FOREST ECOSYSTEMS MAPPING

FOR

THE WESTERN AUSTRALIAN RFA

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As an outcome of the report from the Panel of Independent Scientific Experts for Western Australia's Vegetation Mapping, Mr Jack Bradshaw and Dr Libby Mattiske were requested to develop a map of forest ecosystems based on further subdivisions of Forest Associations where it was considered appropriate to do so. The primary emphasis was on the further subdivision of the 'jarrah forest association'. The following report is a summary of the decision process behind this sub-division undertaken by Jack Bradshaw (Department of Conservation and Land Management) as principal author of the forest associations and Libby Mattiske (Mattiske Consulting Pty Ltd) as principal author of the Vegetation Complexes for the South West Forest Regional Assessment area.

The key elements used in informing the decision on an appropriate sub-division of the associations were the key species in the overstorey (jarrah, karri wandoo etc), the height of the overstorey, the canopy cover of the overstorey (forest versus woodland), and the understorey communities which are primarily determined by a combination of climate, soils and landforms. The weighting attributed to each varied according to their perceived significance. For example where soil becomes a dominant determinant (eg. extreme sites on sands or rocky outcrops) these have been split off to form separate ecosystems (eg. the vegetation of the sandy soils of the Wilga, Collie and Goonaping surfaces have been grouped together in the Jarrah - Sandy Basins).

The outcome of this holistic approach to the sub-division is a 'sub-regionalisation' which allows these factors to be incorporated into a generalised boundary within the forest association rather than to a specific vegetation boundary.

Table 1 and the map associated with this report provides a summary of the recommended forest ecosystems in the South West Regional Forest Agreement. These are based on the Forest Associations of the South West of Western Australia, incorporating the sub -division of the karri forest into the West coast, main belt and South Coast sub-regions (previously proposed) and the sub-regionalised jarrah forest described below. The vegetation components in four areas (Darling Scarp, Swan coastal plain, Dandaragan plateau and Western wheatbelt) have been grouped for the purposes of the RFA. With the exception of the Darling Scarp, these areas are only partially covered by the RFA which makes them unsuitable for analysis.

The summarised descriptions below, in terms of the overstorey, understorey, climate, soils and landforms illustrate the basis for the sub-regionalisation of the jarrah forest association . The descriptions relate to the ecosystem itself and the landscape or mosaic within which it occurs. This sub-regionalisation does not apply to the other associations within it. For familiarity, the names attributed to the ecosystems are based on the key overstorey species and geographic location.

A complete listing of Vegetation Complexes associated with each of the nominated Forest Ecosystems is being prepared as part of the Vegetation Mapping project by Mattiske Consulting Pty Ltd.

1. Jarrah forest - North West

Overstorey

- Jarrah/marri dominates the landscape both on the upper and lower slopes.
- Lower gullies are dominated by yarri (*Eucalyptus patens*), marri (*Corymbia calophylla*) and bullich (*Eucalyptus megacarpa*).
- Majority of jarrah is subspecies - *Eucalyptus marginata* subsp. *marginata.*
- Overstorey is generally >25m.

Understorey/Vegetation

- Understorey gradient reflects a continuum on moister upper lateritic slopes and deeper gravels.
- Middle storey better developed.
- Species in understorey reflecting the diversity of sites and underlying soils and topography (steep slopes).

Climate

- Medium to High Rainfall.
- Humid and Sub Humid Climate Zones.

Soils and Landforms

- Generally more dissected landscapes; lateritic uplands and loamy gravels on slopes.

2. Jarrah forest - North East

Overstorey

- Within a mosaic of jarrah and wandoo overstorey dominating the landscape, jarrah on upper slopes and wandoo on lower slopes; although in the extremes wandoo spreads further up the landscape and a mosaic of wandoo forest and woodland dominates.
- Majority of jarrah is subspecies - *Eucalyptus marginata* subsp. *thalassica.*
- Overstorey is 15-25 m tall.

Understorey/Vegetation

- Understorey gradient reflecting continuum on drier upper lateritic slopes.
- Middle storey generally lacking.
- Species in understorey reflecting mainly the drier conditions and less dissection.
- Wandoo, Shrublands and Heaths in valleys.

Climate

. Low to Medium Rainfall.
. Semi Arid and Arid Climatic Zones.
. Climate significant in vegetation.

Soils and Landforms

. Generally similar lateritic upper slopes, although less dissection (except for extreme breakaway slopes in north-east section of the area supporting Wandoo - Powder bark wandoo- *Eucalyptus wandoo* - *Eucalyptus accedens* and pockets of Rock Sheoak - *Allocasuarina huegeliana).*
. Valley systems broader and either higher clay content or sandier.

3. Jarrah forest - South

Overstorey

. Jarrah occurs as a mosaic with karri in humid areas. Jarrah dominates the lateritic ridges with increasing proportions of marri on slopes. Marri is a more prominent feature of the jarrah/marri mix than it is in the northern jarrah forest. The three tingle species occur as a further extreme in Hyper Humid area and are separated at the association level.
. Majority of jarrah is subspecies - *Eucalyptus marginata* subsp. *marginata*.
. Jarrah overstorey height varies from 15-30 m tall.

Understorey/Vegetation

. Understorey gradient reflecting continuum on moister upper lateritic slopes and deeper gravels to sandier broad flats.
. Middle storey well developed.
. Species in understorey reflecting the diversity of sites and underlying soils and topography.

Climate

. High rainfall, with a higher proportion of summer rainfall than the northern jarrah forest.
. Largely Per Humid and Hyper Humid Climate Zones.

Soils and Landforms

. Mosaic of more dissected landscapes and less dissected landscapes; lateritic uplands and broader sandy flats.

4. Jarrah forest - Sandy Basins

Overstorey

. A mosaic of jarrah and *Banksia* woodlands dominating the landscape with extensive broad wet flats supporting *Melaleuca preissiana*.
. Jarrah species varies in subspecies - *Eucalyptus marginata* subsp. *marginata* in Collie/Wilga areas and *Eucalyptus marginata* subsp. *thalassica* in Gunapin - Sullivan area.
. Overstorey lower in Height due to poorer leached sands.

Understorey/Vegetation

. Understorey gradient reflecting continuum from sandy-laterite upper slopes to broad sandy flats to seasonally moist to wet flats.

. Species in understorey reflecting the diversity of sites and underlying dominant sandy soils and low undulating topography. These areas are the sandy end of the soil continuum.

Climate

. Less of an influence due to the over-riding influence of the soils and landscape.

Soils and Landforms

. Generally very broad flatter areas in several local and wider basins.

. Soils main determining factor in resulting vegetation.

5. Jarrah forest - Blackwood Plateau

Overstorey

. A mosaic of jarrah and marri dominates the landscape with extensive broad flatter flats supporting stunted trees.

. Jarrah subspecies - *Eucalyptus marginata* subsp. *marginata.*

. Overstorey varies from 15-25 m tall.

Understorey/Vegetation

. Understorey gradient reflecting continuum from laterite upper slopes to broad sandy flats to seasonally moist to wet flats.

. Species in understorey reflecting the diversity of sites and underlying dominant sandy soils and low undulating topography.

. Understorey species reflect combination of soils and climate - *Podocarpus drouynianus, Xylomelum occidentale, Agonis parviceps* amongst others.

Climate

. Per Humid.

. Combination of climate and soils are significant in the pattern of understorey species.

Soils and Landforms

Variable, lateritic uplands to broader flat areas often over shallow soils. In extreme southern areas the soils are seasonally wet and shallow

6. Jarrah forest - Leeuwin Ridge

Overstorey

. Within a mosaic of jarrah forest, karri forest, shrublands, heaths and coastal complexes dominating landscape both on upper slopes and lower slopes.

. Overstorey varies from 15-25 m tall.

Understorey/Vegetation

. Understorey gradient mainly a reflection of soils and to a lesser extent the per humid and hyper humid climate zones.

. Species in understorey variable and reflecting the underlying limestone, loams and sands and the degree of exposure to the west coast and seasonal waterlogging. Vegetation on the extreme low lying moister sites still largely influenced by the length of seasonal waterlogging.

Climate

. Per Humid and Hyper Humid.

. In some more extreme sites the climate less of a controlling factor than soils.

Soils and Landforms

. Variable from limestone, exposed granite outcrops, loams and sands.

7. Jarrah forest - Unicup

Overstorey

. Within a mosaic of jarrah and wandoo woodlands dominating the landscape with extensive broad flat wet flats supporting stunted woodlands and in extreme wetland areas species of *Melaleuca.*

. In extreme broad flat valleys the Swamp Yate and *Eucalyptus rudis* dominate reflecting poorly drained soils (in some places these have turned saline).

. Overstorey varies from 10-20 m in height.

Understorey/Vegetation

. Understorey gradient reflecting continuum from sandy-laterite upper slopes to broad sandy and clay flats to seasonally moist to wet flats.

. Species in understorey reflecting the diversity of sites and underlying sandy, laterite and clay soils and low undulating topography.

Climate

. Semi Arid.

. Less of an influence due to the over-riding influence of the soils and landscape.

Soils and Landforms

. Generally very broad flatter areas, often poorly drained and subject to salinisation in some of the eastern valleys.

8. Jarrah forest - Mt Lindesay

Overstorey

. Within a mosaic of Jarrah forest on the upper slopes (although the jarrah is more stunted (generally <15 m) and in parts replaced by *Eucalyptus stoatei)*, *Banksia*'s on lower slopes, shrublands and heaths dominating flatter sandy landscapes and granites on extreme rocky sites on Mt Lindesay area.

. Overstorey generally low in height, trees more stunted due to drier conditions, sands or granite areas.

Understorey/Vegetation

. Understorey gradient reflecting mainly soils and to a lesser extent the humid and sub humid climate zones.

. Species in understorey variable and reflecting the underlying laterite, granites and sands and the degree of exposure to seasonal moister soils. Vegetation on the extreme low lying moister sites still largely influenced by the length of seasonal waterlogging.

Climate

. Humid and Sub Humid Climate in sharp gradient area.

. In some more extreme sites the climate less of a controlling factor than soils.

Soils and Landforms

. Variable from laterite to sands.

28. Darling Scarp vegetation

Overstorey

. A mosaic of jarrah forest, wandoo woodlands, *Allocasuarina huegeliana* woodlands, heaths and lithic complexes dominating landscape both on upper slopes and lower slopes. In southern Scarp areas *Corymbia haematoxylon* replaces marri as the co-dominance within the jarrah forest areas. The complexity and finer scale of the vegetation in this narrow zone is more appropriately considered as one ecosystem.

. Overstorey very variable in height, but generally lower in height.

Understorey/Vegetation

. Understorey gradient reflecting mainly depth to shallow outcrops and dolerite dykes (resulting in clays and wandoo .

. Middle storey well developed (co-dominance of *Banksia grandis, Allocasuarina fraseriana* and *Persoonia longifolia*) .

. Species in understorey reflecting the moister more humid conditions and more dissection in the landscape.

Climate

. Climate less of a controlling factor as shallow soils main determining factor (granites, dolerite dykes and laterite).

Soils and Landforms

. Shallow soils main determining factor (granites, dolerite dykes and laterite).

Table 1 . FOREST ECOSYSTEMS FOR APPLICATION OF JANIS CRITERIA IN REGIONAL FOREST AGREEMENT

1.	Jarrah forest	North West
2.	Jarrah forest	North East
3.	Jarrah forest	South
4.	Jarrah forest	Sandy Basins
5.	Jarrah forest	Blackwood Plateau
6.	Jarrah forest	Leeuwin Ridge
7.	Jarrah forest	Unicup
8.	Jarrah forest	Mt Lindesay
9.	Jarrah forest/Red Tingle	
10.	Jarrah forest/Yellow Tingle	
11.	Jarrah forest/Rates Tingle	
12.	Jarrah open woodland	
13.	Karri	West Coast
14.	Karri	Southern
15.	Karri	South Coast
16.	Karri/Red Tingle	
17.	Karri/Yellow Tingle	
18.	Karri/Rates Tingle	
19.	Wandoo forest	
20.	Wandoo open woodland	
21.	Bullich and Yate woodland	
22.	Peppermint and coastal heathland	
23.	Shrub, herb and segdelands	
24.	Swamps	
25.	Rocky Outcrops	
26.	Sand dunes	
27.	Darling Scarp vegetation	
28.	Swan Coastal Plain vegetation	
29.	Dandaragan Plateau vegetation	
30.	Western Wheatbelt vegetation	

The "forest ecosystems" described above are derived from:

Forest Associations of the South West - the basis of these associations is the dominant tree species and the major structural vegetation classes (Bradshaw *et al.* 1997)

Major associations (eg jarrah forest) are further subdivided according to dominant Vegetation Complexes (Mattiske *et al.* 1997)

For familiarity, the names attributed to the ecosystems are based on key tree species and geographic location.