	PODDRO	<i>Podocarpus drouynianus</i>	Podocarpaceae	S	P	B2
*	AVEFAT	<i>Avena fatua</i>	Poaceae	GR	A	A1
*	AIRCUP	<i>Aira cupaniana</i>	Poaceae	GR	A	A1
	AMPAMP	<i>Amphipogon amphipogonoides</i>	Poaceae	DS	P	B2
*	BRIMAX	<i>Briza maxima</i>	Poaceae	GR	A	A1
*	BRIMIN	<i>BRIZA MINOR</i>	Poaceae	GR	A	A2
*	HOLLAN	<i>Holcus lanatus</i>	Poaceae	GR	P	A1
	TETLAE	<i>Tetrarrhena laevis</i>	Poaceae	GR	P	B3
	AUSFLA	<i>Austrostipa flavescens</i>	Poaceae	GR	P	B2
	BANGRA	<i>Banksia grandis</i>	Proteaceae	T	P	A2
	HAKAMP	<i>Hakea amplexicaulis</i>	Proteaceae	S	P	B2
	PERLON	<i>Persoonia longifolia</i>	Proteaceae	S	P	B2
	TRYODO	<i>Trymalium odoratissimum</i>	<u>Rhamnaceae</u>			
	CLEPUB	<i>Clematis pubescens</i>	Ranunculaceae	V	P	A1
*	ACAECH	<i>Acaena echinata</i>	<u>Rosaceae</u>	H	P	A1
	OPEHIS	<i>Opercularia hispidula</i>	Rubiaceae	S	P	B2
*	RUBFRU	<i>Rubus fruticosus</i>	<u>Rubus</u>	S	P	B2
	RANCOL	<i>Ranunculus colonorum</i>	Ranunculaceae	H	P	A1
	STYRHY	<i>Stylidium rhynchocarpum</i>	Stylidiaceae	DS	P	A1
	PIMCLA	<i>Pimelea clavata</i>	Thymelaeaceae	S	P	A1
	HYBDEB	<i>Hybanthus debilissimus</i>	Violaceae	DS	P	A1
	MACRIE	<i>Macrozamia riedlei</i>	Zamiaceae	CY	P	B3