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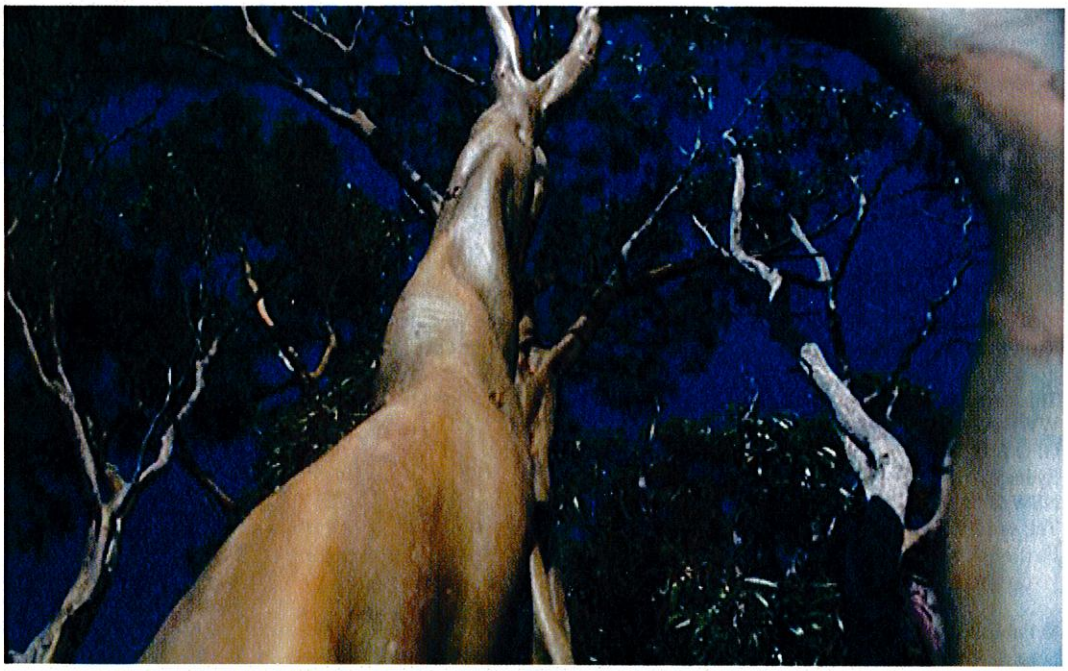

Woodland Watch Annual Flora Surveys 2000-2004

Floristic Results from Surveys of Private and Non-State Managed Woodlands in the Western Australian Wheatbelt

December 2005

This report was compiled and edited by WWF-Australia using the Woodland Watch Annual Flora Survey Reports written by: Rob Davis, Mike Hislop and Nicholas Lander (all of the CALM WA Herbarium, Perth, Western Australia).

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Woodland Watch Site 12 [2000]. WWF-Australia/Richard McLellan

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Acknowledgments

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The voluntary efforts of every participant contributed to the success of the first five years of WWF's Western Australian temperate woodland conservation initiative. A special thanks to this group of highly committed individuals.

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1.0 INTRODUCTION

1.1. Background

Woodland Watch is a eucalypt woodlands conservation project launched in 2000 by WWF-Australia, in collaboration with the WA Herbarium of the Department of Conservation and Land Management, and with funding assistance provided by the Australian Government's Natural Heritage Trust and Alcoa World Alumina Australia.

One of the major objectives of the project was to carry out floristic surveys of selected remnant tall eucalypt woodlands of the Avon Wheatbelt region – on private farmlands and other lands not within the conservation estate. The Avon Wheatbelt bioregion is situated in the South West Botanical Province of Western Australia, which roughly corresponds to one of WWF's priority Global 200 ecoregions - the Southwest Australia Ecoregion. The bioregion is predominantly located within the jurisdictions of the Avon Catchment Council and the Northern Agricultural Catchment Council NRM regions and it encompasses an area of 93,520 square kms, of which 93% has been cleared – predominantly for agriculture (Beard 1990).

All data generated by the Woodland Watch flora surveys are lodged on the CALM FloraBase website. For easy access to all Woodland Watch floristic data please visit: **http://florabase.calm.wa.gov.au/wwatch**

1.2. Project Description

Four woodland types considered by WWF-Australia and leading eucalypt botanists to be amongst the most threatened eucalypt woodland communities of the Avon Wheatbelt region were selected for targeted research and conservation: Salmon Gum *(Eucalyptus salmonophloia),* Gimlet *(E. salubris),* York Gum *(E. loxophleba)* and Red Morrel *(E. longicornis).*

The primary aims of the Woodland Watch project were to identify woodlands of high conservation value in the Avon Wheatbelt, to help landholders to better understand the major threats to these woodlands and their management needs, to assist private landowners and rural communities to better manage and conserve these remnant woodlands, and to add these targeted under-represented eucalypt woodlands to the conservation estate – primarily through voluntary conservation protection mechanisms. The conservation and management components of the project included consideration of degradation impacts such as soil compaction, and over-clearing and grazing, which have contributed to the secondary and more important problems of salinity and rising water tables.

1.3. Rationale

Conducting flora surveys in these woodland communities was considered an essential preliminary activity - to highlight their uniqueness and diversity, and to assess and report on their condition. Using this and other information, property owners could then be advised on how best to manage and protect their remnant vegetation through fencing and other management practices, and conservation support schemes such as covenants – the latter having the potential to provide long-term protection for the woodland. Thus, through Woodland Watch flora surveys, accompanying site assessments and site reports, it is possible to address some of the threats to the woodlands, including salinity. Future monitoring of the sites may provide data on the ability and rate at which these eucalypt woodlands can recover through improved management and protection.

The role of the WA Herbarium in this project was to survey, identify and voucher all plant specimens collected from selected woodland sites.

A total of 41 sites were surveyed in the first year (2000), followed by 21 sites in 2001, 25 sites in 2002, 25 sites in 2003, and 35 sites in 2004.

To date the annual spring Woodland Watch flora surveys have sampled 156 sites and collected over 6000 voucher specimens. (This figure includes an estimate for the voucher specimens collected during the 2005 flora surveys, which are not included in this summary report for years 2000 – 2004). At the end of the fifth year of the Woodland Watch surveys [2004] a total of 5,791 specimens had been vouchered through the Woodland Watch project).

Summary of Annual Survey Results

2000-2001

The woodlands surveyed in 2000 and 2001 were found to be largely comprised of species of the following plant families, arranged here in alphabetical order: Asteraceae, Amaranthaceae, Chenopodiaceae, Anthericaceae, Mimosaceae, Papilionaceae and Poaceae.

Although dominated by eucalypts, there are relatively few other species of Myrtaceae within these woodlands except for the genus *Melaleuca*. Even though melaleucas were relatively common, they were frequently located either on the periphery of these woodlands or in small pockets within, often near granite or by watercourses and in winter wet depressions. There were four common species of *Melaleuca* found in these woodlands: *Melaleuca adnata, M. coronicarpa, M. acuminata* and *M. uncinata*.

The family Proteaceae was also poorly represented in these woodland types. Four species from this family were common. Three, *Hakea recurva, H. preissii* and *Grevillea paniculata* were commonly found in association in *Eucalyptus loxophleba* woodlands. *Grevillea huegelii* was commonly found in *Eucalyptus salmonophloia* woodlands.

The most notable collections in 2000 and 2001 included:

- Eight (8) likely new taxa
- Seven (7) likely new populations of Rare and Priority taxa
- Five (5) significant range extensions

[For full details on these species, see Tables 1 – 4, Section 4 below]

2002

The woodlands surveyed in 2002 were found to be largely comprised of species in the following plant families (in alphabetical order) — Asteraceae, Chenopodiaceae, Mimosaceae, Papilionaceae and Poaceae. In contrast with the 2001 survey, few species in the Amaranthaceae and Anthericaceae were encountered.

Although dominated by eucalypts, there are relatively few species of Myrtaceae within these woodlands, except for the genus *Melaleuca*. Even though melaeucas were relatively common, like in the 2001 surveys, they were frequently located either on the periphery of these woodlands or in small pockets within, often near granite or by watercourses and in wet depressions. There were four common species of *Melaleuca* found in the woodlands visited in this survey, namely *Melaleuca acuminata, M. lanceolata, M. laterifolia* and *M. pauperiflora*.

As with sites surveyed in 2000 and 2001, Proteaceae was also poorly represented in these woodland types.

The most notable collections in 2002 included:

- Four (4) likely new taxa
- Seven (7) likely new populations of Rare and Priority taxa
- Three (3) significant range extensions

2003

The woodlands surveyed in 2003 were found to be largely comprised of species in the following plant families (in alphabetical order) — Asteraceae, Chenopodiaceae, Mimosaceae, Papilionaceae and Poaceae.

Although dominated by eucalypts, there are relatively few species of Myrtaceae within these woodlands, except for the genus *Melaleuca*. Even though melaleucas were relatively common, like in previous surveys, they were frequently located either on the periphery of these woodlands or in small pockets within, often near granite or by watercourses and in wet depressions.

As with sites surveyed in previous years, Proteaceae was also poorly represented in these woodland types.

The most notable collections in 2003 included:

- Seven (7) likely new populations of Rare and Priority taxa
- Fifteen (15) other collections of interest including significant range extensions

2004

The woodlands surveyed in 2004 were found to be largely comprised of species in the following plant families (in alphabetical order) — Asteraceae, Chenopodiaceae, Mimosaceae, Papilionaceae and Poaceae.

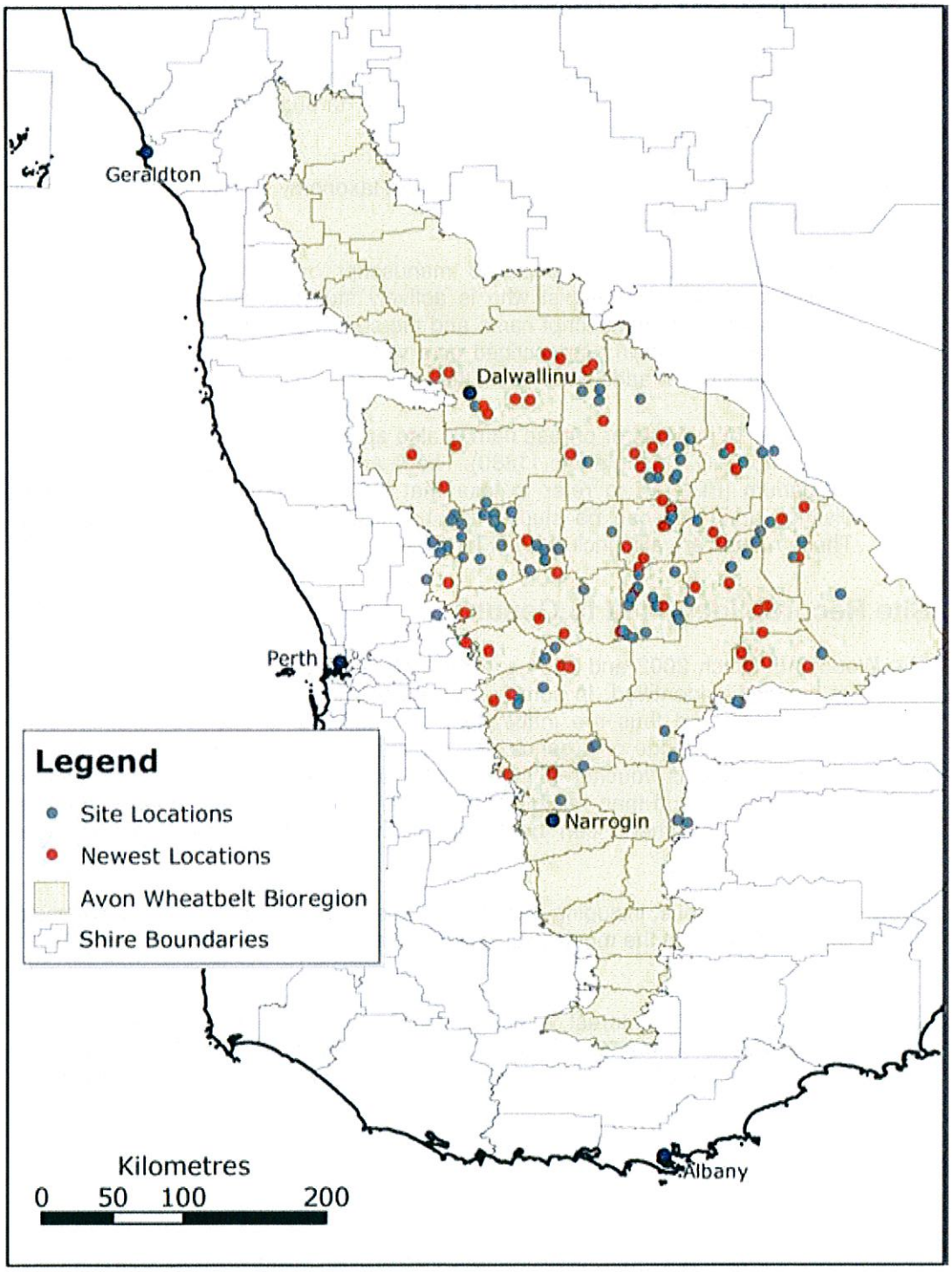
Although dominated by eucalypts, there are relatively few species of Myrtaceae within these woodlands, except for the genus *Melaleuca*. Even though melaleucas were relatively common, like in previous surveys, they were frequently located either on the periphery of these woodlands or in small pockets within, often near granite or by watercourses and in wet depressions. There were four common species of *Melaleuca* found in the woodlands visited in this survey, namely *Melaleuca acuminata*, *M. eleuterostachya*, *M. lanceolata* and *M. scalena*.

As with sites surveyed in previous years, Proteaceae was again poorly represented in these woodland types.

The most notable collections in 2004 included:

- Twelve (12) likely new taxa
- Ten (10) likely new populations of Rare and Priority taxa
- Seventeen (17) significant range extensions
- Twenty (20) other collections of significant interest.

3.0 Woodland Watch Survey Sites 2000-2004



4.0 Notes on Collections

- All specimen collections are data based and incorporated into the WA Herbarium (PERTH) and their details made available through the Herbarium's flora information system FloraBase.

- Specimens are updated according to current taxonomy so that up-to-date names are available for each specimen

- The format used cannot separate manuscript or unpublished names from published names. A botanist who is actively studying the particular genus or species assigns a manuscript name and the specimen is believed to represent a taxon that is unknown, undescribed or a variant. These names are included in FloraBase with the addition of "ms" after the name.

- A number of informal or phrase names also appear on these lists e.g. *Pterostylis* sp. inland (A.C. Beauglehole 11880). These are interim names, used by the WA Herbarium [PERTH] to refer to taxa that have been recognised as probably distinct, until they can be studied taxonomically and formal names published. These names are also included in FloraBase.

Site Records Identified to Genus

The Woodland Watch 2002 and 2004 surveys collected some voucher specimens that could not be readily identified. In some cases these are sterile (non-flowering or non-fruiting specimens) and thus are inadequate to determine to species level. In other cases, specialist knowledge of a genus was not available at the time of determination. Because the material is vouchered in the WA Herbarium collection, it may later be studied by specialists and then reliably named. The tentative name of these and other Woodland Watch specimens can be found at the CALM Florabase website (see References).

Some of these collections, including a number of possible new species, new locations of Priority taxa, and some of the more notable range extensions, are highlighted in Tables 1 – 4 below.

Many other collections of interest were also made during the 2000 - 2004 Woodland Watch flora surveys. Whilst the majority of these collections provided small range extensions, a number were more significant. These are represented in Table 4 below.

Table 1: Likely New Species

TAXON	SITE	YEAR	NOTE: NEW SPECIES
Bossiaea sp.	WW-38	2000	This has been confirmed as an undescribed species by Dr Jim Ross, Chief Botanist, Royal Botanic Gardens, Melbourne (2002, pers. comm.) Even though unnamed, it is not uncommon.
Bossiaea sp.	WW-17	2000	A possible new species
Austrostipa sp.	WW-39	2000	This possible new grass is characterised by its naked florets, found in two (2) separate collections made at this site. This character is found in species belonging to the south-eastern Australian subgenus *Tuberculatae,* which has never before been recorded in Western Australia. Indeed, this collection closely matches an eastern Australian species, *Austrostipa oligostachya.*
Eremophila sp.		2000	There were three (3) separate collections of this genus worthy of note, one (1) of which is a possibly undescribed species belonging to the *Eremophila glabra* complex.
Acacia cochlocarpa		2000	A specimen thought to be of this species closely matches one gathered from a similar area of the Avon region by the Prussian collector Ludwig Preiss in 1840, represented in the WA Herbarium only by a photograph.
Acacia sp.		2000	A new species closely related to *A. sclerophylla.*
Dampiera sp.		2000	An undescribed species found near Brookton.
Lepidosperma sp.		2000	See notes below concerning *Lepidosperma costale.*
***Stylidium* sp.**	WW-65	2002	This represents a new sub-species, namely *Stylidium coroniforme* subsp. *amblyphyllum,* a candidate for DRF status.
Eremophila* aff. *ionantha* x *scoparia	WW-82	2002	This is thought to represent a hybrid, or a new species
***Austrostipa* sp.**	WW-82	2002	This could possibly be a hybrid, or *A. elegantissima* or even a new species.
Synaphea aff. decorticans	WW-64	2002	This could possibly be a hybrid, or a new species.
Orchidaceae		2002	Andrew Brown (CALM), who identified all the orchids collected in this survey,

TAXON	SITE	YEAR	NOTE: NEW SPECIES
			reports that there are numerous unnamed taxa in the genera *Diuris* and *Pterostylis*.
Baeckea sp. Tampia Hill (J.C. Amway 327)	WW-137	2004	This is only the fourth collection of this unnamed taxon and the first found in thirty (30) years.
Calandrinia aff. corrigioloides	WW-114	2004	There appear to be two (2) more or less distinct inland variants of *C. corrigioloides*: one, with smooth seeds, that is at least similar to the common coastal form; and a variant (as here) with a different seed shape and a textured surface. This latter entity, of which there are very few collections, possibly warrants taxonomic recognition at some level.
Calandrinia sp. Blackberry (D.M.Porter 171)	WW-117 WW-118 WW-119 WW-120 WW-126 WW-135	2004	An informal phrase name currently used at the WA Herbarium to refer to a taxon that is probably unnamed but of uncertain status. It was referred to in the 2003 survey results as *C.* aff. *eremaea*. It differs from typical *C. eremaea* in its different seed character but is almost indistinguishable in general morphology.
Diuris aff. recurva	WW-120	2004	An unnamed species in the difficult *D. recurva* complex.
Lepidosperma sp. A2 Island Flat (G.J. Keighery 7000)	WW-139 WW-141	2004	This is an informal phrase name currently used at the WA Herbarium to refer to a taxon that is probably unnamed but of uncertain status.
Lepidosperma aff. costale	WW-143	2004	While clearly quite close to typical *L. costale* (also present at this site) the fact that this entity maintains a number of differences while growing in close proximity to that species strongly suggests that it should be regarded as a separate and distinct taxon. The co-occurrence of two potentially different but certainly closely related taxa at a particular locality, as here, is of great significance to taxonomists in their efforts to resolve problematic groups of species.
Leucopogon sp Yanneymooning (F.Mollemans 3797)	WW-127	2004	Collected from a decomposing granite breakaway. This collection represents only the fourth known locality (and most westerly) for this taxon.
Phyllanglum sp.	WW-133	2004	An interesting collection. Unlike *P. sulcatum*, which is quite widespread in the Wheatbelt, the lower stems here are tuberculate. There is also some

TAXON	SITE	YEAR	NOTE: NEW SPECIES
			indication that, although still immature here, the diagnostic seed character may be different. A fruiting collection taken in the second half of October should resolve the identity of this plant.
Stylidium coroniforme subsp. amblyphyllum	WW-141	2004	Currently listed as DRF. In the course of her revisionary studies towards a Flora of Australia treatment of *Stylidium*, Juliet Wege has decided that the southern populations of *S. coroniforme* are sufficiently distinct to warrant recognition at the infraspecific level. It will soon be referred to therefore as subsp. *amblyphyllum*. This taxon was first collected in 2002 near Quairading during an earlier Woodland Watch survey (2002) and this collection is only the second for the subspecies.
Trachymene sp. aff. cyanopetala	WW-114	2004	This is an anomalous collection with one mericarp typically hair and the other glabrous or with a few marginal hairs. The genus *Trachymene* was recently revised by Barbara L. Rye, but she has not seen any other collections that match this one. Possibly a hybrid between typical *T. cyanopetala* and the variant of *T. pilosa* also collected at this site.
Triglochin sp. B Flora of Australia	WW-114 WW-123 WW-126	2004	An informal phrase name currently used at the WA Herbarium to refer to a taxon that is probably unnamed but of uncertain status.
Triglochin sp. C Flora of Australia	WW-114	2004	An informal phrase name currently used at the WA Herbarium to refer to a taxon that is probably unnamed but of uncertain status.

Table 2: Likely New Populations of Rare & Priority Taxa

TAXON	SITE	YEAR	NOTE: RARE / PRIORITY SPECIES
Austrostipa exilis	WW-34	2000	New population of a Priority two (P2) taxon – representing a significant range extension. It has previously never been recorded in the Avon Wheatbelt region.
Acacia recurvata	WW-13	2000	Possible new population of a Declared Rare Flora (DRF) species at a disjunct location. The condition of the plant was poor, and this population requires further observation.
Gastrolobium callistachys	WW-29	2000	New population of a Priority Four (P4) taxon.
Acacia sclerophylla var. teretiuscula	WW-13	2000	New population of a Priority One (P1) taxon.
Biennospora phlegmatocarpa	WW-05	2000	New population of a Priority two (P2) taxon
Lechenaultia galactites		2000	New population of a Priority Three (P3) species.
Goodenia sp. Chiddarcooping		2000	Relocation and collection from the type locality of a species recommended for Priority listing (P1).
Austrostipa exilis	WW-75	2002	New population of a Priority two (P2) taxon
Austrostipa phaeocalyx	WW-65	2002	New population of a Priority 3 (P3) taxon.
Thysanotus tenuis	WW-70	2002	New population of a Priority 3 (P3) taxon.
Thysanotus tenuis	WW-67	2002	New population of a Priority 3 (P3) taxon.
Acacia ancistrophylla var. peracuata	WW-87	2002	New population of a Priority 3 (P3) taxon.
Acacia ancistrophylla var. peracuata	WW-85	2002	New population of a Priority 3 (P3) taxon.
Stylidium ? coroniforme	WW-70	2002	New population of a Declared Rare Flora (DRF), **possibly a new subspecies**
Hyalosperma stoveae	WW-89	2003	New population of a Priority two (P2) taxon. This specimen represents only the third West Australian collection of this tiny daisy. It is also known to occur in South Australia and Victoria where it is probably also uncommon or at least sparsely distributed to judge by the paucity of collections from those states.
Thysanotus tenuis	WW-90 WW-93 WW-94	2003	New population of a Priority 3 (P3) taxon. A small fringe lily apparently restricted to the central and northern portion of the

TAXON	SITE	YEAR	NOTE: RARE / PRIORITY SPECIES
			southern Wheatbelt. The ongoing site surveys associated with the Woodland Watch program however have extended its known range to the north and do suggest that it may be more common and widespread than had previously been realised. Apart from the three collections above it was also collected twice in the 2002 surveys.
Gunniopsis rubra	WW-92 WW-108	2003	New population of a Priority 3 (P3) taxon. A small, prostrate annual confined to the north and central Wheatbelt.
Blennospora phlegmatocarpa	WW-93	2003	New population of a Priority 3 (P3) taxon. An annual daisy more or less confined to the Wheatbelt of West Australia where it mostly occurs close to areas of primary salinity.
Phlegmatosperma drummondii	WW-94 WW-99	2003	New population of a Priority 3 (P3) taxon. This small, annual crucifer was for a number of years considered extinct before ongoing studies within the genus revealed that there were in fact a few relatively recent collections of the species at the WA Herbarium that had been erroneously labelled. It was then added to the list of Declared Rare Flora before being further reduced to Priority status. Nevertheless it still appears to be an uncommon species with few, scattered collections, mostly from the Wheatbelt.
Stylidium merrallii	WW-97	2003	New population of a Declared Rare Flora (DRF). This showy trigger plant is another that had been considered extinct until its rediscovery in the early 1990s. The few populations known mostly occur at or beyond the eastern edge of the Wheatbelt and this collection certainly represents a westerly range extension for the species.
Eremophila resinosa	WW-99	2003	New population of a Declared Rare Flora (DRF). As with a number of other uncommon eremophilas, this species probably always had a restricted distribution. It is currently only known from a few populations in the Westonia and Koorda districts. Although only a single plant was seen at site WW-99, it was not recognized as a DRF at the time of collection, and it seems reasonable to assume that an organized search would

TAXON	SITE	YEAR	NOTE: RARE / PRIORITY SPECIES
			be likely to reveal other plants in the area.
Acacia phaeocalyx	WW-141	2004	New population of a Priority 3 (P3) taxon.
Austrostipa exilis	WW-133	2004	New population of a Priority two (P2) taxon.
Blennospora phlegmatocarpa	WW-133	2004	New population of a Priority 3 (P3) taxon.
Gunniopsis rubra	WW-126 WW-131 WW-139	2004	New population of a Priority 3 (P3) taxon.
Stenanthemum tridentatum	WW-143	2004	New population of a Priority Four (P4) taxon.
Stylidium coroniforme subsp. amblyphyllum	WW-141	2004	New population of a Declared Rare Flora (DRF) **(new subspecies)**
Stylidium tenuicarpum	WW-140 WW-144	2004	New population of a Priority Four (P4) taxon.

Table 3: Significant Range Extensions

TAXON	SITE	YEAR	NOTES: RANGE EXTENSIONS
Hakea nitida		2000	A significant range extension of approximately 100 kilometres north of known collections.
Abutilon cryptopetalum	WW-24	2000	Range extension
Abutilon oxycarpum	WW-14	2000	Range extension
Lepidosperma costale		2000	Possibly a complex of three species. A detailed study of Type material is needed to confirm which is the true *L. costale*.
Maireana marginate		2000	Proved to be a common species in these woodlands. However, it had been a poorly collected species mainly due to its insignificant appearance. Prior to the Woodland Watch project there had been only 18 collections of this species, this collection has now more than doubled in just two years.
Acacia spp.		2000	The *Acacia* specimens collected during the first two years of Woodland Watch have also assisted in the refinement of taxonomic data for the electronic key to this genus (Maslin, 2001).
Tribonanthes longipetala	WW-70	2002	At eastern extremity of species range
Stylidium obtusatum	WW-70	2002	At eastern extremity of species range
Drosera menziesii subsp. basifolia	WW-70	2002	At eastern extremity of species range
Euchiton sphaericus	WW-101	2003	A small daisy with a mostly coastal distribution. This collection represents one of its most inland occurrences.
Drosera spilos	WW-112	2003	A small white flowered pygmy sundew, this collection represents a south easterly range extension for the species.
Abutilon cryptopetalum	WW-147	2004	South-westerly range extension in WA.
Baeckea sp. Tampia Hill (J.C. Anway 327)	WW-137	2004	First collection of this undescribed species for 30 years.
Bertya dimerostigma	WW-139	2004	Significant westerly range extension of over 100 kms (from the Woolocutty district NE of Hyden).
Dodonaea larraeoides	WW-133	2004	Most easterly collection.
Hakea nitida	WW-141	2004	This collection is only the second from what appears to be a definite outlier population of the species in the central Wheatbelt. The first of these (ie. R. Davis 9467) was collected during the 2000 Woodland Watch surveys. Because the

TAXON	SITE	YEAR	NOTES: RANGE EXTENSIONS
			two specimens are in fruit only an effort should be made to make flowering collections earlier in the year from these populations to dispel any doubts that there may be some morphological divergence from the main populations to the south.
Leucopogon sp Yanneymooning (F.Mollemans 3797)	WW-127	2004	Collected from a decomposing granite breakaway. This collection represents only the fourth known locality (and most westerly) for this taxon.
Lomandra nutans	WW-146	2004	From a northern outlier population.
Menkea australis	WW-117	2004	The most northerly collection from the Avon Wheatbelt, although it is known from pastoral country to the northeast.
Monotaxis bracteata	WW-146	2004	Together with an occurrence at nearby St Ronans reserve this population represents a south west outlier for this widely spread species.
Patersonia drummondii subsp. drummondii	WW-126	2004	South-westerly range extension
Patersonia drummondii subsp. drummondii	WW-146	2004	South-westerly range extension
Phebalium lepidotum	WW-139	2004	Apart from a curious outlier in the Perenjori district well to the north of its usual range, this is the most westerly collection of the species so far recorded in the state.
Podolepis tepperi	WW-118 WW-122	2004	North-westerly range extension.
Sclerolaena densiflora	WW-118	2004	Another species that mainly occurs in arid and semi-arid areas to the north and east. This collection represents a south westerly range extension.
Sclerolaena drummondii	WW-117	2004	Fills an apparent gap in the previously known distribution which had appeared disjunct hitherto.
Stellaria filiformis	WW-122	2004	Most collections of this species are from central Wheatbelt and east beyond the agricultural areas. This is the first collection from the northern Wheatbelt, although there are two collections to the north of the agricultural region.
Trachymene pilosa	WW-114	2004	*Trachymene pilosa* – This entity is referred to by Barbara L. Rye in her recent treatment of the genus as *the homomorphic short tuberculate variant* of the species. This is a northern range extension of this rarely collected form.

Table 4: Other Collections of Note

TAXON	SITE	YEAR	NOTES: COLLECTIONS OF NOTE
Phebalium aff brachycalyx	WW-89	2003	This collection does not well match any of the currently recognized taxa within the genus *Phebalium.* Because this entity was locally common in the area, Paul Wilson (a taxonomic authority on the family *Rutaceae* who is based at the WA Herbarium) believes that it may represent either a stabilized hybrid or an unnamed taxon.
Menkea australis	WW-90 WW-94 WW-96 WW-98	2003	Although long recognized as being a widespread species, before the Woodland Watch flora surveys there had only been two collections of this small annual from the entire Wheatbelt. It might reasonably have been assumed therefore from a scan of a state-wide distribution map for that species that it was probably absent from much of that area. The fact that it was recorded from four WW sites in the central Wheatbelt however suggests that its apparent absence is quite likely to be a function of the inconspicuous habit of this species rather than any significant discontinuities in its distribution in the drier parts of Southwest Australia. The case of this small annual crucifer provides a very good example of how the careful survey methods employed by Woodland Watch are literally filling in the gaps in our knowledge of the floristics of the Wheatbelt's woodland communities.
Cheilanthes adiantoides	WW-94	2003	This rarely collected fern is only known from a few areas in the northern and central Wheatbelt and should probably be included on the Priority list.
Chenopodium cristatus	WW-100	2003	Only three previous collections of this small, aromatic herb from agricultural areas of the state – it mostly occurs in pastoral country to the north and east.
Vittadinia humerata	WW-100	2003	Another species that is known from only a very few localities within the Wheatbelt, although it also has an apparently sparse distribution to the north and east.
Microcybe albiflora	WW-102	2003	Another member of the large family

TAXON	SITE	YEAR	NOTES: COLLECTIONS OF NOTE
			Rutaceae, this specimen is the most northerly record for the species and is also rather atypical in several regards. It needs critical evaluation to determine whether it should just be regarded as a variant of *M. albiflora* or whether it is sufficiently distinct to warrant taxonomic recognition at some level.
Lepidosperma sp.	WW103	2003	The complex sedge genus *Lepidosperma* is greatly in need of taxonomic revision and undoubtedly includes numerous unnamed taxa. This specimen doesn't well fit into any of the published names currently recognized at the WA Herbarium and is probably among those unnamed taxa.
Calandrinia aff. eremaea	WW-92 WW-93 WW-94 WW-98 WW-99 WW-100	2003	As with *Lepidosperma* above, the genus *Calandrinia* is another that is much in need of revision. The entity referred to here as *C. aff eremaea* has often been identified either as *C. eremaea or C. polyandra* but appears to be sufficiently distinct from both of these (in the sense that we currently understand the circumscription of these two species), especially in the important character of seed coat morphology, to be considered a separate taxon.
Phaeoceros sp.	WW-106	2003	This hornwort specimen was collected opportunistically at site WW-106 and forwarded to a specialist Christine Cargill in Canberra. She has not been able yet to determine the specimen to species level and still considers it quite likely to be an unnamed taxon.
Lachnagrostis sp.	WW-110	2003	Another specimen that is not readily placed within the existing taxonomic framework for the genus. It could represent an anomalous variant of *L. plebeia* or a new taxon.
Stylidium aff. hortiorum	WW-110	2003	*Stylidium* authority Juliet Wege has examined the specimen and believes that it is an undescribed taxon closest to *S. hortiorum*. [NB: This trigger plant was collected opportunistically close to site WW-110 but in a different vegetation type].
Cerastium comatum	WW-112	2003	This is the first collection made in West Australia of *Cerastium comatum*, one of the chickweeds. Although no new

TAXON	SITE	YEAR	NOTES: COLLECTIONS OF NOTE
			weeds are ever welcome in the State this small annual is very unlikely to constitute a significant threat either as an agricultural or environmental weed.
Plantago cretica	WW-106	2003	*Plantago cretica* is a perennial weed that appears to be confined within Australia to paddocks in the Toodyay district. It was first collected there by Charles Gardner in 1955.
Acacia acuminata	WW-116 WW-120 WW-122 WW-123	2004	An undescribed variant *with* narrow phyllodes, widespread in the South West and Interzone area between Shark Bay and Esperance.
Acacia erinacea	WW-140	2004	This is the prostrate variant of the species which may well come to be recognized as taxonomically distinct.
Acacia pulchella	WW-146	2004	An infraspecific name has not been applied here to this unusual variant. Of the named varieties it is probably closest to *A. var. reflexa* but differs in its erect petioles.
Acacia sp.	WW-126	2004	This is an interesting collection. It belongs to the *A. sclerophylla* group of species but does not well match any of the named taxa. Neither is it familiar to *Acacia* authority Bruce Maslin. A further fruiting collection of this entity will help resolve its identity.
Erodium crinitum	WW-124	2004	A species that mostly occurs in pastoral country to the north and east of the agricultural districts; only the fourth collection from the Wheatbelt.
Erymophyllum tenellum	WW-126 WW-129	2004	A hairy form, rather than the normal glabrous form. This is the first time that this anomaly has been observed by WA Herbarium taxonomist Paul Wilson, who recently revised the genus.
Grevillea acuaria	WW-137	2004	– This variant is currently referred to in the literature as the 'soft leaf form'. This specimen apparently represents the northernmost collection of this entity. It seems probable that the latter will be formally recognized at some time in the future as taxonomic studies continue.
Grevillea levis	WW-138	2004	This is right at the southern limit for the species and the style pollen presenter is atypically elongate.
Hakea recurva	WW-122	2004	This specimen is notable in being intermediate between the typical subspecies and subsp. *arida*.

TAXON	SITE	YEAR	NOTES: COLLECTIONS OF NOTE
Hibbertia exasperata	WW-140	2004	As with several other species collected at this site (eg *Brachyscome perpusilla* and *Westringia rigida*) *H. exasperata* is right at the southwest extremity of its range in this area.
Hibbertia ovata / H. montana intermediate	WW-146	2004	This material belongs to a close-knit group of species that are much in need of taxonomic revision. It matches collections from nearby Mokine Nature Reserve.
Lachnagrostis plebeia	WW-133	2004	A poorly collected species. This represents only the third time that it has been collected in the Wheatbelt.
Lepidium oxytrichum	WW-118	2004	This species mainly occurs in the pastoral country to the north and east of the agricultural region. This is only the third collection from the Avon Wheatbelt, the other two being from the Mullewa area and another Woodland Watch collection from Kununoppin.
Lepidosperma brunonianum	WW-140	2004	This complex genus of sedges is greatly in need of taxonomic revision. The boundaries of a number of the named species are not clear while at the same time there appear to be many unnamed taxa. This name is applied rather tentatively here.
Lepidosperma obtusum	WW-146	2004	This species appears to have a very restricted distribution. It is currently only known from a few collections mostly in and around Wambyn Nature Reserve.
Lepidosperma resinosum	WW-138	2004	This complex genus of sedges is greatly in need of taxonomic revision. The boundaries of a number of the named species are not clear while at the same time there appear to be many unnamed taxa. This name is applied rather tentatively here.
Lomandra nutans	WW-146	2004	There are only two (2) other collections of this species from the area (Mokine and Wambyn Nature Reserves) and together they form a northern outlier in its distribution.
Oxalis perennans	WW-134 WW-140	2004	- This taxon belongs to the cosmopolitan *O. corniculata* complex the Australian members of which are much in need of taxonomic revision. For this reason the name is applied rather tentatively here.

TAXON	SITE	YEAR	NOTES: COLLECTIONS OF NOTE
Phyllanglum sp.	WW-133	2004	An interesting collection. Unlike *P. sulcatum*, which is quite widespread in the Wheatbelt, the lower stems here are tuberculate. There is also some indication that, although still immature here, the diagnostic seed character may be different.
Stenopetalum lineare	WW-117 WW-121	2004	There have been very few collections of this taxon from the Wheatbelt generally and only one other from the northern Wheatbelt.
Tetragonia diptera	WW-113 WW114	2004	Generally occurs to the north of the agricultural areas. Only the third collection from the Avon Wheatbelt.
Thysanotus manglesianus	WW-145	2004	A more typical larger flowered variant than another found at the same site.

5.0 Survey Methodology

The survey methodology for each Woodland Watch site comprised three components:

Ten by ten metre quadrats

The location of each 10 × 10 metre quadrat was based on the area that best represented the species diversity of the selected woodland type. All species found were collected. Each quadrat was permanently marked by a steel stake on the north-western corner from which the coordinates were recorded using a GPS.

Random stratified collection

This involved a random walk covering the confines of the selected woodland, avoiding adjoining habitats to keep the integrity of survey purely to the targeted *Eucalyptus* woodland habitat.

Site assessment

An assessment of the condition of each site was made using procedures adopted by the Wildflower Society of Western Australia (Trudgen 1991).

This methodology was considered the most effective to achieve the objectives of the project within the time constraints.

2000

In 2000, the first year of the project, a total of 41 sites were surveyed and plants vouchered by Robert Davis of the WA Herbarium, in collaboration with Richard McLellan of WWF-Australia.

2001

In 2001, a total of 21 sites were surveyed and plants vouchered by Leigh Sage of the WA Herbarium, in collaboration with Carla Swift and Richard McLellan of WWF-Australia.

2002

In 2002, a total of 25 sites were surveyed and plants vouchered by Robert Davis of the WA Herbarium, in collaboration with Mike Davis and Mike Griffiths of WWF-Australia.

2003

In 2003, a total of 25 sites were surveyed and plants vouchered by Mike Hislop of the WA Herbarium, in collaboration with Mick Davis and Mike Griffiths of WWF-Australia.

2004

In 2004, a total of 35 sites were surveyed and plants vouchered by Mike Hislop of the WA Herbarium, with the assistance of Mike Griffiths, Mick Davis and Bronwen Smith of WWF-Australia.

NB: Surveys continued in 2005 in the Avon Wheatbelt [a total of 9] and are anticipated to continue into 2006 and beyond (contingent on funding).

6.0 Descriptive Results

6.1 2000-2001

Over the period 2000 - 2001, 62 sites were surveyed, resulting in the collection of approximately 2,400 specimens. Of the 62 woodland sites surveyed, 20 were predominantly *Eucalyptus loxophleba*, 20 *Eucalyptus salmonophloia*, 11 *Eucalyptus salubris* and 5 *Eucalyptus longicornis*. The six remaining sites were predominantly of other woodland types: 2 *Eucalyptus wandoo*, 1 *Eucalyptus salicola*, 1 *Eucalyptus capillosa*, and two other mallee woodlands. These selected woodlands varied greatly in size from 20-30 hectares to several hundred hectares; they also varied in condition.

The number of taxa collected at each site varied considerably. The two sites containing the highest number of taxa of all the sites recorded were Site WW-06, an *Eucalyptus salmonophloia* woodland ENE of Calingiri, and Site WW-17, a woodland of predominantly *Eucalyptus capillosa* with some *Eucalyptus salmonophloia* near Kellerberrin, which both produced 65 voucher specimens. The smallest collection was within a modified *Eucalyptus longicornis* woodland (Site WW-58) north of Merredin, at which only 11 specimens were vouchered.

Eucalyptus salmonophloia dominated sites had marginally the highest number of taxa per site. From the 20 *Eucalyptus salmonophloia* woodland sites surveyed, a total of 816 specimens were vouchered - at an average of 40.8 taxa per site. The same number of *Eucalyptus loxophleba* woodland sites were surveyed, with 805 specimens vouchered - at an average of 40 taxa per site.

The least diverse woodland type appeared to be *Eucalyptus salubris* woodlands. Of the 11 sites surveyed, 347 specimens were collected at an average of 32 taxa per site. *Eucalyptus longicornis* was the most poorly represented of these woodland types, possibly due to the rarity of this woodland type or simply a matter of circumstances. Only five *Eucalyptus longicornis* woodlands were surveyed with 148 specimens vouchered - at an average of 30 taxa per site.

Both the distribution and floristic composition of these woodland types within the Avon Wheatbelt region of Western Australia are highly varied. Using databases maintained by the WA Herbarium, it is possible to plot the distribution of these woodland types. However, this will not yield the true distribution of the woodlands, as Herbarium records often reflect merely the presence of a species and thus may not represent a woodland type as such. But it provides a good first-level approximation. Of the many factors affecting the distribution of these woodlands, the most significant appears to be rainfall and soil type.

Eucalyptus loxophleba woodlands are really composed of two woodland types: *Eucalyptus loxophleba* subsp. *loxophleba,* which dominates the western edge of the Wheatbelt running in a southeast / north-westerly direction; and *Eucalyptus loxophleba* subsp. *lissophloia*, which runs in a similar direction but dominates the eastern edge of

the Avon Wheatbelt region. The distribution of *Eucalyptus salubris* mirrors that of *Eucalyptus loxophleba* subsp. *lissophloia*. The best-represented woodland is *Eucalyptus salmonophloia*, located throughout much of the Avon Wheatbelt region, with the exception of the northern and southern extremities. *Eucalyptus longicornis* distribution is much like that of *E. salmonophloia* other than being slightly less prevalent in the northern extremities of the Avon Wheatbelt.

The surveys provided an insight into the macro vascular plant associations represented within these four major eucalypt woodland types. The woodlands surveyed showed a certain amount of uniformity in species collected. However, there were many subtle changes in plant associations from the north to the south of the project area.

The flowering seasons of 2000 and 2001 were considered to be relatively poor, due to the lack of winter rains in those years with corresponding early starts to summer. There was no rain recorded after the first week of September 2000 throughout the Wheatbelt region. It is likely that these weather conditions impacted on the number of collections made, as some plants may not have flowered in the study period and many of the herbaceous plants may not have germinated at all.

However, even after extensive surveying of areas over several flowering seasons there would still be a small percentage of plant species left unrecorded. Despite the season not being ideal, some significant novelties have already been recognised within the collections (see tables 1 – 4), and no doubt there will be further findings as the collection is more closely scrutinised.

6.2 2002

In 2002 a total of 25 sites were surveyed, resulting in 647 collections. Of the 25 woodland sites surveyed, 9 were *Eucalyptus salmonophloia*, 5 *Eucalyptus loxophleba*, 4 *Eucalyptus longicornis*, and 3 *Eucalyptus salubris*. The 6 remaining sites were predominantly of other woodland types: 1 *Eucalyptus accedens*, 1 *Eucalyptus capillosa*, and 2 other mallee woodlands (modified *Eucalyptus salubris* woodlands). These selected woodlands varied greatly in size from 10 hectares to several hundred hectares; they also varied in condition.

Three sites were found to have high numbers of taxa. Site WW-66, an *Eucalyptus salmonophloia* woodland near Corrigin, produced voucher specimens of 46 taxa. Site WW-83, another *Eucalyptus salmonophloia* woodland at a Reserve near Westonia, produced 41 taxa. Site WW-70, a *Eucalyptus loxophleba* woodland north of Mt Caroline, yielded 40 taxa. The smallest collections were recorded for *Eucalyptus longicornis* woodlands, represented variously by 8 taxa (Site WW-72, near Pithara) to 11 taxa (Site WW-80, near Bencubbin), 18 taxa (Site WW-68, near Narembeen), and 21 taxa (Site WW-73, ENE of Kalannie).

From the 9 *Eucalyptus salmonophloia* woodland sites that were surveyed, a total of 320 specimens were vouchered - at an average of 36 taxa per site.

A total of 5 *Eucalyptus loxophleba* woodland sites were surveyed, with 192 specimens vouchered at an average of 38 taxa per site.
From the 5 *Eucalyptus salubris* woodland sites surveyed (including modified *Eucalyptus salubris* woodland types) 126 specimens were collected at an average of 25 taxa per site.
Represented by 4 sites, *Eucalyptus longicornis* was the least diverse of these woodland types with a total of only 60 specimens vouchered at an average of 15 taxa per site.

6.3 2003

A total of 25 new sites were surveyed in 2003, resulting in 1,095 collections. Of the 25 woodland sites surveyed, 4 were *Eucalyptus salmonophloia*, 5 were *Eucalyptus salubris*, 10 were *Eucalyptus loxophleba*, and 2 were *Eucalyptus longicornis*. The remaining sites were predominantly of other woodland types: 1 *Eucalyptus sheathiana/semivestita*, 1 *Eucalyptus sheathiana/subangusta*, 1 *Eucalyptus capillosa*, and 1 *Eucalyptus astringens*. These selected woodlands varied greatly in size from 10 hectares to several hundred hectares; they also varied in condition.

The number of taxa recorded at each of the sites varied considerably – from 22 taxa (at the *Eucalyptus sheathiana/semivestita* site – WW-88) to 60 taxa (at one of sites with *Eucalyptus loxophleba* as the dominant species – WW-94 near Nungarin). Other *Eucalyptus loxophleba* sites with relatively high numbers of taxa included: WW-103 (59 taxa), WW-105 (56), and WW-109 (59). Another mixed *Eucalyptus loxophleba/salubris* site (WW-107) recorded 57 taxa. Two of the sites dominated by *Eucalyptus salmonophloia* also recorded a high number of taxa: WW-99 (54 taxa) and WW-104 (59).

From the 10 *Eucalyptus loxophleba* woodland sites surveyed, a total of 509 specimens were vouchered at an average of 51 taxa per site. From the 5 *Eucalyptus salubris* woodland sites surveyed, 209 taxa were collected at an average of 42 taxa per site. From the 4 *Eucalyptus salmonophloia* woodland sites surveyed, 174 taxa were collected at an average of 43 taxa per site. From the 2 *Eucalyptus longicornis* woodland sites surveyed, 73 taxa were collected at an average of 36 taxa per site.

6.4 2004

A total of 35 sites were surveyed in 2004, resulting in 1,555 collections. Of the 35 woodland sites surveyed, 5 were *Eucalyptus salmonophloia*, 12 *Eucalyptus loxophleba*, 1 *Eucalyptus longicornis*, and 9 *Eucalyptus salubris.* The remaining sites were predominantly of other woodland types: 1 *Eucalyptus brachycorys*, 3 *Eucalyptus wandoo*, and 1 mallee woodlands (with *Eucalyptus subangusta* and *Allocasuarina acutivalvis*). These selected woodlands varied greatly in size from 10 hectares to several hundred hectares; they also varied in condition.

One site was found to have an exceptionally high numbers of taxa - Site WW-134, a *Eucalyptus loxophleba* woodland located south of Trayning - which produced voucher specimens of 61 taxa. Site WW-131, an *Eucalyptus salmonophloia* woodland northwest

of Bencubbin, produced voucher specimens of 55 taxa. The smallest collection was recorded for a *Eucalyptus salmonophloia* woodland, represented by 26 taxa (Site WW-124, a town reserve at Kununoppin).

From the 12 *Eucalyptus loxophleba* woodland sites surveyed, a total of 586 specimens were vouchered at an average of 49 taxa per site. From the 3 *Eucalyptus wandoo* woodland sites surveyed, 128 taxa were collected at an average of 43 taxa per site. A total of 5 *Eucalyptus salmonophloia* woodland sites were surveyed, with 195 specimens vouchered at an average of 39 taxa per site. From the 9 *Eucalyptus salubris* woodland sites surveyed (including modified *Eucalyptus salubris* woodland types) 346 specimens were collected at an average of 38 taxa per site.

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FloraBase

All Woodland Watch flora survey data are lodged on the department of Conservation and Land Management's FloraBase website. Full species lists can be found and are searchable by Woodland Watch Site Number (WW-##) and on general geographic locality (eg. Burracoppin).

For easy access to all data please visit: http://florabase.calm.wa.gov.au/wwatch