

Conservation Values of the Whicher Scarp



Report of the Expert Panel

Department of Environment and Conservation

2010



Department of
Environment and Conservation

Our environment, our future



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Cover photograph 1: Mountain Marri (*Eucalyptus* or *Corymbia calophylla*) and Jarrah woodland over *Xanthorrhoea acanthostachya* on sandy laterite.

Cover photograph 2: Mountain Marri and Jarrah woodland on deep white sand.

Cover photograph 3: Mountain Marri, Jarrah, *Banksia grandis* and *Banksia attenuata* woodland on deep coloured sands.

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1. Executive Summary

This report has been prepared at the request of the Deputy Director General of Parks and Conservation (DEC) to review the relevant issues raised in the report *A Floristic Survey of the Whicher Scarp* (Keighery *et al.* 2008a). The Report of the Expert Panel briefly describes the background to the recognition of the Whicher Scarp landform and its associated ecosystem and vegetation types through a range of studies. The report outlines the progression of mapping and analysis, and highlights that due to incomplete information at the time the Whicher Scarp was unable to be effectively assessed during the Regional Forest Agreement (RFA) and Forest Management Plan (FMP) deliberations. Recommendations are made in relation to the protection of vegetation and flora values of the Whicher Scarp, the consolidation and creation of conservation lands, environmental and threatening processes and their management, land use management and targeted research.

Recommendations

5.1 Protection of Vegetation and Flora of the Whicher Scarp

The Panel recommends that DEC should:

- recognise the Whicher Scarp as a forest ecosystem;
- treat Whicher Scarp as a “poorly reserved forest ecosystem” informal reserve for the remainder of the current FMP and considered for addition as a “poorly reserved forest ecosystem” informal reserve for the next FMP, based on the percentage of the pre-European area in existing or proposed formal plus CAR informal reserves; and
- consider the vegetation complexes that comprise Whicher Scarp for recognition as “less well reserved vegetation complexes”.

The Panel recommends that the A/Director SFM should:

- require that the species listed in Appendix 1 of this Report should be used by botanists as “significant species” for the purpose of flora surveys in association with proposed disturbance activities in and adjacent to the Whicher Scarp Forest Ecosystem; and
- require that for the purpose of flora surveys associated with proposed disturbance activities in/adjacent to the Whicher Scarp that botanists are familiar with and can recognise PECs of the Whicher Scarp in the field (Table 1).

5.2 Recommendations for Specific Conservation Areas

5.2.1 Consolidation of Conservation lands

The Panel recommends that:

- The boundaries of the Yelverton National Park be expanded to include the full extent of the Yelverton forest public lands (Crown Reserves 29192 and 36715) (Map 4 and 5).

The Panel recommends that:

- the boundaries of the Whicher National Park be expanded to include the full extent of the Central Whicher Scarp slopes on public lands (includes Crown Reserves 24564 and 22455 [south of the Vasse Hwy]) (Map 4 and 6).

The Panel recommends that:

- the boundaries of the Dardanup Conservation Park be expanded to include the full extent of the Dardanup Forest Block, consolidating the Conservation Park and proposed Nature Reserve and contiguous public lands (Map 4 and 7), thus encompassing transitional communities associated with the Swan Coastal Plain, Whicher Scarp, Blackwood Plateau and Darling Scarp; and
- consideration be given to making this a National Park (includes Crown Reserve 8439), which is consistent with the approach taken with Whicher and Yelverton.

5.2.2 Recommendations for New Conservation Lands

The Panel recommends that:

- a Central Whicher Scarp conservation area be established in the Treeton forest north of Gaywal Road, including all native forest and all native forest islands within the pine plantations to protect the specific Whicher Scarp values identified (Map 4 and 8).

The Panel recommends that:

- a North Whicher Scarp conservation area be established in the Abba forest, bounded by Vasse Highway, Haley Road, Claymore Road, River Road and the boundary of Abba Forest Block to protect the specific Whicher Scarp values identified (includes Crown Reserves 18915, 14732, 18047, 1460, 22455 [north of the Vasse Hwy] and UCL Locations 4580, 1784, 1783, 1793) (Map 4 and 9).

The Panel recommends that:

- a North Whicher Scarp conservation area be established in the Argyle forest to protect the specific Whicher Scarp values identified (includes Crown Reserve 9767) (Map 4 and 10).

5.2.3 Recommendations for Non DEC Public Lands

The Panel recommends that DEC:

- work with the relevant LGA to prevent further clearing of intact Whicher Scarp vegetation and facilitate the rehabilitation of disturbed lands with a view to possible future incorporation into adjoining proposed conservation reserves.

The Panel recommends that DEC:

- established a West Whicher Scarp conservation area in the Gale Road area by seeking DEC vesting of Crown Reserve 37063 and UCL Locations 2569, 2570 and the adjoining un-numbered UCL location (Map 11).

6.1 Weed Flora

The Panel recommends that Blackwood and Wellington Districts:

- incorporate the Whicher Scarp into areas of “high conservation significance” for the purpose of monitoring and planning of weed control programmes as soon as possible;
- focus on high priority areas in the Whicher Scarp to ensure that weed invasion is limited to as low level as practicable; and
- focus on old settlements, sand mines and rubbish dumping sites to identify localised infestations of Alert species (such as bulbous weeds and succulents) which may become a problem under climate change.

6.2. Feral Animals and Pests

The Panel recommends that Blackwood and Wellington Districts:

- incorporate the Whicher Scarp into areas of “high conservation significance” for the purpose of monitoring and planning of feral and pest species programmes; and
- work with neighbours to undertake feral animal control where species are found on adjoining lands.

6.3. Phytophthora dieback

The Panel recommends that:

- the Phytophthora dieback occurrence be determined and disease free areas be identified as ‘Protectable Areas’ for management (see DEC Policy No. 3 - Management of Phytophthora and disease caused by it);
- areas within Whicher Scarp should be considered for monitoring for the introduction of Phytophthora dieback as part of KPI 18 - *The effectiveness of dieback hygiene*; and
- the South West Region facilitate the development of a regional Hygiene Management Plan for the Whicher Scarp, to guide acceptable risk and hygiene implementation. (This plan would consider the use of amelioration treatments such as phosphite application).

The Panel recommends that Blackwood and Wellington Districts:

- require that the level of acceptable risk for all disturbance operations in the Whicher Scarp be reduced to the lowest possible level ; and
- Blackwood and Wellington Districts require all disturbance activities involving soil movement in and adjacent to Whicher Scarp be covered by a Hygiene Management Plan which quantify risks to uninfested areas.

6.4. Changing Hydrology

The Panel recommends that:

- drainage proposals associated with agricultural and subdivision development consider and ameliorate the impact on the floristic communities of the Whicher Scarp;
- impact caused by de-watering during mining on the floristic communities of the Whicher Scarp be monitored and ameliorated;
- DEC provide comment in relation to proposals to extract large volumes of groundwater within or adjacent to the Whicher Scarp landform, and these should require;
 - appropriate impact modelling;
 - the development of an ongoing monitoring program; and
 - contingency plans should adverse environmental impacts result.
- no above-ground water supplies be constructed within Whicher Scarp vegetation or within a location that will inundate vegetation of the Whicher Scarp; and
- existing DEC water points should be assessed prior to maintenance or upgrading to determine whether they are affecting the a hydrology of high priority areas of Whicher Scarp, and considered for relocation and rehabilitation if this is occurring.

The Panel recommends that:

- the risk to soil values from the activation of acid sulphate soils will be minimised by:
 - ensuring that planning identifies the risk zone associated with acid sulphate soils for the operation;
 - managing operations in areas identified as having the potential to disturb acid sulphate soil in accordance with DEC Guidelines *Treatment and management of soils and water in acid sulfate soil landscapes* and ensuring these guidelines are followed to mitigate the impact if acid sulphate soils are activated;
 - ensuring that the scale of any proposed disturbance in susceptible sites is reduced to the smallest possible extent; and
 - existing DEC water points should be assessed prior to maintenance or upgrading to determine whether they are in acid sulphate soils, and if so should be considered for relocation and rehabilitation.

7.1 Land Use and Management on DEC Estate

7.1.1. Timber Harvesting

The Panel recommends that:

- the level of acceptable risk from timber harvesting or roading activities that are upslope of the non-infested Whicher Scarp be as low as possible. This could involve the use of a combination of tactics including dry soil operations, split phase harvesting and the use of mini catchments.

7.1.2. Plantations on DEC Estate

The Panel recommends that:

- plantation operations adjoining Whicher Scarp communities are conducted within the plantation and cleared breaks and do not involve disturbance of native vegetation areas within or adjoining the plantations;
- plantation operations adjoining non-infested Whicher Scarp communities are conducted with appropriate hygiene and timing to reduce the likelihood of disease introduction and spread (e.g. dry soil access);
- that FPC control weeds in the plantations to prevent or reduce the spread from the plantation to Whicher Scarp communities; and
- that FPC prepare and implement a plan to control pine wildings in areas of the Whicher Scarp adjacent to softwood plantations.

7.1.3. Fire Management

The Panel recommends that:

- District staff and authors of “*A Floristic Survey of the Whicher Scarp*” liaise with Fire Management Services to identify areas that may be suitable as Fire Reference Areas.
- unnecessary clearing or burn boundary upgrades to be avoided in Whicher Scarp communities;
- burn boundaries that place non-infested areas of the Whicher Scarp at risk of infestation by *Phytophthora dieback* be considered for relocation or closure and rehabilitation;
- District Fire Coordinators ensure fire lines placed through the Whicher Scarp are rehabilitated as soon as possible after the fire is declared safe; and
- fire lines placed through non-infested areas of the Whicher Scarp should be considered for monitoring for the introduction of *Phytophthora dieback* as part of KPI 18 - *The effectiveness of dieback hygiene*.

7.1.4 Roading and Basic Raw Material use by DEC or FPC

The Panel recommends that:

- the new road construction through the Whicher Scarp be avoided;
- the existing road network through Whicher Scarp communities be reviewed by Blackwood and Wellington District and unnecessary roads be closed and rehabilitated;
- all upgrades and road maintenance be conducted in accordance an approved Hygiene Management Plan;
- Blackwood and Wellington Districts do not establish new BRM pits for DEC or FPC use within the Whicher Scarp; and
- existing pits established by DEC or FPC and Shires are rehabilitated by the proponent. (This may include reworking of existing pits, e.g. crushers in gravel pits, to assist with rehabilitation without extension of the mined area).

7.1.5. Recreation

The Panel recommends that:

- the existing track and trail network through Whicher Scarp communities be reviewed and unnecessary tracks and trails be closed and rehabilitated;
- the new track and trail construction through the Whicher Scarp be avoided;
- if approved, new tracks and trails should be designed, located, constructed and maintained to minimise the risk from Phytophthora dieback to uninfested areas, priority flora or threatened ecological communities within the Whicher Scarp;
- Blackwood and Wellington Districts to work with user groups to monitor impacts of approved trails; and
- DEC should not approve any organised recreational activity that could impact on the conservation values of the Whicher Scarp communities.

7.1.6 Other Forest Products

7.1.6.1 Apiary

The Panel recommends that:

- unwanted existing apiary leases are not transferred and are abolished within the Whicher Scarp; and
- no new apiary sites are established within the Whicher Scarp.

7.1.6.2 Firewood Collection

The Panel recommends that:

- South West Region does not designate or gazette firewood areas within Whicher Scarp;
- South West Region takes steps to close those firewood areas that are already established in the Whicher Scarp as soon as possible;
- Blackwood and Wellington Districts place additional signs in and around the Whicher Scarp area to discourage domestic firewood collection as soon as possible; and
- enforcement patrols be targeted on the Whicher Scarp to reduce the impact of illegal firewood collection on these communities.

7.1.6.3 Flora Collection

The Panel recommends that:

- all commercial wildflower picking be excluded from the Whicher Scarp; and
- seed collection be excluded from the Whicher Scarp unless seed is required for rehabilitation projects within the Whicher Scarp.

7.2 Other Land Uses

7.2.1. Agriculture

The Panel recommends that DEC should:

- confirm that the Whicher Scarp is regionally significant and that the information should be used by Native Vegetation Clearing section in the determination of clearing requests as soon as possible; and
- ensure a Whicher Scarp briefing is provided to Blackwood and Wellington District staff, Regional planning staff and Native Vegetation Clearing staff in DEC as soon as possible.

7.2.2 Sub-division and Development

The Panel recommends that:

- areas that are largely intact Whicher Scarp communities be protected and enhanced through the subdivision process; and
- DEC should consider providing a Whicher Scarp briefing to external stakeholders (Local Government Authorities, Environment and Planning officers, Industry and the community) following the endorsement of this report.

7.2.3. Mining and Extractive Industries

7.2.3.1. Exploration and Mining

The Panel recommends that DEC:

- require that Environmental Management Branch approvals for all exploration proposals in the Whicher Scarp communities include measures to avoid or minimise vegetation clearing and the development of a Hygiene Management Plan;
- request the EPA to specify that requests to amend or extend current mine plans are required to identify and protect the floristic values of the Whicher Scarp in consultation with DEC; and
- seek to reduce or negate the mining activities impacts on the Whicher Scarp when providing comment on future mining proposals.

7.2.3.2. Basic Raw Materials

The Panel recommends that DEC:

- does not approve new BRM pits within Whicher Scarp; and
- supports steps to rehabilitate those BRM pits that are already established.

7.2.4. Plantations Outside DEC Estate

The Panel recommends that DEC:

- work with adjoining landowners / plantation managers to prepare a plan to control pine wildings in areas of the Whicher Scarp adjacent to private plantations; and
- work with adjoining landowners and plantation operations adjoining non-infested Whicher Scarp communities to try to have plantation establishment, tending or harvesting operations conducted with appropriate hygiene and timing (e.g. dry soil access).

7.2.5. Utilities

The panel recommends that:

- the utility manager develop a vegetation management plan for Whicher Scarp communities intersected by or occurring within utilities corridors in consultation with DEC;
- the utility manager develop a Hygiene Management Plan for all disturbance activities involving soil movement that are proposed adjacent to or within utilities corridors in Whicher Scarp in consultation with DEC; and
- where possible new corridors should be located to avoid or minimize the further clearing of Whicher Scarp plant communities.

8.1 Floristics

The Panel recommends that:

- DEC Science Division in conjunction with the Region and other interested agencies apply for resources to undertake a biological survey of the Blackwood Plateau. This should focus on wetlands as a priority and include other areas as resources permit.

8.2 Endemic Fauna

The Panel recommends that:

- DEC Science Division apply for resources to undertake a project to identify, document and map any short range endemic fauna species that occur in the area. This information is essential to inform any use of groundwater in the study area for both mining proposals and other water use.

8.3 Disease

The Panel recommends that:

- studies on the epidemiology and biology of *P. cinnamomi* be carried out across the Whicher Scarp by DEC to help understand the movement, impacts and management needs for this disease.



PHOTOGRAPH 1:

The Whicher Flannel Flower (*Actinotus whicheranus*) is confined to two very different Whicher Scarp habitats, the wetland habitat of the Gale Road Busselton Ironstones (a TEC) and the rare upland communities on the deep sands in the Whicher forest. This species flowers in the heat of summer and is very difficult to locate at other times. The closest relatives of this species are found on the sandstones in NSW. This species has been recommended for listing as DRF as it is only known from two groups of populations in very different habitats that are subject to a set of threatening processes.

2. Terms of Reference

The purpose is to provide advice to the Deputy Director General of Parks and Conservation (DEC), using the expert knowledge within the group, on:

- the vegetation and flora values of the Whicher Scarp;
- the conservation significance of the vegetation and flora values in the regional context of the area covered by the Forest Management Plan 2004-2013;
- other conservation values (fauna, landscape, ecological linkage) of the Whicher Scarp;
- the levels of reservation of these vegetation, flora and other conservation values;
- the threats to the vegetation, flora and other conservation values; and
- options to manage these threats.

The group will report to Deputy Director General of Parks and Conservation by end of October 2009.



PHOTOGRAPH 2: A set of restricted and rare wetland communities are found on Whicher Scarp. Some of these communities occur along the Sabina River (this picture is looking south from the Sabina Road Bridge). Populations of a number of rare and restricted taxa are associated with these communities including *Grevillea bronwenae*, *Dryandra formosa* (Whicher Scarp form) and *Lambertia rariflora* subsp. *rariflora*. One of the communities (Table 1 – F1) is a priority ecological community.

3. Introduction

3.1 Background

In the 1970s the Environmental Protection Authority (EPA) recognised the particular flora values of the Whicher Scarp area in the recommendations of the Conservation Through Reserves Committee System 1 (DCE 1976) and System 6 (DCE 1983a and b) reports where the Whicher Scarp is referred to as the Whicher Range. Two areas on the Whicher Scarp were the subject of recommendations being:

- the ‘Whicher Range reserve’ (Figure 1.5 DCE 1976). In 1978 an area similar to the proposed Whicher Range reserve (DCE 1976) was placed on the register of the National Estate (DEWHA 2008). In 2004 the FMP 2004-2013 (Conservation Commission of Western Australia 2004) identified an area similar to that identified in the System 1 report (DCE 1976) but the majority of the Whicher Scarp slopes to the west of the Sabina River have been omitted. On the 8th December 2004 a similar area was vested as the Whicher National Park (Maps 4 and 6); and
- C86 (Dardanup Management Priority Area) in the System 6 report (Figure 59, DCE 1983b). This recommendation has also been partially implemented with the vesting of the Dardanup Conservation Park at the same time as the Whicher National Park (Maps 4 and 7).

A few other smaller conservation areas are also located on the Whicher Scarp, including: Haag Nature Reserve, Nature Reserve 45533 (Gale Road Ironstones) and the Gwindinup Reserve (Reserves 2307 and 25509) which are managed by the Capel Land Conservation District Committee as well as a series of forest conservation areas as were proposed in the Forest Management Plan 2004-2013 (Conservation Commission of Western Australia 2004).

The recommendation for the ‘Whicher Range reserve’ (DCE 1976) by the EPA recognised the incomplete knowledge of the Whicher Scarp and stated that “should finance become available, the WA Herbarium carry out a more complete survey to determine whether several rare or new species of plants occur in State Forest 33 or elsewhere in nearby crown land.”

While there were no specific funds available for this work until the mid 2000s, flora survey work was undertaken over the next three decades by officers of the Department of Conservation and Land Management and EPA together with the Wildflower Society of Western Australia’s Bushland Survey Program. With Swan Bioplan funding in 2005 this work was able to be progressed more rapidly and a report on the floristics of the Whicher Scarp was released in early 2008 (Keighery *et al.* 2008a). The RFA process allows for such flora information to be used to further contribute to the knowledge and protection of the forests of the RFA area (Conservation Commission of Western Australia 2004).

3.2 Boundaries of the Whicher Scarp

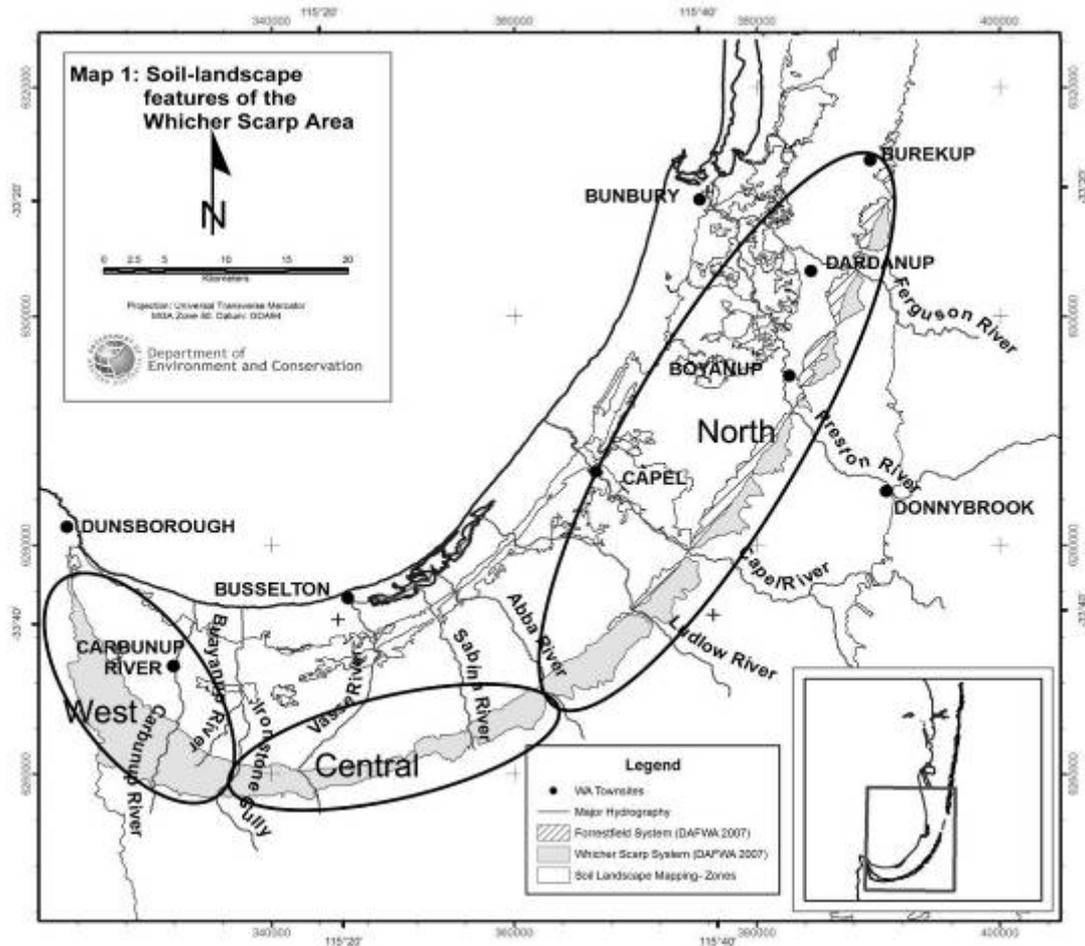
The Whicher Scarp forms a sickle shaped landform unit that extends from near Burekup in the north where it meets the Darling Scarp, to the south-west of Dunsborough where it meets the granites of the Leeuwin-Naturaliste ridge (Map 1). The coastal side of the Scarp abuts the Swan Coastal Plain, the Scarp forming the ‘hills’ of the Bunbury/Busselton area. The boundaries of the Whicher Scarp are defined in soil-landscape mapping (Map 1 after DAFWA 2007). An earlier version of this mapping was apparently used to define the extent of the Whicher Scarp vegetation complexes for the RFA (Mattiske and Havel 1998).

3.3 Location, Geology, Landforms and Soils

The Scarp is thought to have formed as a result of marine erosion of the Perth Sedimentary Basin around two million years ago (Playford *et al.* 1976). An old shoreline rich in mineral sands, the Yoganup Formation (Playford *et al.* 1976), is associated with the Swan Coastal Plain/Scarp interface. The Scarp covers an area of about 21,000 ha, rising to over 100 m in places but with an average height of 50 m and is incised by a series of rivers and creeks. Based on landform and natural values the Whicher Scarp is divided into three sectors, the West, Central and North Whicher Scarp (Map 1).

Broadly the surfaces of the Whicher Scarp fall into three groups consisting of the widespread sands and laterites and the rare ironstones. Laterite capped rises and slopes are common in the Central and North Whicher Scarp, with exposed laterite being uncommon in the West Whicher Scarp. Shallow rises, slopes and swales of deep sands are found throughout the Scarp. In the Central and North Whicher Scarp these range from white through yellow to orange. In the West Whicher Scarp grey sands predominate, sheet laterite occurring at depth. These sands often occur as a sheet over laterite with varying gravel component.

A series of rivers and creeks incise the Whicher Scarp. Associated with these are a series of flat and basin wetlands as well as rare paluslopes. The ironstones also support wetlands.

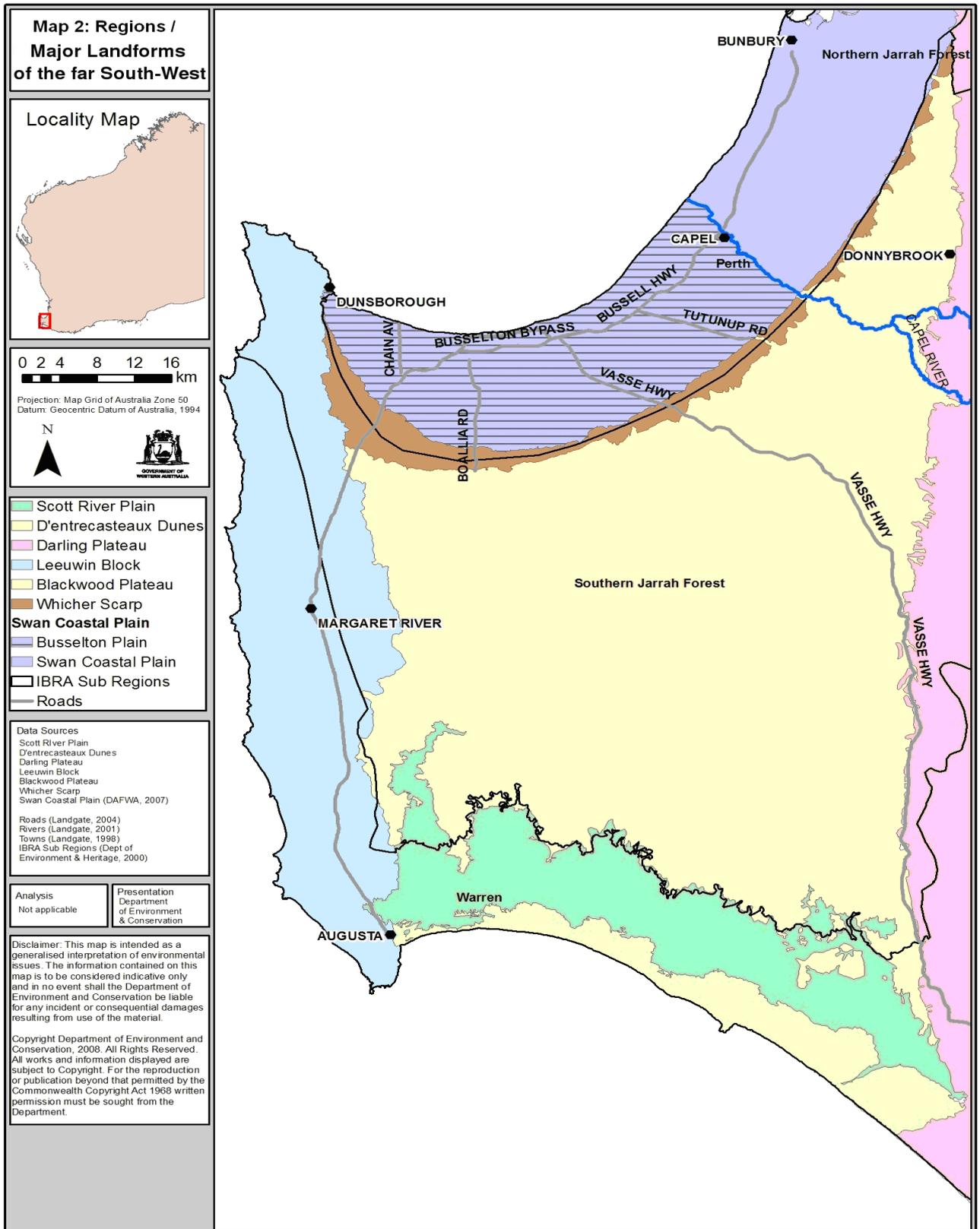


MAP 1: Soil-landscape features of the Whicher Scarp area

3.4 Vegetation and Flora

The natural values of the Whicher Scarp in relation to landforms, vegetation and flora are diverse and varied. These values are summarised below after Matiske and Havel (1998), Keighery *et al.* (2008a) and DEC (2010). It should be noted that the area figures in this section are based on Keighery *et al.* (2008a), these are comparable but different from those in Section 4.3.

- A distinct and naturally restricted landform
Three major subdivisions are evident in the Whicher Scarp, these being the West, Central and North Whicher Scarp (Map 1). These subdivisions are reflected in the flora. In addition the Whicher Scarp:
 - comprises 0.7% (approx 21,000 ha) of the Southern Jarrah Forest Biogeographic Sub-region (Map 2);
 - has around 46% (approx 9,200 ha) remaining as native vegetation; and
 - has over 50% of the remaining naturally vegetated lands in public lands located in nine Whicher Scarp Public Land Reference Areas.
- A diverse flora and a biodiversity hotspot
More than 900 native species reflecting flora of the Jarrah Forest, south coast sands and wetlands and Swan Coastal Plain sands as well as a large number of Whicher Scarp centred species. The Whicher Scarp is a local centre of species richness in the species rich south-west. Based on vegetation and flora values (species richness, endemism, geographically distinct species), the Whicher Scarp deserves recognition as a local biodiversity hotspot in the species rich south-west. Key features of this diverse flora are listed below.
 - A centre of speciation with more than 40 species having been recently described in the Whicher Scarp and another 25 being expected to be able to be differentiated genetically and/or morphologically.
 - A highly endemic flora at a national, regional and local scale. The Whicher Scarp is a local centre of species endemism in the species rich south-west.
 - More than 60 species are State listed species, eight being Declared Rare and 53 Priority Species. Nine species are Commonwealth Listed.
 - There are 49 species at the northern end of their range and 32 species at the southern end of their range.
 - More than 100 species have populations in the Whicher Scarp which are disjunct, sometimes remarkably so, from other populations of the taxon.
- Distinctive Vegetation (Table 1 and 2)
 - Seven unique vegetation complexes occur on the Whicher Scarp – WC, WCv, Y, Yd, Yf, Yw and CSs (Table 1 and 2), of which two are highly restricted (WCv and Yf) and three have less than 30% of their area remaining (CSs, Yf and Yw). Keighery *et al.* (2008a) and DAFWA (2007) place CSs as part of the Swan Coastal Plain. This report and the RFA place CSs as part of the Whicher Scarp after Matiske and Havel (1998).
 - A diverse range of woodland plant communities, including the most southern of the species rich Banksia Woodlands allied with those of the Swan Coastal Plain.
 - Four distinctive regional floristic community patterns are distinguished in the Whicher Scarp (Table 1 – upland groups A, B, C and wetland groups E, F and G).
 - A set of restricted woodland communities are associated with the Whicher Scarp. Four of these (Table 1 – A1, B2, C1 and C2) are found on sandy Whicher Scarp surfaces and are listed Priority Ecological Communities (PECs). A highly restricted community is found in the Dardanup Forest Block (Table 1 - C5), which is also a listed PEC.



MAP 2: Biogeographic regions and major landforms of the Bunbury/Leeuwin-Naturaliste area (Webb *et al.* 2009).

- Restricted and rare wetland communities (Table 1)
The Whicher Scarp is associated with a series of distinctive wetlands including occurrences of the Busselton Ironstone communities (Table 1 – H), this group is equivalent to the Swan Coastal Plain floristic community type 10b, which are a Threatened Ecological Community (TEC) listed by both the state and the commonwealth (DEC 2010a). Two other wetland communities are listed PECs (Table 1- F1 and G2).
- High degree of intactness of native vegetation
Large areas of native vegetation on the Whicher Scarp are in excellent condition, some study sites being free of any weeds. Less than 8% of the flora of the Whicher Scarp is weeds.
- A diversity of unusual relictual habitats
The deep sands of the Whicher Scarp with their associated restricted plant communities and flora are relicts of a past landform stretching from Geraldton to Augusta.
- Ecological linkages maintained
Within the Central and North Whicher Scarp effective ecological linkage is maintained; however, the West Whicher is mainly private land and is heavily cleared. The Whicher Scarp, forms a major regional ecological linkage between the Darling Plateau and the Leeuwin-Naturaliste Ridge.



PHOTOGRAPH 3: A view of a Mountain Marri (*Eucalyptus* or *Corymbia haematoxylon*) dominated plant community. Mountain Marri is the distinctive tree species of the Whicher Scarp. In early summer this species is distinguished by its new red foliage. Insets show the cream summer flowers and fruit. This tree is an important food source for Red Tailed Black Cockatoos.

Table 1: Priority/Threatened Ecological Community (Column 1, after DEC 2010) listed against Whicher Scarp Floristic Community Types (Column 2, after Keighery *et al.* 2008a), number of quadrats in each WHSFCT group (Column 3), quadrats against vegetation complex and soil –landscape unit (Column 4) and quadrats allocated to Whicher Scarp Public Land Reference Area (WHS RA) (Column 5).

PEC or TEC	Whicher Scarp Floristic Community Types (WHSFCTs)		No quads	Quadrats followed by Vegetation Complex (after Mattiske and Havel 1998 or Heddl <i>et al.</i> (1980)/soil landscape unit (DAFWA 2007)	Quadrats allocated to WHS RA, on bass of soil landscape units but with CS (Cartis) in WHS
	A Whicher Scarp woodlands of grey/white sands		23		
P1	A1	Central Whicher Scarp Mountain Marri woodland	7	ACTN01(SWA-AB/AB1), SABI07 (WC/WC2), SABI08 (WC/WC2), SABI09 (WC/YLd), SABI12 (T/WC2), WH04 (Y/YL1), WH06 (T/WC2)	6 WHS RA (4WS, 2Y) 1 SWA
	A2	North Whicher Scarp Jarrah and Woody Pear woodland	5	DARP02 (SWA-Gu/CSs), GOOD02 (RO/RO), OATES-1 (SWA-AB/AB1), UCL06 (Y/YL), WONN-2 (SWA-AB/ABw)	5 WHS RA (1Y, 1BP, 2 SWA)
	A3	North Whicher Scarp Banksia and Woody Pear woodland	4	DARP06 (CS/CSs), DARP07(CS/WC2), GAV01 (WC/WC2), GWINDR01 (CS/WC2)	4 WHS RA (3 WC, 1 CS)
	A4	Whicher Scarp <i>Banksia grandis</i> , Jarrah and Marri woodland	1	will02 (Yd/YLd)	1 WHS RA (Y)
	A5	Central/North Whicher Scarp Mountain Marri woodland	6	DAVE03 (RO/RO3), UCL01 (Y/YL), UCL02 (Yw/YLvw), UCL03 (Yw/YLvw), WH02 (Y/YLd), will04 (Y/YL)	6 WHS RA (5Y, 1BP)
	B Swan Coastal Plain centred woodlands of grey/white sands		22		
	B1	Swan Coastal Plain/North Whicher Scarp <i>Banksia attenuata</i> woodland	21	boyan 01 (C/WC2), buffer01 (KI/KI), dard02 (CS/WC2), GAV05 (WC/WC2), gibson01 (YL/YL1), GWINDR02 (CS/WC2), GWINDR03 (CS/WC2), HAPP02 (WC/WC2), kelly02 (WC/WC2)	9 WHS RA (7 WC, 1 Y, 1BP) 12 SWA
P1	B2	West Whicher Scarp Banksia attenuata woodland	1	CHAM03 (Y/YLd)	1 WHS RA(Y)
	C Whicher Scarp woodlands of coloured sands and laterites		49		
P1	C1	Central Whicher Scarp Jarrah woodland	10	ACTN02 (SWA-AB/AB1), GOUL01 (Y/YL1), kemp01 (T/WC2), SABI 10 (T/WC2), SABI11 (T/WC2), smith03 (Yw/YLw), TREE02 (Yw/Ylf), TREE03 (Y/YL2), TREE04 (T/YL1), wicher01 (Y/YL2)	9 WHS RA (6 Y, 3WC) 1 SWA
P1	C2	Whicher Scarp Jarrah woodland of deep coloured sands	8	ACTON-1 (SWA-Af/JDf), BOYA01 (CS/WC2), DAVE01 (WC/WC2), DAVE02 (WC/WC2), gibson02 (WC/WC2), HAPP01 (WCv/WCv), smith02 (T/YL1), WONN-1 (CSs/CSs)	7 WHS RA (5WC, 1Y, 1CS) 1 SWA
	C3	Whicher Scarp Jarrah and Mountain Marri woodland on laterites	11	boyan 02 (KI/RO3), DARP08 (CS/WC2), DAVE04 (RO/RO3), DAVE05 (RO/RO3), DAVE06 (RO/RO3), GAV02 (KI/KI), GOOD03 (RO/RO), GOOD04 (RO/RO), kelly01 (WC/WC2), TREE01 (Y/YL2), WH05 (Y/YL1)	11 WHS RA (2WC, 2Y, 7 BP)
	C4	Whicher Scarp/Blackwood Plateau Jarrah and Marri woodland	17	CHAM01 (Y/YLd), CHAM02 (Y/YLd), DARP01 (JL/JL), DARP03 (JL/RO3), DARP 04 (JL/RO3), DARP05 (JL/JL), GAV03 (WCv/WCv), GAV04 (WCv/WCv), GIBB02 (YL/YL2), GIBB06 (YL/YL2), GOUL02 (Y/YL1), SABI01 (T/KI), SABI02 (RO/PR) , SABI04 (T/KI), SABI06 (RO/PR), UCL05 (Y/YL), WH03 (Y/YL1)	13 WHS (7Y, 2WC, 4BP) 4 BP
P1	C5	Dardanup Jarrah and Mountain Marri woodland on laterite	2	dard01 (KI/RO3), dard03 (KI/KI&WC2)	2 WHS RA
	E Jarrah and Marri woodland wetland type 1		3	davies04 (SWA-A/ABw), GOOD01 (RO/RO), WH01 (Y/YLd)	3 WHS RA (1 Y, 1 BP, 1 SWA)
	F Jarrah and Marri woodland wetland type 2		4		
P1	F1	Sabina River Jarrah and Marri woodland	2	SABI03 (RO/RO3), SABI05 (RO/PR)	2 WHS RA
	F2	Miscellaneous Wetlands	2	TAYL01 (SWA-Aw/ABw), UCL04 (Yw/YLvw)	2 WHS RA (1 Y, 1 SWA)
	G West Whicher Scarp wetlands		2		
	G1	Creekline Blackbutt (<i>Eucalyptus patens</i>) and Marri forest	1	GIBB01 (Yw/YLvw)	1 WHS RA (Y)
P1	G2	Shrublands of near permanent wetlands in creeklines	1	GIBB03 (Yw/YLvw)	1 WHS RA (Y)
TEC	H Busselton Ironstones		11	iron01 (Tw/Trv), iron02 (Tw/TRv), smith01(Yw/YLw), smith04 (Tw/TRh), will01 (SWA-AB/ABw), will03 (SWA-AB/ABw), WONN-4 (SWA-AB/ABwi), WONN-5 (SWA-AB/ABwi),WONN-6 (SWA-AB/ABwi), YIRON-1 (YW/YLwi), YIRON-2 (YW/YLwi)	4 WHS RA (2 Y, 2 BP) 7 SWA

4. Status of the Whicher Scarp Vegetation Complex

4.1 The Regional Forest Agreement and the Whicher Scarp

A key attribute in the formulation of RFA between the Commonwealth and State governments was the establishment of a Comprehensive, Adequate and Representative (CAR) reserve system. JANIS (1997) outlined biodiversity objectives for a CAR reserve system and a suite of biodiversity criteria required to achieve these objectives. A basis for much of the criteria relied on the reservation extent of forest ecosystems and vegetation complexes.

Prior to the RFA the state did not have mapped forest ecosystems and the vegetation complex mapping (Heddle *et al.* 1980) was restricted to the northern extent of the RFA area (Map 3a). To recognise forest ecosystems the State mapped forest associations and commissioned further vegetation complex mapping. Forest associations were derived from work originally undertaken by the Forests Department in the 1950's and 1960's. Information captured over this period for vegetated public land on dominant tree species and crown cover together with broad structural categories for areas of non-forest vegetation were consolidated into 1:250,000 scale maps.

Vegetation complex mapping is based on landform, soils and climatic zones and their relationship to vegetation (primarily understory vegetation). Mapping of this type was first undertaken for the northern RFA (that part in the Darling System) by Heddle *et al.* (1980) at a scale of 1:250,000. In the development of the RFA the extent of the Heddle *et al.* (1980) mapping within the RFA area (Map 3a) was revised to a scale of 1:50,000 and extended to cover the remainder of the RFA area (Mattiske and Havel 1998).

Forest ecosystems were developed through the subdivision of forest associations based on the grouping of like vegetation complexes.

4.2 Current Extent of Native Vegetation and Vegetation Complexes

Table 2 illustrates the areas and percentages of vegetation complexes that make up the Whicher Forest Ecosystem as defined by this expert panel. The categories of Pre-European area, tenures and reservation status, follow the definitions used for the current Forest Management Plan as this was the basis for determination of the reserve proposals against which this Whicher Scarp submission has been evaluated.

The area remaining as remnant vegetation of each complex is determined from the combination of Swan Bioplan remnant mapping and DAFWA mapping 2009, while the tenure status is based on DEC existing and proposed tenure at December 2008.

The vegetation complex mapping used for this review of the Whicher Scarp, has resulted from a DEC Forest Management Branch project (DEC 2010b) to merge the Mattiske and Havel RFA mapping with a new interpretation of Swan Coastal Plain datasets in a complimentary Swan Coastal Plain vegetation complex mapping. This did require some editing and extension of the original RFA mapping.

Table 2 - Whicher Scarp Vegetation Complexes as defined by the Regional Forest Agreement by Reserve Status and Forest Management Branch updated vegetation complex mapping (after Mattiske and Havel 1998)

Vegetation Code	Pre-European Area	Remaining Area	% of pre-European area remaining	State forest, Timber Reserve, Exec Dir. land	Other Public land	Private Property	Formal Reserves	Informal Reserves	Reserves Area Formal and Informal	% of pre-European Area in Formal Reserves	% of pre-European Area in Formal / Informal Reserves
CSs	2,967	465	16	47	0	381	31	6	37	1	1
WC	4,617	3,145	68	1,851	97	570	365	262	627	8	14
WCv	599	327	55	147	23	115	0	42	42	0	7
Y	9,045	3,475	38	1,373	294	1,259	279	270	549	3	6
Yd	2,215	1,255	57	0	170	854	38	193	230	2	10
Yf	36	6	18	0	0	6	0	0	0	0	0
Yw	4,215	1,110	26	0	99	643	35	332	368	1	9
Whicher Forest Ecosystem	23,694	9,783	41	3,418	683	3,828	748	1105	1853	3	8

4.3 Analysis against Forest Management Plan thresholds

The Whicher Scarp was not recognised as a unique forest ecosystem in the RFA assessment. The Darling Scarp found to the north and east of the Whicher Scarp and contiguous with it in the Boyanup/Dardanup area was recognised as the Darling Scarp forest ecosystem.

It is unclear why the Whicher Scarp was not considered a unique forest ecosystem at the time of RFA assessment, but incomplete mapping is thought to be a major contributing factor, because:

- the Whicher Scarp was not entirely mapped, and the majority of the south-western extent of the Swan Coastal Plain including small areas of the Whicher Scarp were entirely unmapped in relation to vegetation complexes (Map 3).
- In addition to this a significant area of the Whicher Scarp in the vicinity of the Capel River was outside of the RFA boundary. This area, while subject to Heddle *et al.* (1980) vegetation complex mapping, was not updated in the 1:50,000 scale revision by Mattiske and Havel (1998) and as such not included in the RFA assessment (Map 3).

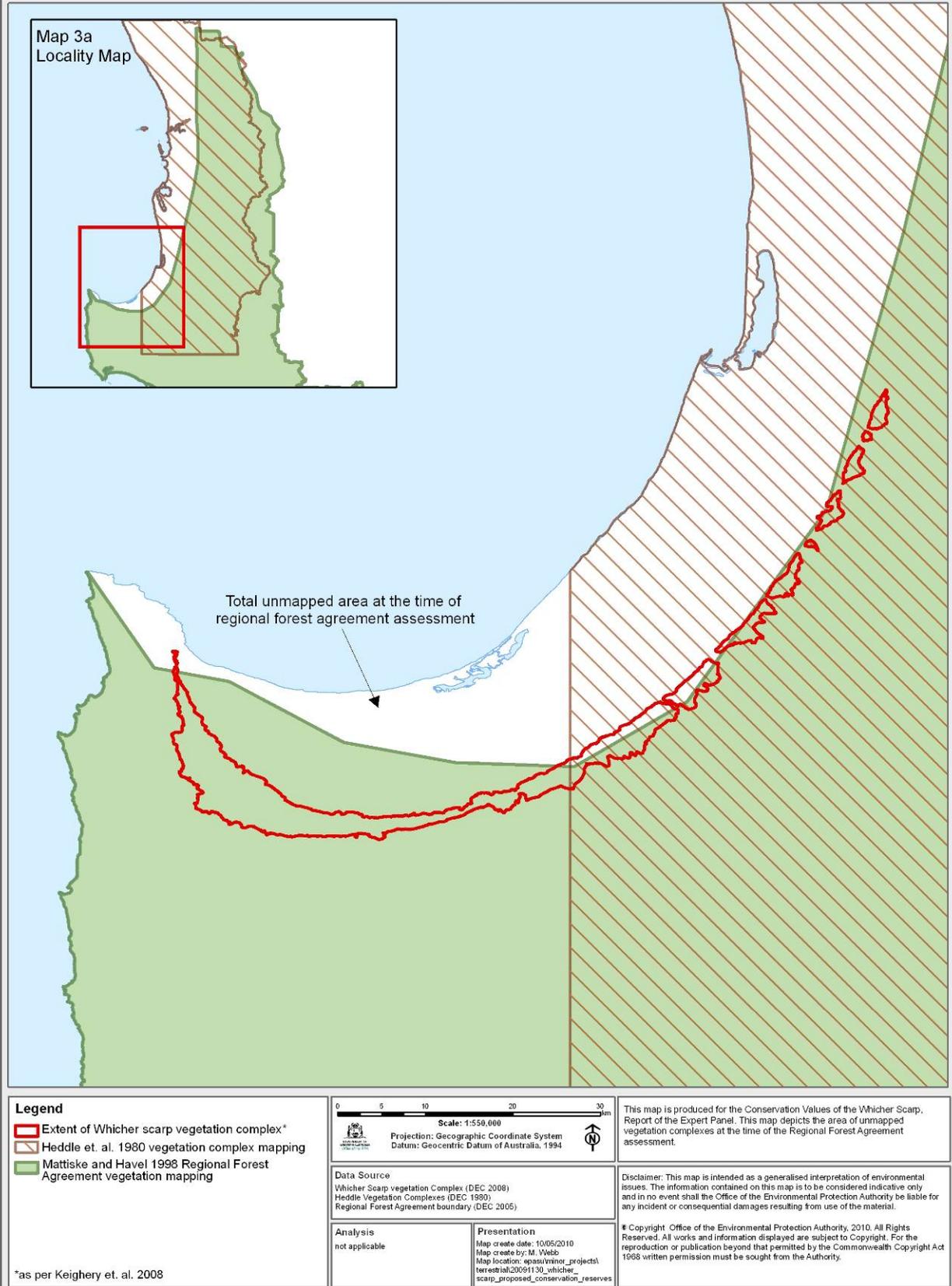
Subsequent vegetation complex mapping (RFA document addendum 1998) for this previously unmapped area has confirmed that the Whicher Scarp supports a unique set of vegetation complexes particularly Whicher, Yelverton & Cartis. Keighery *et al.* (2008a) presents existing and new information to highlight the unique flora and vegetation of the Scarp which strongly supports the previous recognition of the unique vegetation complexes within the Scarp landform (Section 3.4).

The Whicher Scarp has been clearly defined as a unique forest ecosystem in terms of floristic composition and its position in the landscape. The committee considers that the WHS needs to be identified as a regional forest ecosystem in the 2013 review of the Forest Management Plan.

With recognition as a regional forest ecosystem, the WHS qualifies as being a poorly reserved ecosystem with only 8% of its pre-1750 extent in formal and informal reservation (Table 2). In addition to this the Scarp should be given consideration as a Vulnerable forest ecosystem (Commonwealth of Australia 1997) given that almost the entire forest ecosystem is subject to

continuing and significant threatening processes from current or pending mineral tenements (EPA 2009).

Map 3 Whicher Scarp Vegetation Complex Extent



MAP 3: Remnant vegetation, crown lands and conservation areas within the Whicher Scarp.

5. Conservation of the Whicher Scarp Values

The Whicher Scarp supports a distinctive, often restricted, set of plant communities and an associated rich flora characterised by a significant number of populations of endemic, relictual, disjunct and rare species (Section 3). The Whicher Scarp plant communities are mapped in seven Whicher Scarp vegetation complexes, which are here considered to form the Whicher Scarp forest ecosystem (Section 4).

For the purpose of this report, and in keeping with Keighery *et al.* (2008a), the Whicher Scarp values are considered to extend beyond the mapped boundaries of the Whicher Scarp landform (Map 1 and 2). To cover most of these occurrences, a set of Whicher Scarp Public Lands Reference Areas were mapped by Keighery *et al.* (2008a) as shown here in Maps 4 - 10. These Reference Areas extend from the boundaries of the Whicher Scarp landform to around a kilometre onto the Blackwood Plateau and about half a kilometre onto the Swan Coastal Plain within areas of public lands (state forest, timber reserves, miscellaneous reserves and Unallocated Crown Land (UCL)). Eight Public Land Reference Areas are distinguished, each named for the Forest Block on which they are centred, being: Yelverton forest, Treeton forest, Whicher forest, Abba forest, Happy Valley forest, Argyle forest, Boyanup forest and Dardanup forest. These Reference Areas are distinguished by the EPA (2009, Map 2).

The Expert Panel recognises that the decision to change tenure or amend the existing tenure boundaries will not be made on the basis of this report alone. Rather, it will form part of a process requiring a wider systematic review of forest conservation, undertaken during the development of the next Forest Management Plan.

5.1 Protection of Vegetation and Flora of the Whicher Scarp

Currently areas of the Whicher Scarp vegetation are conserved in four land categories being:

- National Park – A narrow sliver of the Yelverton forest Reference Area (West Whicher Scarp) extends into the main block of the Yelverton National Park and the southern portion of the Whicher National Park contains some of the Whicher forest Reference Area (Central Whicher Scarp).
- Nature Reserves – Two tiny Nature Reserves, Haag Nature Reserve and the unnamed Nature Reserve 45533 on Gale Road (Gale Road Ironstones) are located on the Whicher Scarp.
- Conservation Park - A portion of North Whicher Scarp, the most northern extent of the forest conservation areas (Dardanup Conservation Park) which cover part of the northern portion of the scarp.
- Forest Conservation Areas – the remaining area of the Yelverton Forest Block outside the National Park and the northern portion of the Whicher Forest Block contiguous with the National Park are identified in this category.

In addition the Gwindinup Reserve (Reserves 2307 and 25509) is managed for conservation of flora and fauna by the Capel Land Conservation District Committee.

However in consideration of the restricted nature of the Whicher Scarp vegetation complexes (and validity of recognising these in a Whicher Scarp Forest Ecosystem), plant communities and flora, the Scarp is inadequately protected and a series of general recommendations are presented below. Specific area recommendations for conservation of the West, Central and North Whicher Scarp (Map 1) are developed in Section 5.2.

The Panel recommends that DEC should:

- recognise the Whicher Scarp as a forest ecosystem;
- treat Whicher Scarp as a “poorly reserved forest ecosystem” informal reserve for the remainder of the current FMP and considered for addition as a “poorly reserved forest ecosystem” informal reserve for the next FMP, based on the percentage of the pre-European area in existing or proposed formal plus CAR informal reserves; and
- consider the vegetation complexes that comprise Whicher Scarp for recognition as “less well reserved vegetation complexes”.

An important value of the Whicher Scarp vegetation is its ‘significant flora values’ as described in the FMP 2004-2015, Appendix 13 (Conservation Commission of Western Australia 2004). Specifically the Whicher Scarp flora has the following characteristics listed under this category being, ‘areas of high flora species richness, centres of endemic flora, centres of relictual flora, centres of disjunct flora, threatened / priority ecological communities, and declared rare flora’ (see Section 3). The Whicher Scarp vegetation demonstrates these values at an exceptional level. As a consequence, there is a need not only to address the conservation status of the communities of the Scarp but also the address the survey effort required in the area of the Whicher Scarp, and its influence, prior to any disturbance activities.

The Panel recommends that the A/Director SFM should:

- require that the species listed in Appendix 1 of this Report should be used by botanists as “significant species” for the purpose of flora surveys in association with proposed disturbance activities in and adjacent to the Whicher Scarp Forest Ecosystem; and
- require that for the purpose of flora surveys associated with proposed disturbance activities in/adjacent to the Whicher Scarp that botanists are familiar with and can recognise PECs of the Whicher Scarp in the field (Table 1).

5.2 Recommendations for Specific Conservation Areas

A series of specific area recommendations for conservation of the Whicher Scarp have been developed. Keighery *et al.* (2008a) presented a series of broad recommendation to more securely conserve the West, Central and North Whicher Scarp (Map 1). The Panel reviewed these recommendations and makes the following recommendations. These recommendations took into account natural values of the Whicher Scarp, the extent of the Whicher Scarp values (with particular reference to the mapped Reference Areas) and management considerations. An important consideration in boundary determination is that the boundary be recognisable on maps and on the ground. As a consequence management tracks were the preferred boundaries. Tracks were generally selected beyond the Reference Area boundaries to ensure coverage of the Whicher Scarp values and of the interface between the Whicher Scarp and Blackwood Plateau. In one case, Proposed Abba Conservation Reserve (Map 4 and 9) the boundary is inside the Reference Area boundary but this is considered offset by the other extensions beyond Reference Area boundaries.

In two instances, Proposed Yelverton Conservation Area (Map 4 and 5) and Proposed Dardanup Conservation Area (Map 4 and 7), the recommendations encompass the full extent these public land blocks. It is recognised that areas of land, at times, well beyond the extent of the Reference Areas are included in these areas. Particular values of these lands (see specific recommendations) as well as the following shared circumstances/values were taken into account in developing these recommendations:

- The areas represent the largest areas of public land at the most western (Proposed Yelverton Conservation Area) and most northern (Proposed Dardanup Conservation Area) extent of the Whicher Scarp.
- Each area of public land is relatively small and separated from other public lands.

The specific area recommendations are considered in two sections related to their proximity to other formal conservation reserves.

5.2.1 Consolidation of Conservation lands

As outlined previously three formal conservation areas on the Whicher Scarp, Yelverton National Park, Whicher National Park and the Dardanup Conservation Park conserve areas of Whicher Scarp. The boundaries of each of these were reviewed to develop the following recommendations. Specific area reports that referred flora and vegetation values of the Yelverton Forest (Keighery *et al.* 2008b) and the Dardanup Forest (Keighery *et al.* 1996 and 2008c) were taken into account in developing these recommendations.

West Whicher Scarp: Yelverton National Park

The Yelverton National Park does not include any areas mapped as the Whicher Scarp System or vegetation complexes. A small area of the Yelverton Reference Area is encompassed in the northern Yelverton area. The full extent of the southern Yelverton area is included in the recommendation

The boundaries of the Yelverton National Park should be expanded to include the full extent of the Yelverton forest public lands (Yelverton forest), thus encompassing significant areas of the upland and wetland communities, including the PECs (Table 1 - B2 and G2) associated with the West Whicher Scarp as well as populations and habitat of a series of significant species (Keighery *et al.* 2008b) and the interface between the Whicher and the Margaret River Plateau (Crown Reserves 29192 and 36715).

The Panel recommends that:

- The boundaries of the Yelverton National Park be expanded to include the full extent of the Yelverton forest public lands (includes Crown Reserves 29192 and 36715) (Map 4 and 5).

Central Whicher Scarp: Whicher National Park

Currently the boundary of the Whicher National Park excludes contiguous public lands (DEC estate and Crown Reserves 24584 and 22455) on its northern boundary. The addition of these areas to the National Park would allow for the inclusion of all areas of the restricted and rare communities and PECs (Table 1 - A1 and C1) associated with these sandy slopes north of Sabina Road and populations and habitat of a number of significant species including *Lambertia rariflora* subsp. *rariflora* (P4), *Actinotus whicheranus* (P2, recommended for listing as Declared Rare Flora (DRF)) and *Platytheca* sp. *sabina* (G.J. & B.J. Keighery 295)(recommended for listing as P1). The area identified above is closest to that recommended in the draft System report in 1974 (see Figure 4 in Keighery *et al.* 2008a). Additional work has established that the values attributed to the area in 1974 continue to be demonstrated in the area, and at a higher level than originally shown. In addition, as stated earlier these values are demonstrated by the entire extent of the Whicher Scarp.

The Panel recommends that:

- the boundaries of the Whicher National Park be expanded to include the full extent of the Central Whicher Scarp slopes on public lands (includes Crown Reserves 24564 and 22455 [south of the Vasse Hwy]) (Map 4 and 6).

North Whicher Scarp: Dardanup Conservation Park

A series of reports/publications have identified very significant flora and vegetation values for the entire area of the Dardanup Forest Block (Keighery *et al.* 1996, 2008a, 2008c). These include the following:

- Supports vegetation of four major landforms being the:
 - Swan Coastal Plain;
 - largest, northern-most area of the Whicher Scarp;
 - largest, northern-most area of the Blackwood Plateau; and
 - Darling Scarp.
- The largest known area of the interface four major landforms - Swan Coastal Plain/Whicher Scarp/Blackwood Plateau/Darling Scarp.
- Only recorded location of the PEC identified as the Dardanup Jarrah and Mountain Marri woodland on laterite (Table 1 - C5). This community is considered to reflect the interface of the Whicher Scarp, Blackwood Plateau and Darling Scarp.
- Supports a diverse flora of more than 450 native plant taxa with the following particular values:
 - contains significant representations of the flora of the four major landforms it encompasses;
 - supports large number of significant taxa including at least 11 at the end of their range; and
 - contains important populations of Whicher Scarp endemics including *Gastrolobium whicherense*, *Stylidium perplexum* [previously *Stylidium* sp. Dardanup (G.S. McCutcheon 1066)], *Synaphea polypodioides*, *Lomandra whicherensis* and *Logania wendyae*.
- Most northern vegetated public land area in the regionally significant ecological linkage on the Whicher Scarp from this block to the Whicher National Park.
- High degree of intactness of native vegetation.

In consideration of these previously documented values, the specific very high Whicher Scarp values (partially encompassed in the Dardanup Conservation Park) and the relatively small consolidated nature of the Dardanup Forest the following recommendation was developed.

The Panel recommends that:

- the boundaries of the Dardanup Conservation Park be expanded to include the full extent of the Dardanup Forest Block, consolidating the Conservation Park and proposed Nature Reserve and contiguous public lands (Map 4 and 7), thus encompassing a unique set of communities and transitional communities associated with the Swan Coastal Plain, Whicher Scarp, Blackwood Plateau and Darling Scarp; and
- consideration be given to making this a National Park (includes Crown Reserve 8439), which is consistent with the approach taken with the Whicher and Yelverton conservation lands.

5.2.2 Recommendations for New Conservation Lands

The Panel has reviewed the extent of the Whicher Scarp communities outside the conservation reserves and makes the following broad recommendations about the proposed boundaries of areas suitable for conservation reserves, which are not contiguous with existing or proposed conservation estate, and would form the basis for new conservation reserves;

Central Whicher Scarp: Treeton forest Reference Area

The Treeton forest supports substantive Central Whicher Scarp flora and vegetation values including the following.

- Representation of two Whicher Scarp vegetation complexes being Yelverton (Y and Yw).

- Areas of the restricted and rare upland Whicher Scarp floristic community types C1 and C2, both listed as PECs (Table 1).
- Laterites that are shared with and/or intergrade with those of the adjacent Blackwood Plateau.
- Four occurrences of a restricted and rare wetland community of the Whicher Scarp - Busselton Ironstone communities, a listed TEC (four occurrences) and two drainage lines (Table 1).
- Large number significant taxa including at least five taxa at the end of their range and a series of rare taxa including *Daviesia elongata* subsp. *elongata* (DRF), *Lambertia rariflora* subsp. *rariflora* (P4), *Gastrolobium modestum* (DRF) and *Dryandra nivea* subsp. *uliginosa* (DRF).
- Ecological linkage between the Abba, Whicher and Treeton forest areas through contiguous areas of the Blackwood Plateau forest blocks; contiguous area of Whicher Scarp vegetation on private land to north.
- High degree of intactness of the remaining native vegetation (there are significant areas pine plantation/gravel mines that have lead to the fragmentation of the native vegetation).

The Panel recommends that:

- a Central Whicher Scarp conservation area be established in the Treeton forest north of Gaywal Road, including all native forest and all native forest islands within the pine plantations to protect the specific Whicher Scarp values identified. (Map 4 and 8).

North Whicher Scarp: Abba forest Reference Area

The Abba forest supports substantive North Whicher Scarp flora and vegetation values including the following.

- Representation of six Whicher Scarp vegetation complexes being the Yelverton (Y and Yw and Yd), Whicher (Wcv and Wc) and Cartis (Cs).
- Four Whicher Scarp floristic community types typical of the restricted sandy north/north-west facing slopes (Table 1 - A2, A3, A4 and C2), one of which is a listed PEC (C2).
- Laterites that are shared with and/or intergrade with those of the adjacent Blackwood Plateau (Table 1 - C4).
- Restricted and rare wetland communities of the Whicher Scarp and Whicher Scarp/Swan Coastal Plain Interface Wetlands.
- Areas of restricted wetland communities including the Evans/Claymore Rd Swamp and Swan Coastal Plain Paluslope Wetlands, a state listed PEC.
- The largest area of Whicher Scarp/Swan Coastal Plain interface in public lands including the Williamson Road Busselton Ironstones.
- Interface of the Whicher Scarp/Swan Coastal Plain, through private lands and road/rail reserve, with the only almost complete transect of the Swan Coastal Plain (south of Shire of Serpentine-Jarrahdale). This transect includes a series of listed TECs including the Tutunnup Road Busselton Ironstones.
- Supports diversity of the flora of the North Whicher Scarp, a large number significant taxa including at least 18 at the end of their range, a series of rare taxa such as *Astroloma* sp. Nannup (R.D. Royce 3978) (P4), *Hemigenia rigida* (P1), *Pultenaea skinneri* (P4) and *Acacia flagelliformis* (P4) and many populations of disjunct taxa including *Actinostrobus acuminatus*.
- Ecological linkage between the Abba, Whicher and Treeton forest areas through contiguous areas of the Blackwood Plateau forest blocks.
- Ecological linkage with contiguous Swan Coastal Plain vegetation.
- High degree of intactness of native vegetation (significant areas pine plantation, gravel mines, rolled vegetation).

The Panel recommends that:

- a North Whicher Scarp conservation area be established in the Abba forest, bounded by Vasse Highway, Haley Road, Claymore Road, River Road and the boundary of Abba Forest Block to protect the specific Whicher Scarp values identified (includes Crown Reserves 18915, 14732, 18047, 1460, 22455 [north of the Vasse Hwy] and UCL Locations 4580, 1784, 1783) (Map 4 and 9).

North Whicher Scarp: Argyle forest Reference Area

The Argyle forest supports substantive North Whicher Scarp flora and vegetation values including the following.

- Areas of three Whicher Scarp vegetation complexes being Cartis (Cs) and Whicher (Wcv and Wc).
- Plant communities of the Whicher Scarp sandy slopes (Table 1 - A3 and C2), a group of communities associated with laterites that are shared with and/or intergrade with those of the adjacent Blackwood Plateau (Table 1 - C3 and C4) and a group of communities on grey sands that are shared with those of the Swan Coastal Plain (Table 1 - B1). One of these (Table 1 - C2) is a PEC.
- Supports diversity of the flora of the North Whicher Scarp and extensive populations of a large number of significant taxa including at least nine taxa at the end of their range and a series of rare taxa including *Daviesia elongata* subsp. *elongata* (DRF), *Logania wendyae* (P1), *Stenanthemum sublineare* (P2) and the newly recognised taxa, *Lomandra whicherensis* and *Platytheca anasima*.
- Ecological linkage with contiguous Blackwood Plateau vegetation within State forest.
- A very high degree of intactness of native vegetation in what is considered the least disturbed area of the Whicher Scarp and adjacent Blackwood Plateau.

The Panel notes this recommendation for a North Whicher Scarp conservation area in the Argyle forest and recommends that the final boundary for consideration in the next FMP should take into account the Whicher Scarp vegetation and the findings of the recommended survey of the Blackwood Plateau. Any proposal based on this analysis has the potential to provide a consolidated reserve of the Whicher Scarp, Blackwood Plateau, and potentially elements of the Darling Scarp. Of particular interest is the Camp Gully and Britten Gully catchments as Whicher Scarp plant communities (and Swan Coastal Plain communities) extend substantially beyond their mapped boundaries in drainage lines. The boundary of the proposed new conservation reserve has been selected because it encompasses all the recognised Whicher Scarp, the interface with the Blackwood Plateau, a significant area of the Camp Gully and Britten Gully catchments and utilises the nearest suitable low profile road.

The Panel recommends that:

- a North Whicher Scarp conservation area be established in the Argyle forest to protect the specific Whicher Scarp values identified (includes Crown Reserve 9767) (Map 4 and 10).

5.2.3 Recommendations for Non DEC Public Lands

In some cases these recommendations include areas of other public land that are contiguous with the DEC estate. Many of these reserves are currently being used for Basic Raw Materials (BRM) supply and a variety of other potentially incompatible uses.

The Panel recommends that DEC:

- work with the relevant LGA to prevent further clearing of intact Whicher Scarp vegetation and facilitate the rehabilitation of disturbed lands with a view to possible future incorporation into adjoining proposed conservation reserves.

West Whicher Scarp: Gale Road Crown and UCL Reserves

The large body of remnant vegetation comprised of Crown Reserve 37063 and UCL locations 2569, 2570 and an unnumbered UCL reserve south-east of the junction of Gale and South - Carburnup Roads supports Whicher Scarp vegetation together with a large transitional area of Whicher Scarp / Blackwood Plateau interface vegetation. This area supports West Whicher Scarp flora and vegetation values including the following;

- Representation of the Whicher Scarp Yelverton (Y) vegetation complex;
- Contains the easternmost upland and is adjacent to and contiguous with the easternmost wetland communities of the West Whicher Scarp;
- Provides a significant linkage opportunity between the Central and West Whicher Scarp;
- Contains the western most extent of a Whicher Scarp coloured sands plant community (Table 1 - C2), which is listed as a PEC;
- The intergrade of Whicher Scarp sand communities with the laterites of the Blackwood Plateau;
- A high degree of intactness of the remnant vegetation (predominantly of an Excellent condition); and
- The reserves have plant communities representing the interface of the Leeuwin Block, Blackwood Plateau and Whicher Scarp landforms.

The Panel recommends that DEC:

- establish a West Whicher Scarp conservation area in the Gale Road area by seeking DEC vesting of Crown Reserve 37063 and UCL Locations 2569, 2570 and the adjoining un-numbered UCL location (Map 11).



PHOTOGRAPH 4: Wendy's Logania (*Logania wendyae*) is a Whicher Scarp endemic, confined to the North Whicher Scarp (currently only known from Dardanup, Boyanup and Argyle forests) and is listed as Priority 1. This species was first located in the Dardanup Forest Block by G Keighery in the late 1990s during a CALM, DEP and Wildflower Society of WA botanical survey.

6. Environmental and Threatening Processes and their Management

6.1 Weed Flora

The Whicher Scarp is notably free of weeds despite it being in close proximity to a number of rapidly developing communities, notably Busselton and Dunsborough, as well as a number of smaller rural communities such as Dardanup, Boyanup, Capel and Donnybrook. It is the closest area of public forest encountered by people seeking firewood, or who are dumping domestic and garden waste. The impact of these activities is noted to be increasing, particularly within forest blocks such as Treeton, Happy Valley and the southern extent of Argyle. It is likely that such activities are resulting in the introduction of weeds and other degradation, and it is expected that these impacts will increase with increasing local populations.

With its long perimeter with surrounding cleared lands it will be subject to on-going weed invasion threats from agricultural and environmental weeds. Invasion of perennial pasture grasses, such as Veldt Grass along tracks and edges is an ongoing issue. Areas of very high conservation value, such as areas with threatened and priority species and communities should be the priority for control. The relationship between increased cover of these grass weeds and fire (frequent fire increasing weed cover and the contributing to an increased fuel load) needs to be monitored and addressed before irreversible damage occurs. Areas that have been subject to other uses such as settlements and sand and/or gravel mining are nodes for weed invasion and should be targeted for inspection and control. An example of this is the Gwindinup Reserve where there have been numerous activities associated with an old settlement. Sand mining and rubbish dumping has introduced localised infestations of bulbous weeds such as *Freesia*, *Ferraria crispa* and *Lachenalia aloides* and the shrub *Genista canariensis*.

The Panel recommends that Blackwood and Wellington Districts:

- incorporate the Whicher Scarp into areas of “high conservation significance” for the purpose of monitoring and planning of weed control programmes as soon as possible;
- focus on high priority areas in the Whicher Scarp to ensure that weed invasion is limited to as low level as practicable; and
- focus on old settlements, sand mines and rubbish dumping sites to identify localised infestations of Alert species (such as bulbous weeds and succulents) which may become a problem under climate change.

6.2. Feral Animals and Pests

The main concern for feral animals and pests in the Whicher Scarp are those that will spread plant diseases or contribute to the loss of plant biodiversity. Therefore it is intended that the activities of species such as rabbits, pigs, goats and deer be monitored and control measures implemented as appropriate.

The Panel recommends that Blackwood and Wellington Districts:

- incorporate the Whicher Scarp into areas of “high conservation significance” for the purpose of monitoring and planning of feral and pest species programmes; and
- work with neighbours to undertake feral animal control where species are found on adjoining lands.

6.3. Phytophthora dieback

Phytophthora dieback is considered widespread and a major threat to the floristic values of the Whicher Scarp. It is important that all management activity within the scarp manage Phytophthora dieback to ensure that protectable areas remain free of the pathogen. An important step to managing the disease is to identify large non-infested areas and assess these areas for their protectability.

The Panel recommends that:

- the Phytophthora dieback occurrence be determined and disease free areas be identified as 'Protectable Areas' for management (see DEC Policy No. 3 - Management of Phytophthora and disease caused by it); and
- areas within Whicher Scarp should be considered for monitoring for the introduction of Phytophthora dieback as part of KPI 18 - *The effectiveness of dieback hygiene*; and
- the South West Region facilitate the development of a regional Hygiene Management Plan for the Whicher Scarp, to guide acceptable risk and hygiene implementation. (This plan would consider the use of amelioration treatments such as phosphite application).

Irrespective of an overall Phytophthora dieback occurrence map it is considered important that hygienic practices be incorporated into all soil disturbance activities. It is essential that DEC and all external organisations prepare hygiene plans prior to activities commencing.

The Panel recommends that Blackwood and Wellington Districts:

- require that the level of acceptable risk for all disturbance operations in the Whicher Scarp be reduced to the lowest possible level; and
- require all disturbance activities involving soil movement in and adjacent to Whicher Scarp be covered by a Hygiene Management Plan which quantify risks to uninfested areas.

6.4. Changing Hydrology

It has been identified that the Whicher Scarp has unusual ground water interactions resulting in unique plant communities. It is envisaged that there are activities such as drainage for agricultural and semi urban development, mine de-watering, the establishment of above-ground water supplies (e.g. dams, water-points) and the establishment large scale groundwater abstraction for domestic or agricultural purposes, that could change the hydrology of TECS, PECS or wetlands.

The Panel recommends that:

- drainage proposals associated with agricultural and subdivision development consider and ameliorate the impact on the floristic communities of the Whicher Scarp;
- impact caused by de-watering during mining on the floristic communities of the Whicher Scarp be monitored and ameliorated;
- DEC provide comment in relation to proposals to extract large volumes of groundwater within or adjacent to the Whicher Scarp landform, and these should require;
 - appropriate impact modelling;
 - the development of an ongoing monitoring program; and
 - contingency plans should adverse environmental impacts result.
- no above-ground water supplies be constructed within Whicher Scarp vegetation or within a location that will inundate vegetation of the Whicher Scarp; and
- existing DEC water points should be assessed prior to maintenance or upgrading to determine whether they are affecting the a hydrology of high priority areas of Whicher Scarp, and considered for relocation and rehabilitation if this is occurring.

In addition to the changes to the surface hydrology the drying of inundated areas or the uncovering of some soil types can activate the development of acid sulphate soils. Once activated these processes are very difficult to stop or ameliorate and the best option is seen to be prevention.

The Panel recommends that:

- the risk to soil values from the activation of acid sulphate soils will be minimised by:
 - ensuring that planning identifies the risk zone associated with acid sulphate soils for the operation;
 - managing operations in areas identified as having the potential to disturb acid sulphate soil in accordance with DEC Guidelines *Treatment and management of soils and water in acid sulfate soil landscapes* and ensuring these guidelines are followed to mitigate the impact if acid sulphate soils are activated;
 - ensuring that the scale of any proposed disturbance in susceptible sites is reduced to the smallest possible extent; and
 - existing DEC water points should be assessed prior to maintenance or upgrading to determine whether they are in acid sulphate soils, and if so should be considered for relocation and rehabilitation.



PHOTOGRAPH 5

The Whicher Boronia (*Boronia humifusa*) in the Argyle forest. This is a North Whicher Scarp endemic that is found in Argyle, Happy Valley and Abba forests. While this species can be locally common, it is restricted in its distribution. This species is listed as Priority 1.

7. Land Use and Management

Common land uses within the Whicher Scarp and hinterland include DEC managed lands, both native forest, managed as state forest and conservation reserves, and timber plantations, agriculture, subdivision and development, mining and extractive industries, public utilities, and tourism.

7.1 Land Use and Management on DEC Estate

7.1.1. Timber Harvesting

If the recommendations are accepted that the Whicher Scarp communities are recognized as informal reserves then this will excluded timber harvesting. In this case the on-going impact of timber harvesting on the Whicher Scarp will be a result of timber harvesting or haulage on the down slope native plant communities within the same mini-catchment.

The Panel recommends that:

- the level of acceptable risk from timber harvesting or roading activities that are upslope of the non-infested Whicher Scarp be as low as possible. This could involve the use of a combination of tactics including dry soil operations, split phase harvesting and the use of mini catchments.

7.1.2. Plantations on DEC Estate

The Whicher Scarp has a number of softwood plantations on DEC estate that are managed and harvested by the Forest Products Commission (FPC).

The Panel recommends that:

- plantation operations adjoining Whicher Scarp communities are conducted within the plantation and cleared breaks and do not involve disturbance of native vegetation areas within or adjoining the plantations;
- plantation operations adjoining non-infested Whicher Scarp communities are conducted with appropriate hygiene and timing to reduce the likelihood of disease introduction and spread (e.g. dry soil access);
- that FPC control weeds in the plantations to prevent or reduce the spread from the plantation to Whicher Scarp communities; and
- that FPC prepare and implement a plan to control pine wildings in areas of the Whicher Scarp adjacent to softwood plantations.

7.1.3. Fire Management

Fire is an integral part of the natural environment and is not considered a direct threat to the native plant communities within the Whicher Scarp. On-going prescribed burning is appropriate, however the Panel recognized the importance of maintaining a range of fuel ages.

The Panel recommends that:

- District staff and authors of "*A Floristic Survey of the Whicher Scarp*" liaise with Fire Management Services to identify areas that may be suitable as Fire Reference Areas.

Fire suppression and prevention activities (e.g. fire breaks maintenance) have the potential to spread *Phytophthora dieback* and weed species.

The Panel recommends that:

- unnecessary clearing or burn boundary upgrades to be avoided in Whicher Scarp communities;
- burn boundaries that place non-infested areas of the Whicher Scarp at risk of infestation by *Phytophthora dieback* be considered for relocation or closure and rehabilitation;
- District Fire Coordinators ensure fire lines placed through the Whicher Scarp are rehabilitated as soon as possible after the fire is declared safe; and
- fire lines placed through non-infested areas of the Whicher Scarp should be considered for monitoring for the introduction of *Phytophthora dieback* as part of KPI 18 - *The effectiveness of dieback hygiene*.

7.1.4 Roading and Basic Raw Material use by DEC or FPC

The Whicher Scarp is currently intersected by a range of road types and standards. The construction of new roads through the Whicher Scarp, and establishment of new Basic Raw Material (BRM) pits on the Whicher Scarp should be avoided. All road construction and maintenance should use appropriate hygiene practices and existing roads that put non-infested areas under threat from *Phytophthora dieback* should be considered for realignment. Road upgrading through the Whicher Scarp communities should only occur where viable alternatives do not exist and if approved should minimise disturbance to the Whicher Scarp communities.

The Panel recommends that:

- the new road construction through the Whicher Scarp be avoided;
- the existing road network through Whicher Scarp communities be reviewed by Blackwood and Wellington District and unnecessary roads be closed and rehabilitated;
- all upgrades and road maintenance be conducted in accordance an approved Hygiene Management Plan;
- Blackwood and Wellington Districts do not establish new BRM pits for DEC or FPC use within the Whicher Scarp; and
- existing pits established by DEC or FPC and Shires are rehabilitated by the proponent. This may include reworking of existing pits, e.g. crushers in gravel pits, to assist with rehabilitation without extension of the mined area.

7.1.5. Recreation

A number of informal and formal recreational activities have historically occurred within the Whicher Scarp and adjoining forest. Informal use of the area by walkers, horse riders, trail and mountain bike riders has been observed in the Whicher Scarp. Events such as endurance horse riding, trail bike and mountain bike events have previously occurred within the Whicher Scarp however not in the past two years. It is important to continue to manage approved activities, commercial tourism operators and informal recreational use to discourage inappropriate recreational activities. Organised events and Commercial Tourism Operators need to be assessed on a case by case basis with some activities such as local naturalists club walks likely to be compatible with the conservation of the Whicher Scarp whereas car rally events would generally be considered inappropriate.

The Panel recommends that:

- the existing track and trail network through Whicher Scarp communities be reviewed and unnecessary tracks and trails be closed and rehabilitated;
- the new track and trail construction through the Whicher Scarp be avoided;
- if approved, new tracks and trails should be designed, located, constructed and maintained to minimise the risk from *Phytophthora dieback* to uninfested areas, priority flora or threatened ecological communities within the Whicher Scarp;
- Blackwood and Wellington Districts to work with user groups to monitor impacts of approved trails; and
- DEC should not approve any organised recreational activity that could impact on the conservation values of the Whicher Scarp communities.

7.1.6 Other Forest Products

There are a range of forest management activities associated with the accessing and collection of other forest products on DEC estate that have the potential to impact on the native plant communities of the Whicher Scarp. These activities include:

71.6.1 Apiary

The Panel recommends that:

- unwanted existing apiary leases are not transferred and are abolished within the Whicher Scarp; and
- no new apiary sites are established within the Whicher Scarp.

7.1.6.2 Firewood Collection

The collection of the firewood from the Bunbury and Busselton hinterlands are a major pressure on the surrounding forest. The collection of firewood is currently managed by providing maps of areas approved for firewood collection, installation of signage and enforcement patrols. DEC has recognised the need to improve the management of this activity in accordance with legal requirements.

The Panel recommends that:

- South West Region does not designate or gazette firewood areas within Whicher Scarp;
- South West Region takes steps to close those firewood areas that are already established in the Whicher Scarp as soon as possible;
- Blackwood and Wellington Districts place additional signs in and around the Whicher Scarp area to discourage domestic firewood collection as soon as possible; and
- enforcement patrols be targeted on the Whicher Scarp to reduce the impact of illegal firewood collection on these communities.

7.1.6.3 Flora Collection

The FMP provides for harvesting of some wildflower species that occur naturally in stream zones or diverse ecotype zones. The Department is able to prepare a list of such species and District Managers may endorse harvesting in informal reserves for these species, where the harvesting would not significantly impact on the values of the informal reserve. The approval of wildflower picking according to this provision is not supported.

The Panel recommends that:

- all commercial wildflower picking be excluded from the Whicher Scarp; and
- seed collection be excluded from the Whicher Scarp unless seed is required for rehabilitation projects within the Whicher Scarp.

7.2 Other Land Uses

7.2.1. Agriculture

The Panel recognizes that Whicher Scarp communities exist on agricultural land and intact communities should be identified and protected from degradation. The interaction with agriculture is predominately via applications for clearing of native vegetation which should recognize the values of the Whicher Scarp.

The Panel recommends that DEC should:

- confirm that the Whicher Scarp is regionally significant and that the information should be used by Native Vegetation Clearing section in the determination of clearing requests as soon as possible; and
- ensure a Whicher Scarp briefing is provided to Blackwood and Wellington District staff, Regional planning staff and Native Vegetation Clearing staff in DEC as soon as possible.

7.2.2 Sub-division and Development

The Panel recognizes that Whicher Scarp vegetation communities exist on land proposed for rural and semi-rural subdivision and intact communities should be identified and protected from clearing and degradation. DEC has interaction with the development process via a range planning processes and should aim to provide information and advice to decision makers to protect the Whicher Scarp.

The Panel recommends that:

- areas that are largely intact Whicher Scarp communities be protected and enhanced through the subdivision process; and
- DEC should consider providing a Whicher Scarp briefing to external stakeholders (Local Government Authorities, Environment and Planning officers, Industry and the community) following the endorsement of this report.

7.2.3. Mining and Extractive Industries

7.2.3.1. Exploration and Mining

Currently there are a number of active and pending mining tenements across the entire extent of the Whicher Scarp. These activities pose a significant threat to the values of the Whicher Scarp and any current or future assessment process should reduce or negate the impact on the values of the Scarp.

The Panel recommends that DEC:

- require that Environmental Management Branch approvals for all exploration proposals in the Whicher Scarp communities include measures to avoid or minimise vegetation clearing and the development of a Hygiene Management Plan;
- request the EPA to specify that requests to amend or extend current mine plans are required to identify and protect the floristic values of the Whicher Scarp in consultation with DEC; and
- seek to reduce or negate the mining activities impacts on the Whicher Scarp when providing comment on future mining proposals.

7.2.3.2. Basic Raw Materials

A number of BRM pits within the Whicher Scarp have been accessed previously by Local Government Authorities and other agencies (e.g. Main Roads Western Australia, Water Corporation) using Notice of Entry conditions under the Local Government Act (1995). These include gravel pits used primarily for road building purposes, and sand pits used primarily for land fill and construction purposes. The pits vary in their current status of use, completion and

rehabilitation. It is not envisaged that further pits be approved, however, the rehabilitation of existing pits will be facilitated. ‘Worked out areas’ may be revisited with new techniques to facilitate further extraction, landscaping and rehabilitation on a case by case basis.

The Panel recommends that DEC:

- does not approve new BRM pits within Whicher Scarp; and
- supports steps to rehabilitate those BRM pits that are already established.

7.2.4. Plantations Outside DEC Estate

The Whicher Scarp has a number of softwood and hardwood plantations established on land outside DEC estate. These plantations are managed and harvested by private individuals and companies and may have an impact on the adjoining Whicher Scarp.

The Panel recommends that DEC:

- work with adjoining landowners / plantation managers to prepare a plan to control pine wildings in areas of the Whicher Scarp adjacent to private plantations; and
- work with adjoining landowners and plantation operations adjoining non-infested Whicher Scarp communities to try to have plantation establishment, tending or harvesting operations conducted with appropriate hygiene and timing (e.g. dry soil access).

7.2.5. Utilities

The construction of any new utility infrastructure within the Whicher Scarp should be co-located within existing corridors and / or established on adjacent private land rather than Whicher Scarp. Maintenance works associated with pipeline and powerlines must be limited to the existing corridor and be conducted with sufficient hygiene. Management and maintenance activities within the Whicher Scarp are undertaken according to an approved Hygiene Management Plan.

The panel recommends that:

- the utility manager develop a vegetation management plan for Whicher Scarp communities intersected by or occurring within utilities corridors in consultation with DEC;
- the utility manager develop a Hygiene Management Plan for all disturbance activities involving soil movement that are proposed adjacent to or within utilities corridors in Whicher Scarp in consultation with DEC; and
- where possible new corridors should be located to avoid or minimize the further clearing of Whicher Scarp plant communities.



PHOTOGRAPH 6: The Whicher Pultenaea (*Pultenaea radiata*) is confined to the Whicher Scarp and near Blackwood Plateau. This is one of the species at the northern extent of its range in the Dardanup Forest Block and is a dominant species in the Central Whicher Scarp.

8. Targeted Research

The Whicher Scarp has been subject to detailed vascular flora and general vertebrate fauna surveys. Flora data has been collated, analysed and produced as the report “*Floristics of the Whicher Scarp*”. Fauna data was reviewed for the RFA, but remains somewhat disjointed and needs to be collated in the medium term. The major areas for targeted research are a comparison of the floristics of the Whicher Scarp to the adjacent Blackwood Plateau since the comparison to the Swan Coastal Plain has been recently completed. Experience elsewhere indicates that the potential for short range endemic fauna species is most likely in the surficial groundwater expressions of the Leederville and Yarragadee aquifers along the scarp and these need urgent study. *Phytophthora dieback* disease appears to have major impacts on the West Whicher compared to other sections and requires investigation.

8.1 Floristics

Detailed local and regional floristic data has been gathered and reported on for the Whicher Scarp and adjacent Swan Coastal Plain, however this is lacking for the adjacent Blackwood Plateau.

The Panel recommends that:

- DEC Science Division in conjunction with the Region and other interested agencies apply for resources to undertake a biological survey of the Blackwood Plateau. This should focus on wetlands as a priority and include other areas as resources permit.

8.2 Endemic Fauna

There are a series of restricted and rare wetland communities and very unusual paluslope wetlands along the Whicher Scarp. In other regions these are normally associated with short range endemic fauna.

The Panel recommends that:

- DEC Science Division apply for resources to undertake a project to identify, document and map any short range endemic fauna species that occur in the area. This information is essential to inform any use of groundwater in the study area for both mining proposals and other water use.

8.3 Disease

Observations of *Phytophthora cinnamomi* distribution and impact in the Whicher Scarp such as absence of infection down slope from an infected area and absence of collapse in presence of infection in the Central and North Whicher Scarp indicate that *P. cinnamomi* impact is poorly understood in the Whicher Scarp (Map 1).

The Panel recommends that:

- studies on the epidemiology and biology of *P. cinnamomi* be carried out across the Whicher Scarp by DEC to help understand the movement, impacts and management needs for this disease.

9. Appendices

Appendix 1 Significant taxa of the Whicher Scarp (after Table 10 Keighery *et al.* 2008)

KEY

= Additions/changes since 2008 report (Western Australian Herbarium 1998)

- Column 1** **Family**
Families are grouped into Ferns, Gymnosperms, Monocotyledons and Dicotyledons
- Column 2** **Scientific Name**
Genus + Species + Infra Species Rank + Infra Species Name + Informal Name from BJ Keighery *et al.* (2007). Some species names may be modified from original sources of information: DEP (1996) and Gibson *et al.* (1994). Some taxa yet to be formally described and named may have a reference collection number from the relevant collector. Taxa (species, sub-species and varieties) are listed alphabetically within genera.
* Weed
subsp. Subspecies
var. Variety
MS A manuscript name yet to be published
PN A phrase name for a taxon yet to be described and published.
- Column 3** **Common Name**
- Columns 4 - 8** **Significant Taxa**
- Column 4** **WA = Western Australian Listed Taxa**
Significant plant taxa (species, sub-species and varieties) listed under the State *Wildlife Conservation Act 1950* (Government of Western Australia 2006) and by the Department of Environment and Conservation (Atkins 2006). Priority taxa conservation code listings are current as at January 2008 (Western Australian Herbarium 2008). See Appendix 1 for further descriptions of the categories below.
R Declared Rare Flora: Extant Taxa
X Declared Rare Flora: Presumed Extinct Taxa
1 Priority 1: Poorly Known Taxa
2 Priority 2: Poorly Known Taxa
3 Priority 3: Poorly Known Taxa
4 Priority 4: Rare Taxa
- Column 5** **IUCN = Internationally Listed Taxa**
Significant plant taxa (species, sub-species and varieties) listed according to the *IUCN Red List of Threatened Species* as of December 2006. Taxa are listed on the IUCN website (IUCN 2007). See Appendix 1 for further descriptions of the categories below.
CR Taxa that are critically endangered
E Taxa that are endangered
V Taxa that are vulnerable
- Column 6** **Com = Commonwealth Listed Taxa**
Significant plant taxa (species, sub-species and varieties) listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* as of December 2006. Taxa are listed on the Department of the Environment, Water, Heritage and the Arts website (DEWHA 2007). See Appendix 1 for further descriptions of the categories below.
E Taxa that are endangered
V Taxa that are vulnerable

In some instances, the codes for the Commonwealth and the Internationally listed taxa differ; in these cases, the discrepancy is indicated by an asterisk in the 'Com' column.

Column 7**OS = Other Categories of Significance**

z Recently recognised taxa

Significant due to geographical location

- r** Populations at the northern (N) or southern (S) limit of their known geographic range, limit indicated as follows. Example: r (N or S, Locality, Region).
- d** Populations disjunct from their known geographic range
- p** Poorly reserved as is known from only a few populations in reserves (applies to all Declared Rare Flora and Priority taxa)
- s** Significant populations in reference to location, population size, diversity of ages and/or health (applies to all Declared Rare Flora and Priority taxa)
- u** Uncommon in the area (generally applies to disjunct populations)

Taxa with regional and/or ecological preferences**Endemic taxa**

- e** Local endemic, less than 100 km range
- e(AREA)** AREA after Map 3 (Biogeographic region or subregion)
 - SWA** Swan Coastal Plain (Swan Coastal Plain)
 - SWA(B)** Busselton area of the Swan Coastal Plain (Swan Coastal Plain)
 - WHS** Whicher Scarp (Jarrah Forest South)
 - BP** Blackwood Plateau (Jarrah Forest South)
 - SC** Scott Coastal Plain (Warren)
 - MP** Margaret River Plateau (Warren and Jarrah Forest South)
 - JF** Jarrah Forest (Jarrah Forest)
- Ne** Extends well north from WHS
- Se** Extends well south from WHS (and adjacent Busselton Plain at times)

Taxa with ecological preferences

- h** Taxa with distinct habitat preference Example: h (ironstone)
- a** Relictual species (monotypic genera are annotated)

Taxa with morphological and/or genetic variation

- v** Morphological variant, unsure of significance at taxonomic level
- t** Morphological variant, significant taxonomically
- g** Genetic variant

Column 8**Endemic (State)**

Taxa (species, sub-species and varieties) endemic to Western Australia (WA) or Australia (AUST; or >AUST = cosmopolitan). No records are given for weeds (see Hussey *et al.* 2007 for country of origin), unless the plant is also native to WA.

Family	Scientific Name	Common Name	Significant Taxa				Endemic
			WA	IUCN	Com	OS	
FERNS							
Adiantaceae	<i>Adiantum aethiopicum</i>	Common Maidenhair				d,p,s,u,h	AUST
Adiantaceae	<i>Cheilanthes austrotenuifolia</i>	Rock Fern				d,p,s,u,h	>AUST
GYMNOSPERMS							
Cupressaceae	<i>Actinostrobus acuminatus</i>	Creeping Cypress				d,p,s,u,h	WA
MONOCOTYLEDONS							
Anthericaceae	<i>Hodgsoniola junciformis</i>	Rush Lily				p,s,u,Se,h	WA
Anthericaceae	<i>Johnsonia acaulis</i>	Small Johnsonia				s,h,v	WA
Anthericaceae	<i>Johnsonia inconspicua</i>	Hidden Johnsonia	3			z,r(S, Yelverton, WHS),d,p,s,g	WA
Anthericaceae	<i>Johnsonia lupulina</i>	Elegant Johnsonia				Se,h	WA
Anthericaceae	<i>Laxmannia jamesii</i>	James' Paper Lily	4		V*	r(N, Whicher NP, WHS),d,p,s,u ,a	WA
Anthericaceae	<i>Thysanotus formosus</i>	Fringed Lily	1			r(N, Boyanup, WHS),p,s,u,eWHS/ BP	WA
Anthericaceae	<i>Thysanotus glaucus</i>	Fringed Lily	4			d,p,s,u,h	WA
Anthericaceae	<i>Thysanotus pseudojunceus</i>	Fringed Lily				r(N, Dardanup, WHS),d,s,u	WA
Cyperaceae	<i>Caustis dioica</i>	Caustis				r(S, Treeton, WHS),d,p,s,u,h,g	WA
Cyperaceae	<i>Caustis</i> sp. Boyanup (G.S. McCutcheon 1706) PN	Caustis	1			d,p,s,u,h,g	WA
Cyperaceae	<i>Cyathochaeta avenacea</i>	Cyathochaeta				v,t,g	WA
Cyperaceae	<i>Cyathochaeta clandestina</i>	Cyathochaeta				d,s,h	WA
Cyperaceae	<i>Cyathochaeta equitans</i>	Cyathochaeta				d,s,h	WA
Cyperaceae	<i>Cyathochaeta</i> sp. Carburnup (G.J. Keighery 14123)	Carburnup River Cyathochaeta				z,d,p,s,u,eSWA(B)/WHS,h	WA
Cyperaceae	<i>Cyathochaeta</i> sp. Sabina (SABI03&06)	Sabina River Cyathochaeta				z,p,s,u,eWHS,h	WA
Cyperaceae	<i>Cyathochaeta teretifolia</i>	Cyathochaeta	3			d,p,s,u,h	WA
Cyperaceae	<i>Evandra aristata</i>	Graceful Evandra				r(N, West WHS),d,s,u,Se,h	WA
Cyperaceae	<i>Gahnia decomposita</i>	Swamp Sawsedge				d,s,u,Se,h	WA
Cyperaceae	<i>Gymnoschoenus anceps</i>	Western Button Grass				r(N, West WHS),d,s,u,Se,h, a	WA
Cyperaceae	<i>Lepidosperma</i> aff. <i>resinosum</i> (A. Webb 10)	Busselton Lepidosperma				s,u,eSWA(B)/WHS	WA
Cyperaceae	<i>Lepidosperma obtusum</i>	Lepidosperma				r(W, Treeton, WHS),d,s,u,h,g	WA

Family	Scientific Name	Common Name	Significant Taxa				Endemic
			WA	IUCN	Com	OS	
Cyperaceae	<i>Schoenus pennisetis</i>	Schoenus	1			r(S,Goodwood Rd,WHS),p,s,u,h	WA
Cyperaceae	<i>Schoenus</i> sp. Whicher (G.J. Keighery and B.J. Keighery 901	Whicher Schoenus				z,s,u,eWHS	WA
Dasypogonaceae	<i>Baxteria australis</i>	Baxteria				s,Se,h,a	WA
Dasypogonaceae	<i>Calectasia narragara</i>	Blue Tinsel Lily				r(S,Whicher NP,WHS),s,u,h	WA
Dasypogonaceae	<i>Chamaexeros serra</i>	Little Fringe-leaf				d,s,u	WA
Dasypogonaceae	<i>Dasypogon hookeri</i>	Hooker's Pineapple Bush				r(N,Boyanup,WH HS),s,Se,h,a	WA
Dasypogonaceae	<i>Lomandra spartea</i>	Lomandra				r(S,Whicher NP,WHS),d,s,u,h	WA
Dasypogonaceae	<i>Lomandra whicherensis</i>	Whicher Lomandra				z,r(S,Argyle,WH S),p,s,u,e,h,a	WA
Iridaceae	<i>Patersonia limbata</i>	Hairy Flag				r(N,Dardanup,WH HS),d,p,s,u,Se	WA
Iridaceae	<i>Patersonia maxwellii</i>	Maxwell's Flag				r(S,Yelverton,WH HS),d,p,s,u	WA
Iridaceae	<i>Patersonia occidentalis</i> var. <i>angustifolia</i>	Swamp Flag				z,d,s,u,Se,h	WA
Iridaceae	<i>Patersonia umbrosa</i> var. <i>umbrosa</i>	Purple Flag				r(N,Gwindinup,WH HS),d,p,s,u,eS WA(B)/BP,h	WA
Orchidaceae	<i>Caladenia longicauda</i> subsp. <i>clivicola</i>	Spider Orchid	4			p,s,u,e	WA
Orchidaceae	<i>Caladenia plicata</i>	Crab-lipped Spider Orchid	4			p,s,u	WA
Orchidaceae	<i>Caladenia speciosa</i>	Sandplain White Spider Orchid	4			z,r(S,Whicher NP,WHS),p,s,u	WA
Restionaceae	<i>Chordifex isomorphus</i>	Chordifex	4			p,s,Se	WA
Restionaceae	<i>Empodisma gracillimum</i>	Empodisma				d,p,s,u,Se,h,a	WA
Restionaceae	<i>Hypolaena caespitosa</i>	Hypolaena				Se	WA
Restionaceae	<i>Hypolaena exsulca</i>	Hypolaena				eSWA(B)/WHS, v	WA
Restionaceae	<i>Hypolaena grandiuscula</i>	Hypolaena				r(N,Whicher,WH S),d,p,s,u,Se,h,a	WA
Restionaceae	<i>Lepyrodia heleocharoides</i>	Lepyrodia	3			r(SW,Yelverton,WH HS),d,p,s,u,Se	WA
Restionaceae	<i>Loxocarya magna</i>	Loxocarya	3			z,p,s,u,Se,h	WA
Restionaceae	<i>Loxocarya striata</i> subsp. <i>implexa</i> MS	Loxocarya				z,p,s,u,eSWA(B)/WHS,h	WA
Restionaceae	<i>Tyrbastes glaucescens</i>	Tyrbastes	4			z,p,s,u,Se,h	WA
Xanthorrhoeaceae	<i>Xanthorrhoea acanthostachya</i>	Prickly Balga				r(S,Abba,WHS), s,u,Ne,h,v,t	WA
Xyridaceae	<i>Xyris atrovirida</i>	Xyris				r(S,Abba,WHS), d,p,s,u,e,h	WA

Family	Scientific Name	Common Name	Significant Taxa				Endemic
			WA	IUCN	Com	OS	
Xyridaceae	<i>Xyris lacera</i>	Xyris				d,s,u,Se,h	WA
Xyridaceae	<i>Xyris lanata</i>	Xyris				d,p,s,u,Se,h	WA
Xyridaceae	<i>Xyris laxiflora</i>	Xyris				d,s,u,Se,h	WA
DICOTYLEDONS							
Apiaceae	<i>Actinotus whicheranus</i>	Whicher Flannel Flower	2			z,p,s,u,e,WHS,h	WA
Apiaceae	<i>Platysace haplosciadia</i>	Platysace				r(N,Abba,WHS),d,s,u	WA
Apiaceae	<i>Trachymene grandis</i>	White Lace Flower				d,s,u	WA
Apiaceae	<i>Xanthosia atkinsoniana</i>	Xanthosia				d,s,u	AUST
Apiaceae	<i>Xanthosia tasmanica</i>	Xanthosia				r(N,Dardanup,WHS),d,s,u,Se,t	AUST
Asteraceae	<i>Amblyosperma minor</i>	Claypan Native Gerbera				z,r(N,Dardanup,WHS),d,s,u,h	WA
Asteraceae	<i>Craspedia variabilis</i>	Bachelor's Buttons				d,s,u	AUST
Asteraceae	<i>Hyalosperma demissum</i>	Hyalosperma				r(S,Abba,WHS),d,s,u	WA
Asteraceae	<i>Olearia homolepis</i>	Olearia				d(Kemp Rd),u	WA
Asteraceae	<i>Olearia strigosa</i>	Olearia				r(S,Whicher NP,WHS),p,s,u,e SWA(B)/WHS	WA
Casuarinaceae	<i>Allocasuarina thuyoides</i>	Horned Sheoak				d,s,u	WA
Cephalotaceae	<i>Cephalotus follicularis</i>	Albany Pitcher Plant				r(N,Haag NR,WHS),d,p,s,u,h,a	WA
Dilleniaceae	<i>Hibbertia acerosa</i>	Needle-leaved Hibbertia				d,s,u	WA
Dilleniaceae	<i>Hibbertia aurea</i>	Hibbertia				d,s,u,v,g	WA
Dilleniaceae	<i>Hibbertia ferruginea</i>	Ferruginous Hibbertia				z,s,u,Se	WA
Dilleniaceae	<i>Hibbertia huegelii</i>	Huegel's Hibbertia				r(S,West WHS),d,s,u	WA
Dilleniaceae	<i>Hibbertia lasiopus</i>	Hibbertia				r(N,Argyle,WHS),d,p,s,u,t	WA
Dilleniaceae	<i>Hibbertia mylnei</i>	Hibbertia				d,s,u	WA
Dilleniaceae	<i>Hibbertia serrata</i>	Serrate-leaved Hibbertia				d	WA
Droseraceae	<i>Drosera hyperostigma</i>	Sundew				d,s,u	WA
Droseraceae	<i>Drosera myriantha</i>	Rainbow				r(N,Goodwood Rd,WHS),d,s,u	WA
Epacridaceae	<i>Andersonia aristata</i>	Andersonia				r(S,Gale Rd Ironstones,WHS),d,s,u,h	WA
Epacridaceae	<i>Andersonia barbata</i>	Andersonia				r(N,Abba,WHS),d,p,s,u,Se	WA
Epacridaceae	<i>Andersonia fallax</i> MS	Andersonia				z,r(N,Whicher NP,WHS),p,s,u,e WHS/BP,h	WA

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			WA	IUCN	Com	OS	
Epacridaceae	<i>Andersonia ferricola</i> MS	Ironstone Andersonia	1			z,r(S,Treeton,WHS),p,s,u,eSWA(B)/WHS,h	WA
Epacridaceae	<i>Andersonia heterophylla</i>	Andersonia				r(S,Whicher NP,WHS),d,s,u,h	WA
Epacridaceae	<i>Andersonia micrantha</i>	Andersonia				r(N,Boyanup,WHS),p,s,u,Se	WA
Epacridaceae	<i>Astroloma</i> sp. Nannup (R.D. Royce 3978) PN	Nannup Astroloma	4			z,r(N,Abba,WHS),p,s,u,Se	WA
Epacridaceae	<i>Leucopogon oliganthus</i>	Beard Heath				r(S,Abba,WHS),d,s,u,a,g	WA
Epacridaceae	<i>Leucopogon</i> sp. Whicher Range (G.J. Keighery 11763) PN	Whicher Beard Heath				r(N,Abba,WHS),s,eWHS/BP	WA
Euphorbiaceae	<i>Amperea micrantha</i>	Amperea	2			p,s,u	WA
Euphorbiaceae	<i>Amperea volubilis</i>	Amperea				r(N,Whicher,WH S),d,p,s,u	WA
Euphorbiaceae	<i>Ricinocarpos</i> aff. <i>cyanescens</i> (A. Webb sn 27 October 2003)	Whicher Ricinocarpos				z,p,s,u,eWHS,h	WA
Euphorbiaceae	<i>Stachystemon vermicularis</i>	Stachystemon				d,p,s,u,h	WA
Goodeniaceae	<i>Anthotium junciforme</i>	Anthotium	4			p,s,u,h	WA
Goodeniaceae	<i>Dampiera linearis</i>	Dampiera				v,g	WA
Lamiaceae	<i>Hemigenia rigida</i>	Hemigenia	1			p,s,h	WA
Lamiaceae	<i>Pityrodia bartlingii</i>	Woolly Foxglove				r(SW,Whicher,WHS),d,p,s,u,Ne,h,g	WA
Loganiaceae	<i>Logania wendyae</i>	Wendy's Logania	1			z,p,s,u,eWHS,h	WA
Mimosaceae	<i>Acacia browniana</i> var. <i>browniana</i>	Brown's Wattle				r(N,Gwindinup Reserve,WHS)	WA
Mimosaceae	<i>Acacia flagelliformis</i>	Rush Wattle	4			p,s,u,eSWA/WH S/BP,h	WA
Mimosaceae	<i>Acacia inops</i>	Wattle	3			d,p,s,u,Se,h	WA
Mimosaceae	<i>Acacia luteola</i>	Wattle				r(N,Dardanup,WHS),d	WA
Mimosaceae	<i>Acacia mooreana</i>	Moore's Wattle				r(N,Dardanup,WHS),s,h	WA
Mimosaceae	<i>Acacia preissiana</i>	Preiss's Wattle				r(S,WHS),s	WA
Mimosaceae	<i>Acacia semitrullata</i>	Wattle	3			p,s,u,h	WA
Mimosaceae	<i>Acacia tayloriana</i>	Taylor's Wattle	4			r(N,Abba,WHS),p,s,u,eWHS/BP	WA
Mimosaceae	<i>Acacia tetragonocarpa</i>	Wattle				d,s,u	WA
Mimosaceae	<i>Acacia uliginosa</i>	Wattle				r(N,Whicher,WH S),p,s,u,Se	WA
Myrtaceae	<i>Actinodium cunninghamii</i>	Albany Swamp Daisy				p,s,u,h,g	WA
Myrtaceae	<i>Agonis flexuosa</i> var. <i>flexuosa</i>	Peppermint				s,u,h	WA

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			WA	IUCN	Com	OS	
Myrtaceae	<i>Beaufortia sparsa</i>	Swamp Beaufortia				d,p,s,u,h,g	WA
Myrtaceae	<i>Beaufortia squarrosa</i>	Sandplain Beaufortia				r(S,Abba,WHS), d,p,s,u,Ne,h,g	WA
Myrtaceae	<i>Calothamnus pallidifolius</i>	Whicher Calothamnus				s,u	WA
Myrtaceae	<i>Calothamnus schaueri</i>	Schauer's Calothamnus				d,s,u	WA
Myrtaceae	<i>Calothamnus</i> sp. Scott River (R.D. Royce 84) PN	Scott River Calothamnus	2			z,r(N,Treeton,WHS),p,s,u,eWHS/ SC,h	WA
Myrtaceae	<i>Calothamnus</i> sp. Whicher (B.J. Keighery & N. Gibson 230) PN	Ironstone Calothamnus	4			z,p,s,u,eSWA(B) /WHS,h	WA
Myrtaceae	<i>Calytrix fraseri</i>	Pink Summer Starflower				d,s,u,h	WA
Myrtaceae	<i>Calytrix</i> sp. Tutunup (G.J. Keighery & N. Gibson 2953) PN	Ironstone Starflower	2			z,p,s,u,eSWA(B) /WHS,h,t	WA
Myrtaceae	<i>Calytrix tenuiramea</i>	Starflower				r(W,Whicher NP,WHS),d,s,u,h	WA
Myrtaceae	<i>Chamelaucium erythrochlorum</i> MS	Blackwood Wax	4			z,r(N,Dardanup, WHS),p,s,u,eSWA(B)/WHS/BP,h	WA
Myrtaceae	<i>Darwinia vestita</i>	Pom-pom Darwinia				r(NW,Dardanup, WHS),p,s,u,Se	WA
Myrtaceae	<i>Eremaea asterocarpa</i>	Star-fruited Eremaea				r(S,Argyle,WHS),d,s,u,eSWA/WHS,h	WA
Myrtaceae	<i>Eremaea pauciflora</i> var. <i>pauciflora</i>	Sandplain Eremaea				d,s,u,h	WA
Myrtaceae	<i>Eucalyptus decipiens</i> subsp. <i>chalara</i>	Swamp Limestone Marlock				z,r(N,Goodwood Rd,WHS),p,s,u,h	WA
Myrtaceae	<i>Eucalyptus haematoxylon</i>	Mountain Marri				r(S,Treeton,WH S),d,s,Ne,g	WA
Myrtaceae	<i>Eucalyptus megacarpa</i>	Bullich				d,s,u,h	WA
Myrtaceae	<i>Eucalyptus relictata</i>	Whicher Mallee	2			z,p,s,u,eWHS/BP,h,a	WA
Myrtaceae	<i>Eucalyptus relictata</i> x <i>lane-poolei</i>	Hybrid Whicher Gum				p,s,u,eWHS	WA
Myrtaceae	<i>Homalospermum firmum</i>	Homalospermum				d,s,u,h	WA
Myrtaceae	<i>Kunzea rostrata</i>	Orange-fruited Kunzea				r(N,Dardanup,WH S),s,eSWA(B)/WHS/BP	WA
Myrtaceae	<i>Paragonis grandiflora</i> MS	Strange Peppermint				r(S,Whicher NP,WHS),s	WA
Myrtaceae	<i>Taxandria fragrans</i> MS	Swamp Peppermint				r(N,Argyle,WHS),d,s,u,h	WA
Myrtaceae	<i>Verticordia densiflora</i> var. <i>pedunculata</i>	Compacted Featherflower	R	E	E	d,p,s,u,eSWA(B) /WHS,h	WA

Family	Scientific Name	Common Name	Significant Taxa				Endemic
			WA	IUCN	Com	OS	
Papilionaceae	<i>Aotus cordifolia</i>	Swamp Aotus	3			p,s,u,h	WA
Papilionaceae	<i>Bossiaea pulchella</i>	Beautiful Bossiaea				r(S,Abba,WHS),p,s	WA
Papilionaceae	<i>Bossiaea</i> sp. Waroona (B.J. Keighery & N. Gibson 229) PN	Foothills Bossiaea				z,r(S,Goodwood Rd,WHS)	WA
Papilionaceae	<i>Chorizema reticulatum</i>	Showy Flame Pea	3			r(N,Argyle,WHS),p,s	WA
Papilionaceae	<i>Chorizema spathulatum</i>	Flame Pea				r(N,Whicher NP,WHS),d,Se	WA
Papilionaceae	<i>Daviesia divaricata</i> subsp. <i>divaricata</i> MS	Daviesia				d,s,u,h	WA
Papilionaceae	<i>Daviesia elongata</i> subsp. <i>elongata</i>	Spreading Daviesia	R	V	V	p,s,u,eSWA(B)/WHS,h	WA
Papilionaceae	<i>Daviesia flexuosa</i>	Flexible Daviesia				r(N,West WHS),d,s,u,Se	WA
Papilionaceae	<i>Daviesia major</i>	Daviesia				r(S,Abba,WHS),d	WA
Papilionaceae	<i>Daviesia nudiflora</i>	Leafy Daviesia				r(S,Argyle,WHS),d,s,u,h,v	WA
Papilionaceae	<i>Dillwynia</i> sp. Capel (P.A. Jurjevich 1771) PN	Capel Dillwynia				z,r(N,WHS),p,s,u,eWHS/BP	WA
Papilionaceae	<i>Gastrolobium modestum</i>	Modest Gastrolobium	R	V	V	z,p,s,u,eWHS/BP,h	WA
Papilionaceae	<i>Gastrolobium whicherense</i>	Whicher Gastrolobium	2			z,p,s,u,eWHS,h	WA
Papilionaceae	<i>Gompholobium cyaninum</i> MS	Blue Gompholobium				s,u,h	WA
Papilionaceae	<i>Gompholobium villosum</i>	Hairy Gompholobium				d,s,u	WA
Papilionaceae	<i>Hovea stricta</i>	Prickly Hovea				d,s,u,Ne	WA
Papilionaceae	<i>Jacksonia lehmannii</i>	Lehmann's Jacksonia				r(S,Whicher,WH S),d,s,u	WA
Papilionaceae	<i>Jacksonia</i> sp. Whicher (G.J. Keighery 9953)	Whicher Jacksonia				z,s,eSWA(B)/WHS/BP,h	WA
Papilionaceae	<i>Pultenaea brachytropis</i>	Pultenaea				r(N,Abba,WHS),Se	WA
Papilionaceae	<i>Pultenaea pinifolia</i>	Tree Pultenaea	3			d,p,s,u,eSWA(B)/WHS/BP,h	WA
Papilionaceae	<i>Pultenaea radiata</i>	Whicher Pultenaea				r(N,Dardanup,WHS),s,eWHS/BP,h	WA
Papilionaceae	<i>Pultenaea skinneri</i>	Skinner's Pultenaea	4			d,p,s,u,eSWA/WHS/BP,h	WA
Papilionaceae	<i>Pultenaea verruculosa</i>	Pultenaea				r(N,WHS)	WA
Proteaceae	<i>Adenanthos barbiger</i> subsp. <i>barbiger</i> MS	Hairy Jugflower				z,r(N,Dardanup,WHS),s,Se	WA
Proteaceae	<i>Banksia meisneri</i> subsp. <i>ascendens</i>	Meisner's Banksia	4			p,s,Se	WA

Family	Scientific Name	Common Name	Significant Taxa				Endemic
			WA	IUCN	Com	OS	
Proteaceae	<i>Banksia sphaerocarpa</i> var. <i>sphaerocarpa</i>	Fox Banksia				r(W,Abba,WHS),d,s	WA
Proteaceae	<i>Conospermum acerosum</i> subsp. <i>acerosum</i>	Needle-leaved Smokebush				d,s,u,h	WA
Proteaceae	<i>Conospermum caeruleum</i> subsp. <i>marginatum</i>	Blue Smokebush				s,u,eSWA(B)/WHS/BP	WA
Proteaceae	<i>Conospermum paniculatum</i>	Wiry Smokebush	3			p,s,Se	WA
Proteaceae	<i>Conospermum teretifolium</i>	Spider Smokebush				r(N,Argyle,WHS),d,s,u,Se,h	WA
Proteaceae	<i>Dryandra armata</i> var. <i>armata</i>	Prickly Dryandra				d,s,u,h	WA
Proteaceae	<i>Dryandra baxteri</i>	Baxter's Dryandra				r(N,Abba,WHS),d,s,u,h	WA
Proteaceae	<i>Dryandra formosa</i>	Showy Dryandra				r(N,Whicher NP,WHS),d,s,u,h,a,g	WA
Proteaceae	<i>Dryandra mimica</i>	Summer Honeypot	R	V	E*	r(S,Whicher NP,WHS),d,p,s,u,eSWA/WHS,h,a,g	WA
Proteaceae	<i>Dryandra nivea</i> subsp. <i>uliginosa</i>	Bush Honeypot	R	E	E	z,d,p,s,u,eSWA/WHS/SC,h	WA
Proteaceae	<i>Dryandra sessilis</i>	Parrotbush				d,u,h	WA
Proteaceae	<i>Dryandra squarrosa</i> subsp. <i>argillacea</i>	Ironstone Pingle	R	V	V	z,d,p,s,u,eSWA(B)/WHS,h	WA
Proteaceae	<i>Franklandia fucifolia</i>	Yellow Franklandia				r(NE,Abba,WHS),d,p,s,u,Se,h,v,g	WA
Proteaceae	<i>Franklandia triaristata</i>	Beautiful Franklandia	4			d,p,s,u,Se,h	WA
Proteaceae	<i>Grevillea bipinnatifida</i> subsp. <i>bipinnatifida</i>	Fuchsia Grevillea				d,s,u	WA
Proteaceae	<i>Grevillea brachystylis</i> subsp. Busselton (G.J. Keighery s.n. 28/8/1985) PN	Whicher Grevillea	R	CR	*	z,p,s,u,eSWA(B)/WHS	WA
Proteaceae	<i>Grevillea bronwenae</i>	Bronwen's Grevillea				p,s,u,eWHS/BP	WA
Proteaceae	<i>Grevillea pulchella</i> subsp. <i>ascendens</i> Whicher Scarp Form (G.J.Keighery & B.J.Keighery 938)	Beautiful Grevillea				z,s,u,eWHS,h	WA
Proteaceae	<i>Hakea cyclocarpa</i>	Ramshorn Hakea				s,h	WA
Proteaceae	<i>Hakea falcata</i>	Forest Hakea				r(N,Whicher NP,WHS),d,s,u,Se,h	WA
Proteaceae	<i>Hakea lasianthoides</i>	River Hakea				d,s,h	WA

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Proteaceae	<i>Hakea linearis</i>	Swamp Hakea				r(N, West WHS),d,s,u,Se,h	WA
Proteaceae	<i>Hakea oldfieldii</i>	Oldfield's Hakea	3			d,p,s,u,h,g	WA
Proteaceae	<i>Hakea stenocarpa</i>	Narrow-fruited Hakea				d,s,u	WA
Proteaceae	<i>Isopogon attenuatus</i>	Coneflower				r(N,Abba, WHS),s	WA
Proteaceae	<i>Isopogon formosus</i> subsp. <i>dasylepis</i>	Rose Coneflower	3			d,p,s,u,Se,h	WA
Proteaceae	<i>Lambertia multiflora</i> var. <i>darlingensis</i>	Golden Lambertia				r(S,Abba, WHS),d,p,s,Ne,h	WA
Proteaceae	<i>Lambertia rariflora</i> subsp. <i>rariflora</i>	Whicher Lambertia	4			d,p,s,u,eWHS/B P,h	WA
Proteaceae	<i>Petrophile latericola</i> MS	Ironstone Petrophile	R	CR	E*	z,d,p,s,u,eSWA(B)/WHS,h	WA
Proteaceae	<i>Petrophile serruriae</i>	Petrophile				d,s,u,h,g	WA
Proteaceae	<i>Petrophile striata</i>	Petrophile				d,s,u	WA
Proteaceae	<i>Strangea stenocarpoides</i>	Strangea				s,Se,h	WA
Proteaceae	<i>Synaphea hians</i>	Synaphea	3			z,p,s,u	WA
Proteaceae	<i>Synaphea petiolaris</i> subsp. <i>simplex</i>	Synaphea	2			p,s,u,eSWA(B)/WHS,h	WA
Proteaceae	<i>Synaphea polypodioides</i>	Donnybrook Synaphea	2#			z,p,s,eWHS	WA
Proteaceae	<i>Synaphea whicherensis</i>	Whicher Synaphea				z,r(N,Argyle, WHS),s,eSWA(B)/WHS/BP	WA
Rafflesiaceae	<i>Pilostyles hamiltonii</i>	Stemflower				s,u	WA
Rhamnaceae	<i>Stenanthemum sublineare</i>	Stenanthemum	2			d,p,s,u	WA
Rutaceae	<i>Boronia capitata</i> subsp. <i>gracilis</i>	Slender Boronia	2			r(SW, Yelverton, WHS),p,s,u,eSWA/WHS,h	WA
Rutaceae	<i>Boronia humifusa</i>	Whicher Boronia	1			p,s,u,eWHS,h	WA
Rutaceae	<i>Boronia purdieana</i> subsp. <i>purdieana</i>	Yellow Boronia				r(S, WHS),d,s,u, Ne,h	WA
Rutaceae	<i>Boronia tetragona</i>	Pink Boronia	3			d,p,s,u,Se,h	WA
Rutaceae	<i>Crowea angustifolia</i> var. <i>angustifolia</i>	Crowea				r(N, Whicher NP, WHS),d,s,u, Se,h	WA
Stackhousiaceae	<i>Tripterococcus paniculatus</i> MS	Tripterococcus	1			z,r(S, Boyanup, WHS),d,p,s,u,eSWA/WHS,h	WA
Sterculiaceae	<i>Thomasia laxiflora</i>	Whicher Thomasia	3			r(N, Boyanup, WHS),p,s,e,h	WA
Sterculiaceae	<i>Thomasia macrocarpa</i>	Large-fruited Thomasia				d,s,u,Ne	WA
Stylidiaceae	<i>Stylidium acuminatum</i> MS	Sharp-leaved Triggerplant				z,r(S, Argyle, WHS),d,p,s,u,e,h	WA

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Stylidiaceae	<i>Stylidium affine</i>	Hills Queen Triggerplant				d	WA
Stylidiaceae	<i>Stylidium barleei</i>	Tooth-leaved Triggerplant	3			r(N,Acton Park,WHS),p,s,u,eSWA(B)/WHS/BP,h	WA
Stylidiaceae	<i>Stylidium caespitosum</i>	Fly-away Triggerplant				d,p,s,u,Se,h,g	WA
Stylidiaceae	<i>Stylidium ferricola</i>	Ironstone Triggerplant	1			p,s,u,eSWA(B)/WHS,h	WA
Stylidiaceae	<i>Stylidium lateriticola</i>	Laterite Triggerplant				r(SW,Whicher NP,WHS),d,p,s,u,Ne,h,g	WA
Stylidiaceae	<i>Stylidium perplexum</i> # (= <i>S.</i> sp. Dardanup (G.S. McCutcheon GSM 1066) PN	Dardanup Triggerplant	1			z,p,s,u,eWHS,h	WA
Tremandraceae	<i>Platytheca anasima</i> # (= <i>S.</i> sp. Argyle (G.J. & B.J. Keighery 281) PN	Argyle Platytheca	1#			z,p,s,u,eWHS,h,a	WA
Tremandraceae	<i>Platytheca</i> sp. Sabina (G.J. & B.J. Keighery 295) PN	Sabina River Platytheca	1#			z,p,s,u,eWHS,h,a	WA
Tremandraceae	<i>Tetratheca parvifolia</i>	Tetratheca	3			p,s,u,e,h	WA

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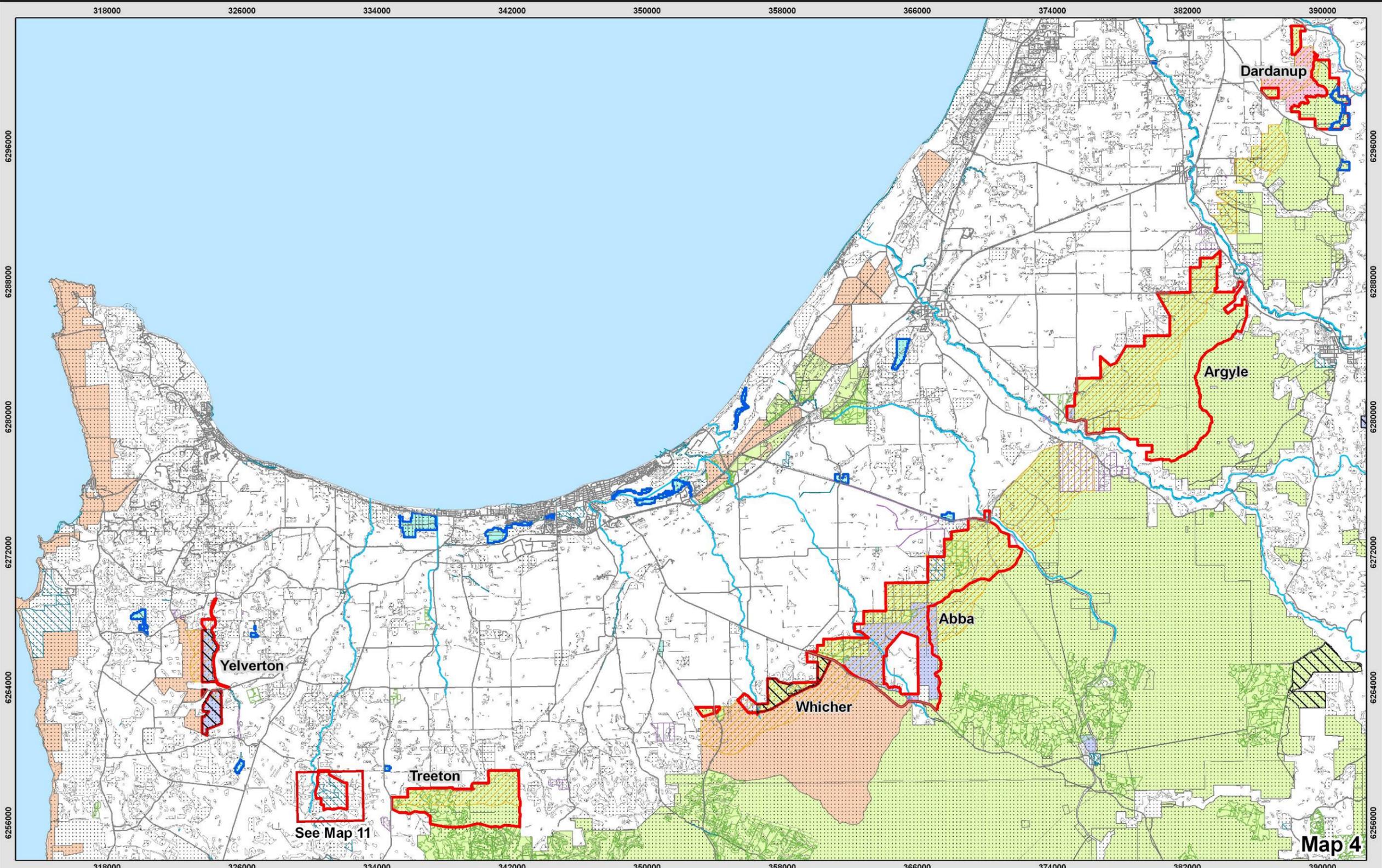
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11. Abbreviations

BRM	Basic Raw Materials
CALM	Department of Conservation and Land Management
CAR	Comprehensive, Adequate and Representative
DAFWA	Department of Agriculture and Food, Western Australia
DCE	Department of Conservation and Environment
DEC	Department of Environment and Conservation
DEP	Department of Environmental Protection
DEWHA	Department of the Environment, Water, Heritage and the Arts
DOE	Department of Environment
DPI	Department for Planning and Infrastructure
DRF	Declared Rare Flora
EPA	Environmental Protection Authority
FMP	Forest Management Plan
FPC	Forest Products Commission
PEC	Priority Ecological Community
RFA	Regional Forest Agreement
SFM	Sustainable Forest Management
TEC	Threatened Ecological Communities
UCL	Unallocated Crown Land

Map 4 – Conservation proposals



Map 4

Produced by the Office of the Environmental Protection Authority

0 2 4 8 km
1:200,000 (at A3)

Projection: Map Grid of Australia Zone 50
Datum: Geometric Datum of Australia, 1994

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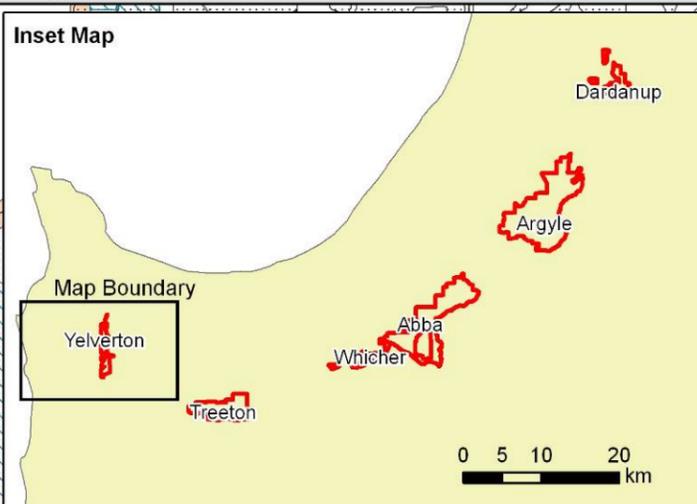
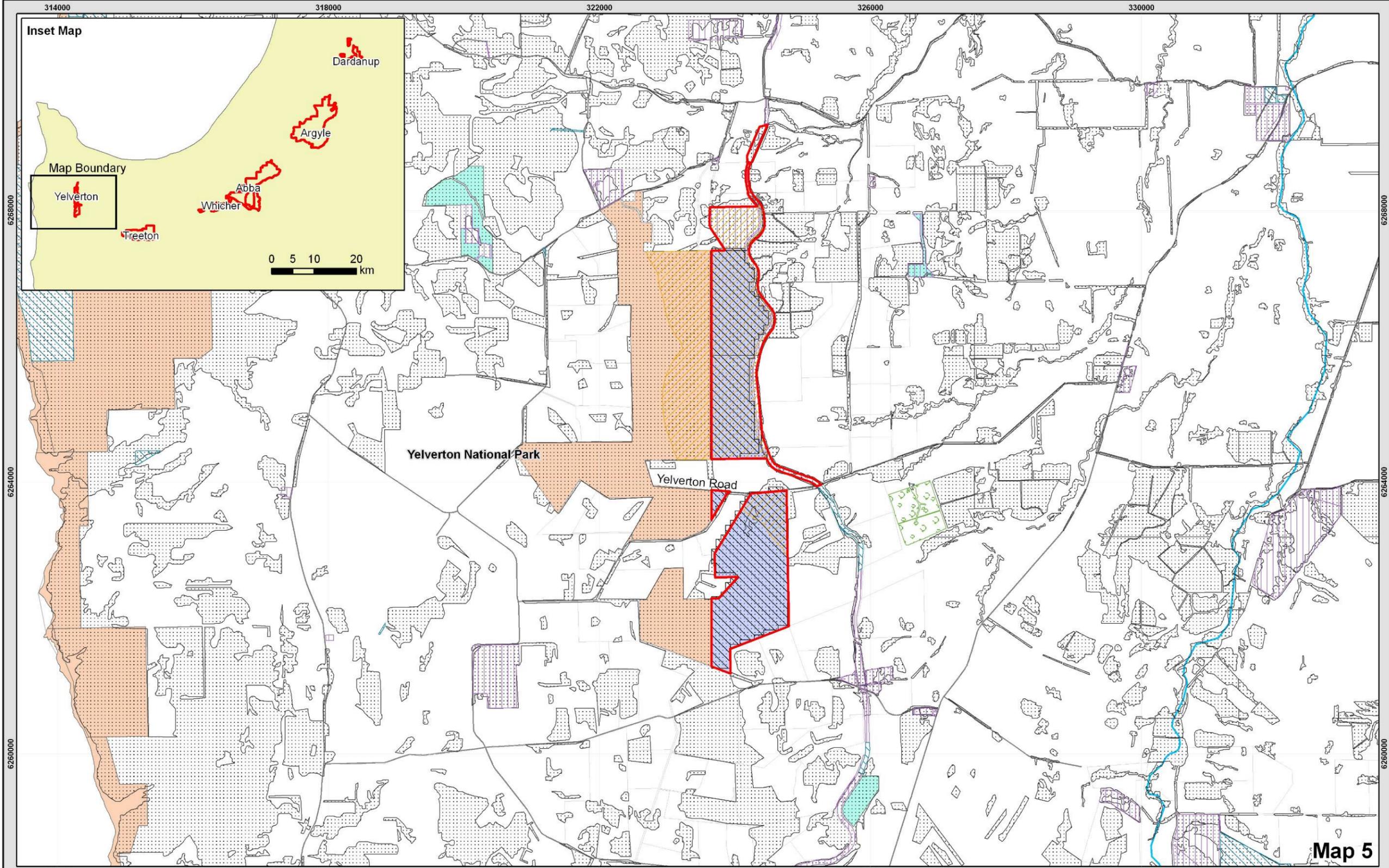
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Whicher Scarp Proposed Conservation Reserves

Legend			
	Proposed Conservation Reserves		Plantations
	Proposed Nature Reserves*		Rivers
	Forest Conservation Areas*		Sealed Roads
	Whicher Reference Areas		Native Vegetation
	Other Crown Reserves		DEC Managed Lands
	Unallocated Crown Land		Conservation Park
			National Park
			Nature Reserve
			State Forest
			Timber Reserve

Data Sources	
Proposed Conservation Reserves (WSEP, 2009)	
Proposed Nature Reserves* (DEC, 2004)	
Forest Conservation Areas* (DEC, 2004)	
Whicher Reference Areas (DEC, 2007)	
Unallocated Crown Land (Landgate, 2007)	
Unmanaged and Other Crown Reserves (Landgate, 2007)	
Native vegetation (DEC, 2009)	
Rivers (Landgate, 2001)	
Sealed Road (Landgate, 2001)	
DEC Managed Land (DEC, 2007)	





Map 5

Produced by the Office of the Environmental Protection Authority

0 0.5 1 2 km
1:50,000 (at A3)
Projection: Map Grid of Australia Zone 50
Datum: Geometric Datum of Australia, 1994

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Proposed addition to Yelverton Conservation Reserve

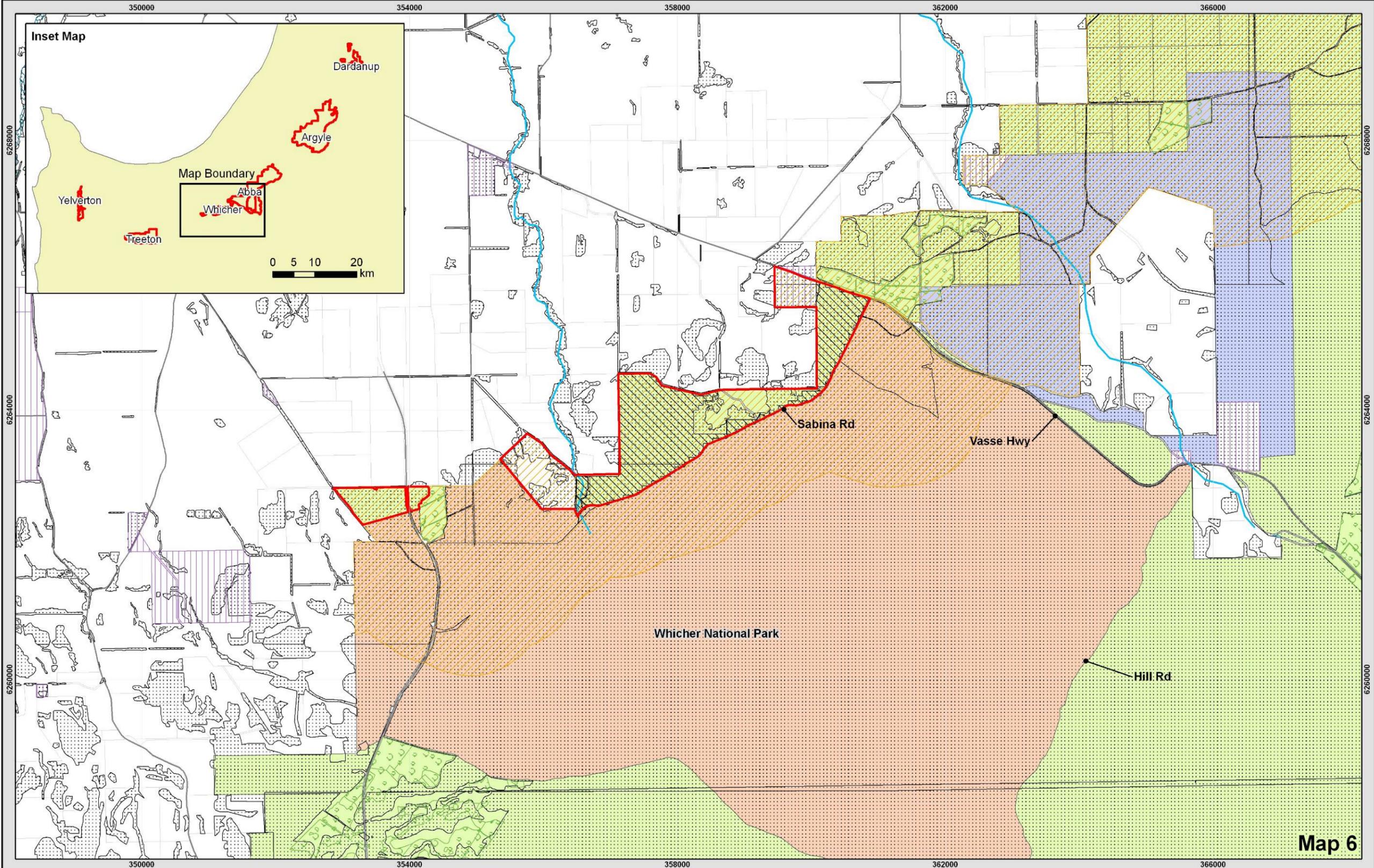
Legend			
	Proposed Conservation Reserves		Plantations
	Forest Conservation Areas*		Native Vegetation
	Whicher Reference Areas		Cadastral
	Unallocated Crown Land		Rivers
	Unmanaged and Other Crown Reserves		Sealed Roads
	DEC Managed Lands		Conservation Park
	National Park		Nature Reserve
	State Forest		Timber Reserve

*Sourced from Forest Management Plan

Data Sources

- Proposed Conservation Reserves (WSEP, 2009)
- Forest Conservation Areas* (DEC, 2004)
- Whicher Reference Areas (DEC, 2007)
- Unallocated Crown Land (Landgate, 2007)
- Unmanaged and Other Crown Reserves (Landgate, 2007)
- Rivers (Landgate, 2001)
- Sealed Road (DOLA, 2001)
- Native Vegetation (DEC, 2009)
- DEC Managed Land (DEC, 2007)
- Cadastral (Landgate, 2009)





Map 6

Produced by the Office of the Environmental Protection Authority

1:50,000 (at A3)

Projection: Map Grid of Australia Zone 50
Datum: Geometric Datum of Australia, 1994

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Proposed addition to Whicher National Park

Legend

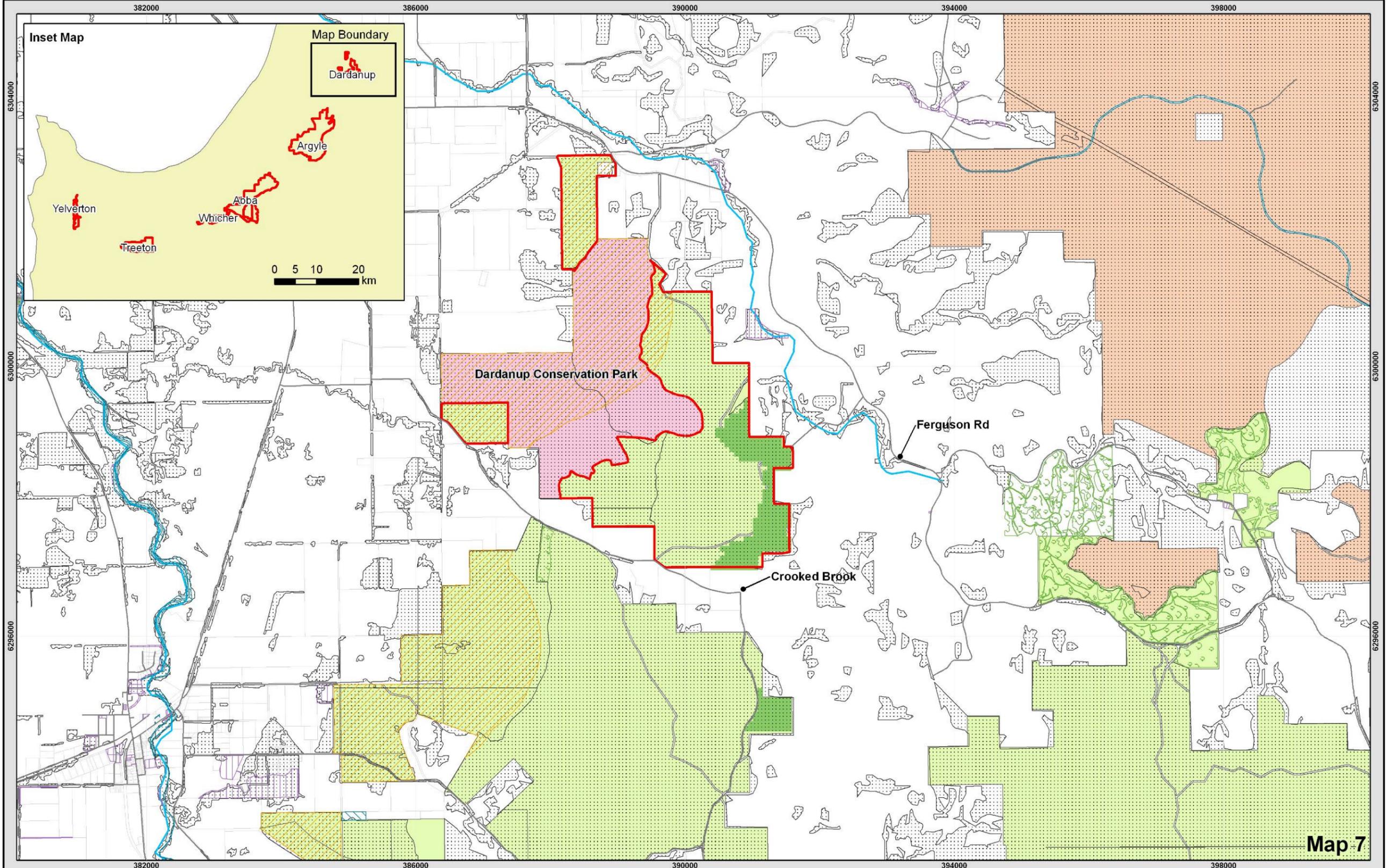
Proposed Conservation Reserves	Plantations	DEC Managed Lands
Forest Conservation Area*	Native Vegetation	Conservation Park
Whicher Reference Areas	Cadastre	National Park
Unallocated Crown Land	Rivers	Nature Reserve
Unmanaged and Other Crown Reserves	Sealed Roads	State Forest
		Timber Reserve

*Sourced from Forest Management Plan

Data Sources

- Proposed Conservation Reserves (WSEP, 2009)
- Forest Conservation Areas* (DEC 2004)
- Whicher Reference Areas (DEC, 2007)
- Unallocated Crown Land (Landgate, 2007)
- Unmanaged and Other Crown Reserves (Landgate, 2007)
- Rivers (Landgate, 2001)
- Sealed Road (Landgate, 2001)
- Native Vegetation (DEC, 2009)
- DEC Managed Land (DEC, 2007)
- Cadastre (Landgate, 2009)





Map 7

Produced by the Office of the Environmental Protection Authority

0 0.5 1 2 km
1:50,000 (at A3)

Projection: Map Grid of Australia Zone 50
Datum: Geometric Datum of Australia, 1994

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Proposed addition to Dardanup Conservation Park

Legend

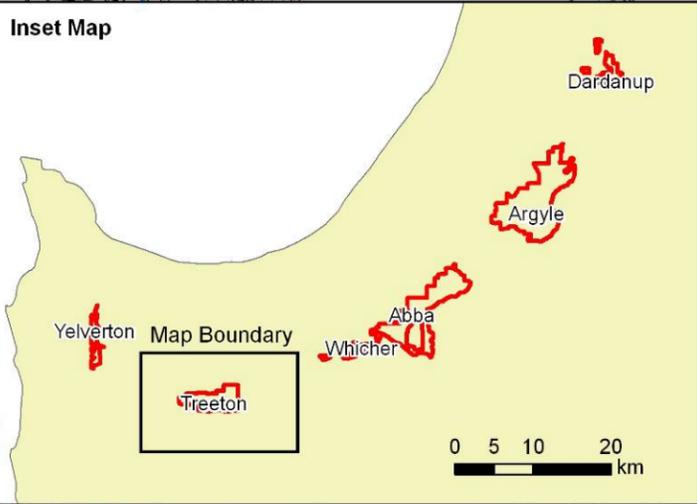
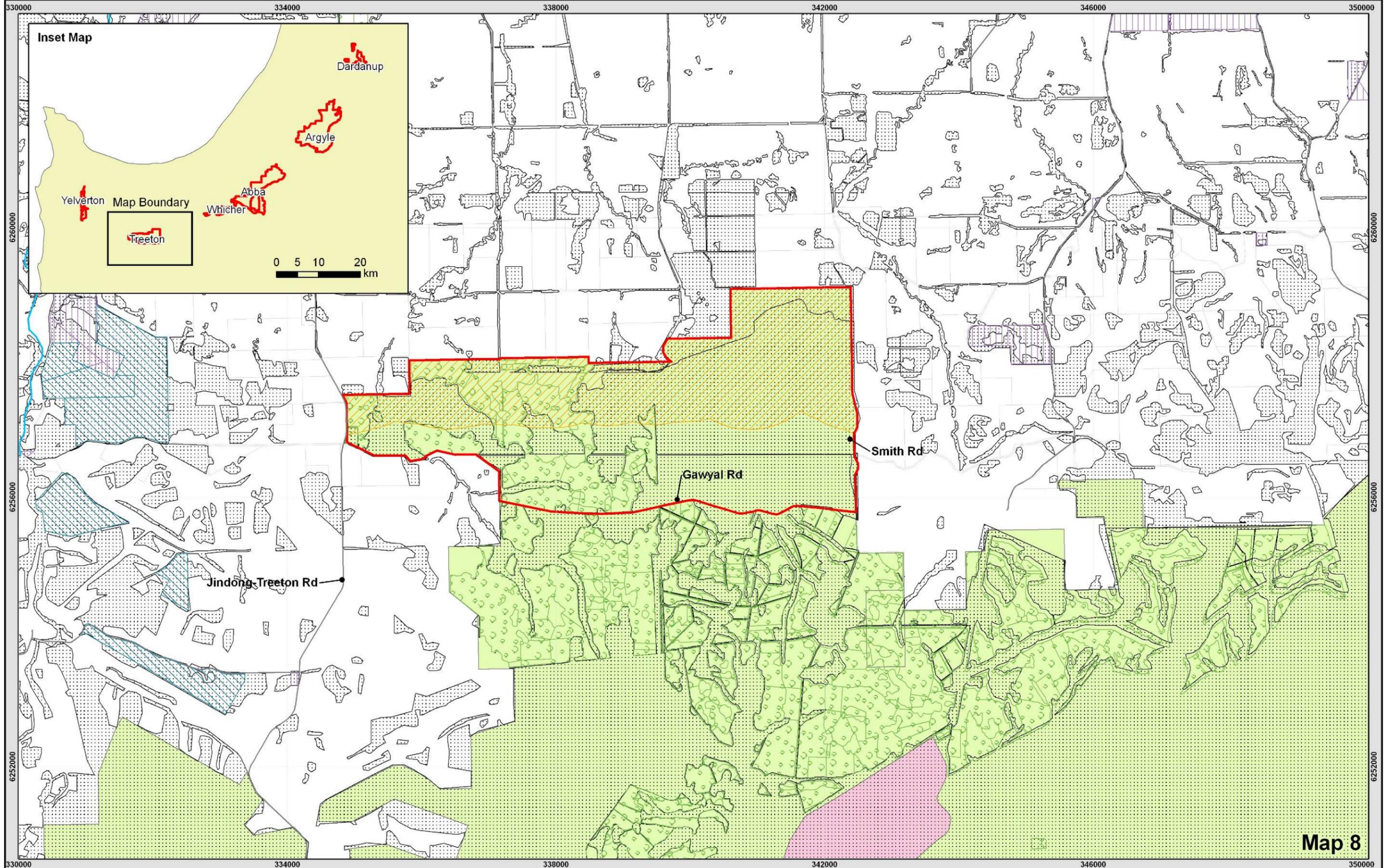
Proposed Conservation Reserves	Plantations	DEC Managed Lands
Proposed Nature Reserve*	Native Vegetation	Conservation Park
Whicher Reference Areas	Cadastre	National Park
Unallocated Crown Land	Rivers	Nature Reserve
Unmanaged and Other Crown Reserves	Sealed Roads	State Forest
		Timber Reserve

*Sourced from Forest Management Plan

Data Sources

- Proposed Conservation Reserves (WSEP, 2009)
- Proposed Nature Reserves* (DEC, 2004)
- Whicher Reference Areas (DEC, 2007)
- Unallocated Crown Land (Landgate, 2007)
- Unmanaged and Other Crown Reserves (Landgate, 2007)
- Rivers (Landgate, 2001)
- Sealed Road (DOLA, 2001)
- Native Vegetation (DEC, 2009)
- DEC Managed Land (DEC, 2007)
- Cadastre (Landgate, 2009)





Map 8

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1:50,000 (at A3)

Projection: Map Grid of Australia Zone 50
Datum: Geometric Datum of Australia, 1994

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Proposed Treeton Conservation Reserve

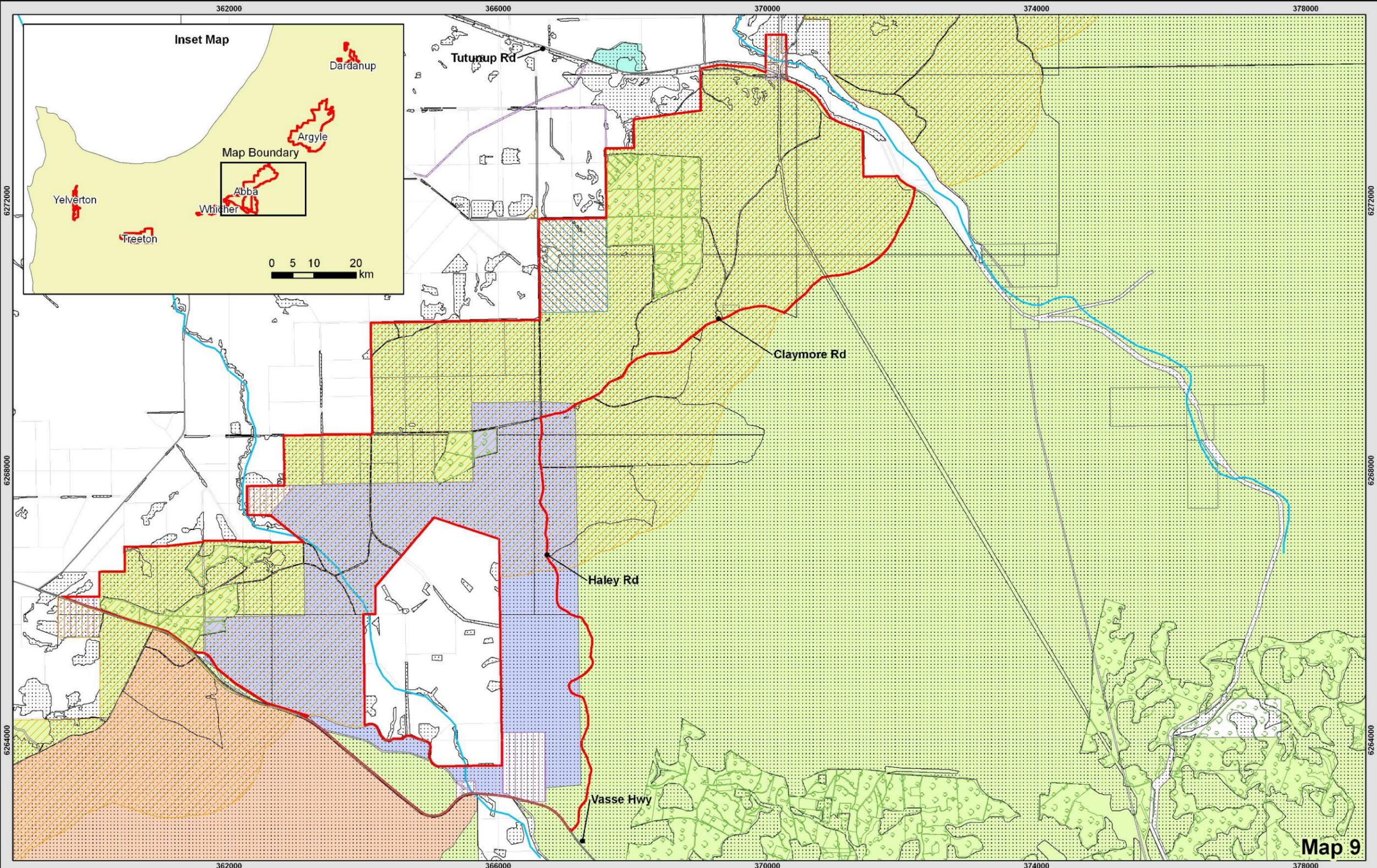
Legend

Proposed Conservation Reserves	Plantations	DEC Managed Lands
Proposed Conservation Park*	Native Vegetation	Conservation Park
Whicher Reference Areas	Cadastre	National Park
Unallocated Crown Land	Rivers	Nature Reserve
Unmanaged and Other Crown Reserves	Sealed Roads	State Forest
		Timber Reserve

*Sourced from Forest Management Plan

- Data Sources**
- Proposed Conservation Reserves (WSEP, 2009)
 - Proposed Conservation Park* (DEC 2004)
 - Whicher Reference Areas (DEC, 2007)
 - Unallocated Crown Land (Landgate, 2007)
 - Unmanaged and Other Crown Reserves (Landgate, 2007)
 - Rivers (Landgate, 2001)
 - Sealed Road (Landgate, 2001)
 - Native Vegetation (DEC, 2009)
 - DEC Managed Land (DEC, 2007)
 - Cadastre (Landgate, 2009)





Map 9

Produced by the Office of the Environmental Protection Authority

1:50,000 (at A3)

Projection: Map Grid of Australia Zone 50
Datum: Geometric Datum of Australia, 1994

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Proposed Abba Conservation Reserve

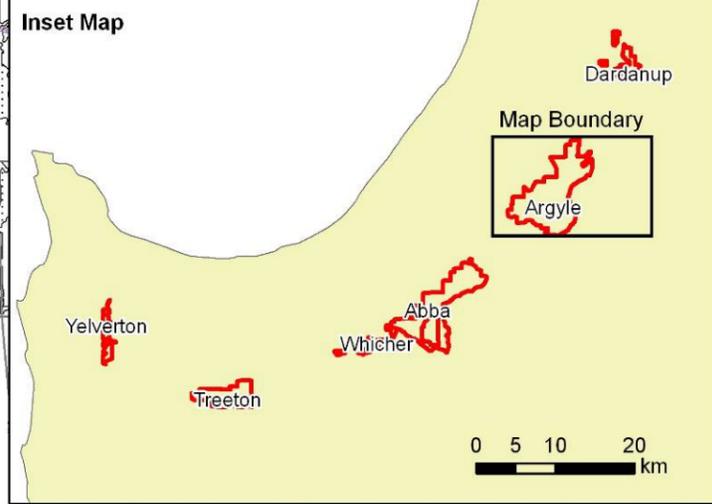
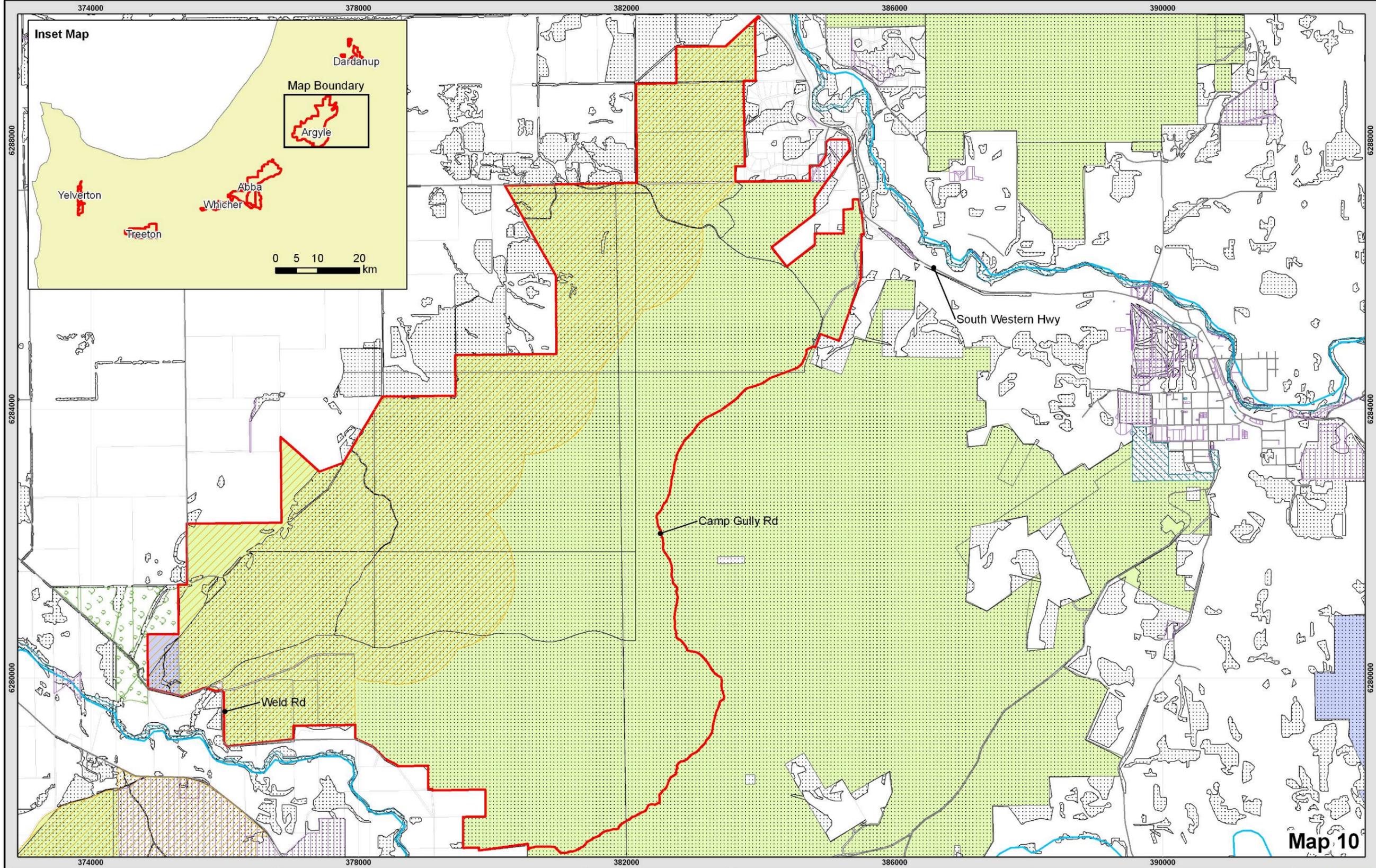
Legend

Proposed Conservation Reserves	Plantations	DEC Managed Lands
Whitcher Reference Areas	Native Vegetation	Conservation Park
Unallocated Crown Land	Cadastre	National Park
Unmanaged and Other Crown Reserves	Rivers	Nature Reserve
	Sealed Roads	State Forest
		Timber Reserve

Data Sources

- Proposed Conservation Reserves (WSEP, 2009)
- Whitcher Reference Areas (DEC, 2007)
- Unallocated Crown Land (Landgate, 2007)
- Unmanaged and Other Crown Reserves (Landgate, 2007)
- Rivers (Landgate, 2001)
- Sealed Road (DOLA, 2001)
- Native Vegetation (DEC, 2009)
- DEC Managed Land (DEC, 2007)
- Cadastre (Landgate, 2009)





Map 10

Produced by the Office of the Environmental Protection Authority

1:50,000 (at A3)

Projection: Map Grid of Australia Zone 50
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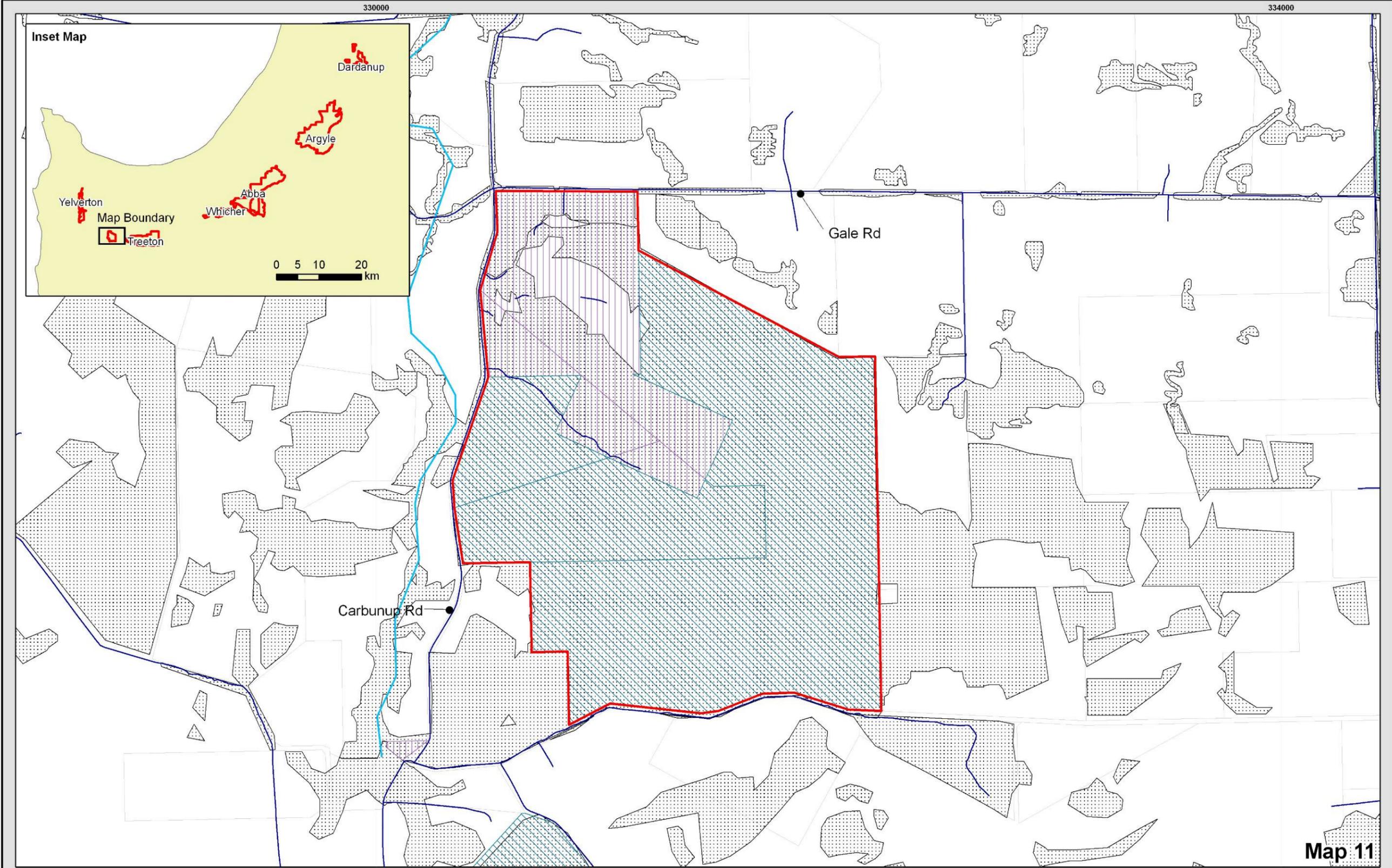
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Proposed Argyle Conservation Reserve

Legend					
	Proposed Conservation Reserves		Plantations		DEC Managed Lands
	Whicher Reference Areas		Native Vegetation		Conservation Park
	Unallocated Crown Land		Cadastral		National Park
	Unmanaged and Other Crown Reserves		Sealed Roads		Nature Reserve
			Rivers		State Forest
					Timber Reserve

Data Sources
Proposed Conservation Reserves (WSEP, 2009)
Whicher Reference Areas (DEC, 2007)
Unallocated Crown Land (Landgate, 2009)
Unmanaged and Other Crown Reserves (Landgate, 2009)
Rivers (Landgate, 2001)
Sealed Road (Landgate, 2001)
Native Vegetation (DEC, 2009)
DEC Managed Land (DEC, 2007)
Cadastral (Landgate, 2009)





Map 11

Produced by the Office of the Environmental Protection Authority

0 150 300 600 m

1:15,000 (at A3)

Projection: Map Grid of Australia Zone 50
Datum: Geometric Datum of Australia, 1994

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Proposed area for Consideration - UCL and Crown Reserve

Legend

Proposed area for further consideration (UCL & Crown Reserve)	Conservation Park
Unallocated Crown Land	National Park
Unmanaged and Other Crown Reserves	Nature Reserve
Native Vegetation	State Forest
Cadastre	Timber Reserve
Rivers	

Data Sources

- Proposed area for further consideration (DEC 2010)
- Unallocated Crown Land (Landgate, 2007)
- Unmanaged and Other Crown Reserves (Landgate, 2007)
- Rivers (Landgate, 2001)
- Sealed Road (Landgate, 2001)
- Native Vegetation (DEC, 2009)
- DEC Managed Land (DEC, 2007)
- Cadastre (Landgate, 2009)

