Capes Regional Environmental Weed Strategy

Prepared for the Cape to Cape Catchments Group

by

Genevieve Hanran-Smith

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Acronyms

AMR Shire   Shire of Augusta-Margaret River

CCG   Cape to Cape Catchments Group

CAP   Conservation Action Plan

CoB   City of Busselton

DAFWA   Department of Food and Agriculture WA

DPaW   Department of Parks and Wildlife

GIS   Geographical Information System

LBLCDC   Lower Blackwood Land Conservation District Committee

YallLCDC   Yallingup Land Conservation District Committee

SWCC   South West Catchments Council

Acknowledgements

Reference details

The recommended reference for this publication is: Cape to Cape Catchments Group (2015) *Capes Regional Environmental Weed Strategy*.

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1. Introduction

Weeds are a problem in the south west corner of Australia, as they are in many other parts of the world. They occur across all land tenures and in all parts of the landscape. They have a negative impact on agriculture and the environment, and are considered one of the major threats to biodiversity in the region.

The biodiversity values of the south west corner of Australia are well recognised. The area is located within a global biodiversity hotspot (the only one in Australia and one of 35 worldwide) and a national biodiversity hotspot (one of 15). Recognition as a biodiversity hotspot is related to both the area's diversity of flora, and the high level of threat to the natural environment.

The south west corner is very popular and has an increasing resident and tourist population. The area's appealing and distinctive sense of place is in part dependent on the visual appeal of its native vegetation. Areas of remnant jarrah-marri forest and vegetated creeklines interspersed with paddocks and vineyards are a defining feature of the region, as is the Leeuwin-Naturaliste ridge with its coastal heath and karri forest.

Factors exacerbating the impacts of environmental weeds on biodiversity in the area include subdivision and land development, changing land use, climate change, and fire.

1. This strategy

This environmental weed strategy has been developed to provide direction to the Cape to Cape Catchments Group (CCG) and the Augusta-Margaret River Conservation Action Plan (CAP) Reference Group on management of environmental weeds in the Capes catchments and the Shire of Augusta-Margaret River. This strategy provides direction for the period 2015 to 2020 and should be reviewed after that time.

The objective of environmental weed management being addressed by this strategy *is **to reduce the impact of environmental weeds on biodiversity within the Capes/Augusta-Margaret River region***.
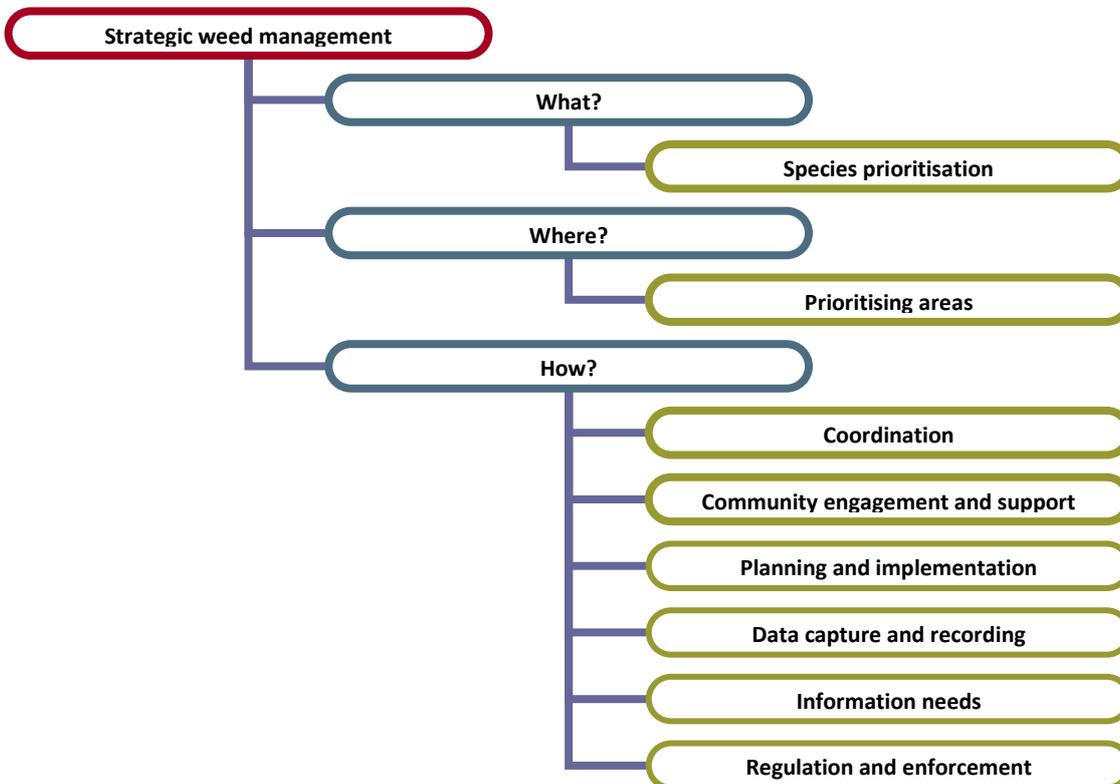

Figure 1: Strategy structure

2. The problem

Environmental weeds negatively impact on areas of native vegetation by out competing native plants for space, water and nutrients, changing and simplifying the composition of vegetation communities and reducing their value as habitat for native animals. Many weeds also increase fuel loads and fire risk.

Environmental weeds also change the unique character and sense of place of our region.

The number of environmental weed species found in Western Australian and the south west is considerable. 1350 environmental weeds species were prioritised in the Environmental Weed Strategy of Western Australia (1999) and DPaW ranked 720 species in their regional prioritisation for the south-west region (2013).

Integral to the problem of environmental weeds are issues related to people. Environmental weed species are introduced and spread by people and control of weeds is reliant on land managers. Control of weeds on a landscape scale can be difficult and expensive. It requires considerable resources and a sustained effort. Effectiveness relies on participation by many land managers. Lack of motivation, resources, technical knowledge, and coordination across the landscape are all central to the problem of environmental weeds.

Other issues impacting on environmental weed management include that recognised weed species are still being sold and planted, potential weed species are being introduced to the area, and statutory regulation and control is limited and inadequate.

For the purpose of this strategy environmental weeds have been divided into three groups:

Established weeds - species that are well established in the area, some already widespread, and all continuing to spread.

Emerging weeds - species that are within the region but are currently not widespread, infestations may be known from a few locations only or may be scattered lightly across the landscape.

Potential weeds – species that are yet to be identified as environmental weeds within the region. This may include plants known to be weeds in other parts of Australia and the world.

3. Setting priorities

Effective environmental weed management for biodiversity protection needs to be strategic as the problem is extensive and the available resources limited. A strategic approach requires that activities be prioritised. This strategy has used two approaches to provide direction on environmental weed management in the region: what species to focus on; and where to focus weed management activities. The recommendations are for the period 2015 to 2020 and it is strongly recommended that they be reviewed after this period. The two approaches are detailed below.

4.1 What species to focus on?

Prioritisation of weed species for this strategy was undertaken using the Department of Parks and Wildlife's (DPaW) weed prioritisation process. Weed species were assessed and rated for their invasiveness, ecological impacts, potential and current distribution and feasibility of control. Ratings for these five factors were then combined in four matrices to give an overall ranking for each species. The matrices were developed by DPaW in line with the 'National Post-Border Weed Risk Management Protocol'. Further information on the methodology is found in Appendix 1.

As environmental weed presence and extent varies in different landscape types the species prioritisation was undertaken within the following landscape units:

- Jarrah-marri forest
- Leeuwin-Naturaliste ridge
- Scott coastal plain
- Riparian
- Coastal dunes

Rating of weed species for the prioritisation process was done in workshops attended by Cherie Kemp (DPaW), Megan Flower (DPaW), John McKinney (AMR Shire), Merryn Delaney (AMR Shire), Will Oldfield (CoB), Rick Ensley (community/weed control contractor), Lyndsey Cox (CCG), Charlie Cox (community/weed control contractor), Yasaman Mohammadi (Lower Blackwood LCDC), Drew McKenzie (CCG), Boyd Wykes (CCG), Andrew Reeves (DAFWA) and Genevieve Hanran-Smith (CCG). Following the workshops participants reviewed the rankings and modifications were made as appropriate.

The prioritisation process ranks the weed species from Very High to Negligible. General objectives and management recommendations are linked to the rankings.

Two important considerations in regard to the species prioritisation are:

1. The ranking is done within each of the landscape units on a regional scale. It is not relevant at a local scale. If prioritising weed species at a specific site a separate prioritisation process is required. The Randall system is recommended for site based weed prioritisation.

2. The DPaW prioritisation process ranks very few species as Very High (VH) or High (H). Regional eradication is the recommended management objective for species ranked Very High to High. Eradication is only reasonable where the extent of the infestation is very limited, the potential environmental impact extremely high and the feasibility of control very high. This is a rare scenario and as a result a VH or H ranking is rare. Of the 721 species assessed in DPaW's ranking for the south west region only one species ranked as Very High and eight species as High. Within the prioritisation process undertaken for this strategy no species received a VH or H ranking.

The weed ranking within the different landscape units is detailed in Table 1 below. This table does not include the full suite of weeds assessed. It includes weeds where the ranking and recommended management requires action (ie. management recommendations C to H as described at the end of Table 1). The full list of weeds that were assessed in the workshops is contained in Appendix 2.

Table 1: Highest ranked emerging environmental weeds in the Capes/Augusta-Margaret River region

Scientific Name	Common Name	Ranking and management recommendations for landscape units				
		Jarrah-marri forest and woodland	Leeuwin-Naturaliste ridge	Scott coastal plain	Riparian	Coastal dunes
Anredera cordifolia	Madeira vine	L (B,C,D)	M (D,E,F,G)	L (B,C,D)	M (D,E,F,G)	
Asparagus declinatus	Asparagus fern	L (D)	L (D)	N (A)	M (D,E,F)	
Asparagus scandens	Asparagus fern/climbing asparagus	N (A,B)	L (B,C,D)	N (A)	M (D,E,F,G)	
Cenchrus macrourus	African feathergrass	L (B,C,D)		L (C)	M (D,E,F)	
Euphorbia terracina	Geraldton carnation weed		M (D,E,F,G)			M (D,E,F,G)
Genista linifolia	Flaxleaf broom	M (D,E,F,G)	L (B,C,D)	L (B,C,D)		
Genista monspessulana	Broom	M (D,E,F,G)	L (B,C,D)	L (B,C,D)		
Gomphocarpus fruticosus	Swan plant, narrowleaf cottonbush	M (D,E,F)	M (D,E,F)	N (A)		
Gomphocarpus physocarpus	Balloon cottonbush	M (D,E,F)	M (D,E,F)	L (C)		
Olea europaea subsp. *europaea*	Olive	M (D,E,F)	M (D,E,F)	N (A)		

Table 2: Highest ranked established environmental weeds in the Capes/Augusta-Margaret River region

Scientific Name	Common Name	Ranking and management recommendations for landscape units				
		Jarrah-marri forest and woodland	Leeuwin-Naturaliste ridge	Scott coastal plain	Riparian	Coastal dunes
Acacia iteaphylla	Flinders Range wattle	M (D,E,F,G)	M (D,E,F,G)	N (A,B)		
Acacia longifolia	Sydney golden wattle	M (D,E,F,G)	M (D,E,F,G)	M (D,E,F)	M (D,E,F)	L (C)
Acacia melanoxylon	Blackwood	L (B,C,D)		L (B,C,D)	M (D,E,F)	
Dipogon lignosus	Dolichos pea	M (D,E,F)	M (D,E,F)	N (A)	M (D,E,F)	
Ficus carica	Edible fig, common fig				M (D,E,F)	
Leptospermum laevigatum	Victorian teatree	L (B,C,D)	M (D,E,F,G)	L (B,C,D)		L (B,C,D)
Pittosporum undulatum	Sweet pittosporum	L (B,C,D)	M (D,E,F)	N (A)	M (D,E,F)	
Rubus anglocandicans	European blackberry	N (A)		L (B,C,D)	M (D,E,F)	
Watsonia spp.	Watsonia	M (D,E,F)	M (D,E,F)	L (B,C,D)	M (D,E,F)	
Zantedeschia aethiopica	Arum lily	M (D,E,F,G)	M (D,E,F,G)	M (D,E,F)	M (D,E,F,G)	L (B,C,D)

Table 3: Ranking and management recommendations for environmental weeds within landscape units in the Capes/Augusta-Margaret River region

Scientific Name	Common Name	Ranking and management recommendations for landscape units				
		Jarrah-marri forest and woodland	Leeuwin-Naturaliste ridge	Scott coastal plain	Riparian	Coastal dunes
Acacia iteaphylla	Flinders Range wattle	M (D,E,F,G)	M (D,E,F,G)	N (A,B)		
Acacia longifolia	Sydney golden wattle	M (D,E,F,G)	M (D,E,F,G)	M (D,E,F)	M (D,E,F)	L (C)
Acacia melanoxylon	Blackwood	L (B,C,D)		L (B,C,D)	M (D,E,F)	
Anredera cordifolia	Madeira vine	L (B,C,D)	M (D,E,F,G)	L (B,C,D)	M (D,E,F,G)	
Arundo donax	Giant reed	L (B,C,D)		L (B,C,D)	L (B,C,D)	
Asparagus asparagoides	Bridal creeper	N (B)	N (B)	L (C)	N (B)	
Asparagus declinatus	Asparagus fern	L (D)	L (D)	N (A)	M (D,E,F)	
Asparagus scandens	Asparagus fern/climbing asparagus	N (A,B)	L (B,C,D)	N (A)	M (D,E,F,G)	
Cenchrus clandestinus	Kikuyu grass	N (A)	N (A)	N (B)	L (D)	
Cenchrus macrourus	African feathergrass	L (B,C,D)		L (C)	M (D,E,F)	
Centranthus ruber	Valerian	N (A,B)		N (A,B)		
Chamaecytisus palmensis	Tree lucerne, tagasaste	L (C)	L (B,C,D)	L (B,C,D)		
Chasmanthe floribunda	African cornflag	L (B,C,D)	L (B,C,D)	L (B,C,D)		
Cyathea cooperi	Rough tree fern				L (C)	
Dipogon lignosus	Dolichos pea	M (D,E,F)	M (D,E,F)	N (A)	M (D,E,F)	
Echium fastuosum	Pride of Madeira		L (B,C,D)			
Echium plantagineum	Paterson's curse		L (B,C,D)			
Ehrharta calycina	Perennial veldtgrass	L (B,C,D)	N (A)	N (A)		
Ehrharta villosa	Pypgrass					L (D,E)
Eragrostis curvula	African love grass	L (B,C,D)	N (A)	N (A)		
Eucalyptus botryoides	Bangalay	L (B,C,D)		L (B,C,D)		
Eucalyptus citriodora	Lemon-scented gum	FAR	L (B,C,D)	FAR		
Eucalyptus globulus	Blue gum	N (A,B)	L (B,C,D)	N (A,B)		
Euphorbia terracina	Geraldton carnation weed		M (D,E,F,G)			M (D,E,F,G)
Ficus carica	Edible fig, common fig				M (D,E,F)	
Freesia alba x leichtlinii	Freesia	L (C)	L (C)	L (C)		
Genista linifolia	Flaxleaf broom	M (D,E,F,G)	L (B,C,D)	L (B,C,D)		
Genista monspessulana	Broom	M (D,E,F,G)	L (B,C,D)	L (B,C,D)		
Gladiolus undulatus	Wavy gladiolus	L (C)	L (C)	N (A)	L (D)	
Gomphocarpus fruticosus	Swan plant, narrowleaf cottonbush	M (D,E,F)	M (D,E,F)	N (A)		
Gomphocarpus physocarpus	Balloon cottonbush	M (D,E,F)	M (D,E,F)	L (C)		

Scientific Name	Common Name	Ranking and management recommendations for landscape units				
		Jarrah-marri forest and woodland	Leeuwin-Naturaliste ridge	Scott coastal plain	Riparian	Coastal dunes
Histiopteris incisa	Bat's wing fern				L (C)	
Hyparrhenia hirta	Tambookie grass	L (B,C)	L (B,C)	L (C)		
Hypericum perforatum var. angustifolium	St John's wort	L (B,C,D)	N (A,B)	N (A)		
Ipomoea indica	Morning glory				L (B,C,D)	
Ixia spp.	Ixia	L (B,C,D)	L (B,C,D)	N (A)		
Kunzea baxteri	Kunzea		L (B,C,D)			
Lachenalia aloides	Soldiers	L (B,C,D)	L (B,C,D)	N (A)		
Leptospermum laevigatum	Victorian teatree	L (B,C,D)	M (D,E,F,G)	L (B,C,D)		L (B,C,D)
Lonicera japonica	Japanese honeysuckle				L (B,C,D)	
Melaleuca armillaris	Bracelet honey-myrtle	L (B,C,D)	L (B,C,D)	L (B,C,D)		
Moraea flaccida	One-leaf cape tulip	L (B,C,D)	L (B,C,D)	N (A)		
Olea europaea subsp. europaea	Olive	M (D,E,F)	M (D,E,F)	N (A)		
Parentucellia viscosa	Sticky bartsia				L (D)	
Paspalum dilatatum	Paspalum				L (C)	
Paspalum distichum	Water couch				L (C)	
Paspalum vaginatum	Saltwater couch				L (C)	
Pelargonium capitatum	Rose pelargonium					L (D)
Pinus radiate	Pine	L (B,C,D)	L (B,C,D)	L (B,C,D)		
Pittosporum undulatum	Sweet pittosporum	L (B,C,D)	M (D,E,F)	N (A)	M (D,E,F)	
Polygala myrtifolia and virgata	Myrtleleaf milkwort	L (C)	L (C)	N (A)		
Roldana petasites		L (B,C,D)	L (B,C,D)			
Rubus anglocandicans	European blackberry	N (A)		L (B,C,D)	M (D,E,F)	
Tetragonia decumbens	Sea spinach					L (D)
Trachyandra divaricata	Dune onion weed					L (B,C)
Tritonia crocata	Tritonia	L (B,C,D)	L (B,C,D)			
Tritonia gladioralis	Tritonia, lined tritonia	L (B,C,D)	L (B,C,D)			
Typha orientalis	Bulrush				L (C)	
Vinca major	Blue periwinkle	L (B,C,D)	L (B,C,D)	N (A)	L (B,C,D)	
Watsonia spp.	Watsonia	M (D,E,F)	M (D,E,F)	L (B,C,D)	M (D,E,F)	
Zantedeschia aethiopica	Arum lily	M (D,E,F,G)	M (D,E,F,G)	M (D,E,F)	M (D,E,F,G)	L (B,C,D)

Key for ranking and management objective: **VH** (very high) – Eradication; **H** (high) – Eradication or control to reduce extent; **M** (medium) – Control to reduce extent or containment; **L** (low) – Containment at key sites only; **N** (negligible) – Monitoring only.

Key for recommended management actions:

Code   Description of management action

A   No action (the weed species ranking is so low as to not warrant any investment in strategic management

B   Monitor only (aims to detect any significant changes in the species' weed risk or manageability)

C   Improve general weed management (aims to minimise weed impact and maintain the overall biodiversity and cultural values in the region)

D   Protect priority sites (aims to prevent spread of weed species to areas of high biodiversity or cultural value)

E   Targeted control to reduce infestations at priority sites (aims to significantly reduce the impact of a weed species on areas of natural and cultural value)

F   Contain regional spread (aims to prevent the ongoing spread of the weed species in the region)

G   Reduce regional infestations (aims to significantly reduce the extent of the weed species in the region)

H   Regional eradication (aims to remove the weed species from the region)

Table 4: Established environmental weeds where recommended management focuses on protection of priority sites

Scientific Name	Common Name	Ranking and management recommendations for landscape units				
		Jarrah-marri forest and woodland	Leeuwin-Naturaliste ridge	Scott coastal plain	Riparian	Coastal dunes
Arundo donax	Giant reed	L (B,C,D)		L (B,C,D)	L (B,C,D)	
Chamaecytisus palmensis	Tree lucerne, tagasaste		L (B,C,D)	L (B,C,D)		
Chasmanthe floribunda	African cornflag	L (B,C,D)	L (B,C,D)	L (B,C,D)		
Echium fastuosum	Pride of Madeira		L (B,C,D)			
Echium plantagineum	Paterson's curse		L (B,C,D)			
Ehrharta calycina	Perennial veldtgrass	L (B,C,D)				
Ehrharta villosa	Pypgrass					L (D,E)
Eragrostis curvula	African love grass	L (B,C,D)				
Eucalyptus botryoides	Bangalay	L (B,C,D)		L (B,C,D)		
Eucalyptus citriodora	Lemon-scented gum		L (B,C,D)			
Eucalyptus globulus	Blue gum		L (B,C,D)			
Gladiolus undulatus	Wavy gladiolus				L (D)	
Hypericum perforatum var. angustifolium	St John's wort	L (B,C,D)				
Ipomoea indica	Morning glory				L (B,C,D)	
Ixia spp.	Ixia	L (B,C,D)	L (B,C,D)			
Kunzea baxteri	Kunzea		L (B,C,D)			
Lachenalia aloides	Soldiers	L (B,C,D)	L (B,C,D)			
Lonicera japonica	Japanese honeysuckle				L (B,C,D)	
Melaleuca armillaris	Bracelet honey-myrtle	L (B,C,D)	L (B,C,D)	L (B,C,D)		
Moraea flaccida	One-leaf cape tulip	L (B,C,D)	L (B,C,D)			
Parentucellia viscosa	Sticky bartsia				L (D)	

Scientific Name	Common Name	Ranking and management recommendations for landscape units				
		Jarrah-marri forest and woodland	Leeuwin-Naturaliste ridge	Scott coastal plain	Riparian	Coastal dunes
Pelargonium capitatum	Rose pelargonium					L (D)
Pinus radiate	Pine	L (B,C,D)	L (B,C,D)	L (B,C,D)		
Roldana petasites		L (B,C,D)	L (B,C,D)			
Tetragonia decumbens	Sea spinach					L (D)
Tritonia crocata	Tritonia	L (B,C,D)	L (B,C,D)			
Tritonia gladioralis	Tritonia, lined tritonia	L (B,C,D)	L (B,C,D)			
Vinca major	Blue periwinkle	L (B,C,D)	L (B,C,D)		L (B,C,D)	

4.2   Where to focus weed management activities?

As resources are limited and the extent of the problem considerable weed management activities should be targeted to achieve the best biodiversity protection outcomes.

Table 6 lists criteria relevant to identification of target areas with comments regarding the availability and suitability of digital data that could be used to assist decision making.

This strategy does not offer a prescriptive solution but aims to provide a GIS resource to assist decision making on where to focus weed management activities.

Table 5: Criteria relevant to prioritisation of areas for environmental weed management

Criteria	Comments
Vegetation complexes with limited area and/or percentage of original pre-European extent remaining.	Regional data available. Discussed below and an example of the data available shown in Figures 2, 7 and 8
Rare and endangered flora and fauna	Limited data available. Data collection inconsistent across the region with significantly more data collected for public than private land.
Habitat for priority fauna	Limited and inconsistent data available. Data collection inconsistent across the region with significantly more data collected for public than private land.
Value of remnant vegetation in relation to size, shape and connection with other areas of remnant vegetation in the landscape	Regional data available. Discussed below and an example of the data available shown in Figures 3, 4, 7 and 8.
Remnant vegetation condition	No consistent data available across the region.
Waterway foreshore condition	Data available for most of the waterways across the region as a component of River Action Plan development. No data on Turner Brook. Discussed below. Foreshore identified as in good to excellent condition are shown in Figures 5 and 8.
Weed presence and extent	Limited and inconsistent data available.
Previous weed management and landholder activity, particularly where it is coordinated across large areas of the landscape	Data available for properties that have received CCG assistance for weed control since 2012. Depicted in Figure 6.

Information on datasets relevant to decision making regarding target areas for weed management:

1. **Vegetation complexes with limited area and/or percentage of original extent remaining.**

A dataset of native vegetation status statistics was developed as part of a State NRM 2012-2014 project delivered by the Local Biodiversity Program through the Western Australian Local Government Association, in partnership with the Department of Planning and the Department of Environment and Conservation and supported by SWCC and Local Government.

This dataset identifies current remnant vegetation extent according to vegetation complexes. The vegetation complexes are based on patterning of vegetation at a regional scale reflected by the underlying key determining factors of landform, soil and climate. Two sets of vegetation complex mapping were used:

- Vegetation complex mapping by Heddle, Loneragan & Havel(1980)
- Vegetation complex mapping by Havel & Mattiske (2000)

The data identifies the current extent of each of the mapped vegetation complexes and the percentage of original pre-European extent remaining.

As an example of how this data can be used, Figure 2 shows areas of remnant vegetation that are vegetation complexes with less than 30% of their original extent remaining.

2. **Value of remnant vegetation in relation to size, shape and connection with other areas of remnant vegetation in the landscape**

Remnant vegetation connectivity characteristics and patch size were assessed using spatial modeling developed through the Perth Biodiversity Project (2012). 2013 remnant vegetation mapping was used as a basis for the analysis. Three connectivity measures were developed:

Fragmentation: a scaleless and dimensionless measure which describes the shape and local arrangement of remnant vegetation patches in the region. It measures the degree to which any remnant patch is diverting from the 'ideal circle' shape. A high vegetation fragmentation index indicates large, compact or locally well connected patches, a low index indicates small, isolated or poorly shaped patches.

Regional Connectivity: a scaleless and dimensionless measure of how well a patch of remnant vegetation contributes to a network of patches in the wider landscape. A high regional connectivity index indicates large patches that are part of a large, dense regional network, and a low index indicates small, fragmented or isolated patches.

Connectivity Reach: describes the size of the connective network a patch belongs to but does not consider how sparse or dense the network is.

Figure 3 depicts an example of how this data can be used. In this example the connectivity criteria set is for vegetation that scores greater than the mean weighted average for remnants on private land. Figure 3 depicts how many of the connectivity criteria each remnant meets. Figure 4 shows the connectivity values depicted in Figure 3 on private land only.

As further examples, Figures 7 and 8 show areas that meet at least of the 2 connectivity criteria and also have less than 30% of the original pre-European extent remaining.

3. **Waterway foreshore condition**

Foreshore condition has been mapped for most of the waterways in the region during the development of river action plans. No data is available for Turner Brook and a few of the very small streams. The Pen-Scott method of foreshore assessment was used. This system provides a graded description of the stream foreshore that ranges from pristine (A grade) to degraded ditch (D grade).

The data can be used to identify areas of riparian vegetation that are in excellent to good condition. Areas classified as A grade have very limited weed presence. The weed burden in B grade areas ranges from B1 where weeds have become significant component of the understorey vegetation though native vegetation is still dominant, through to B3 where weeds dominate the understorey.

As an example of how this data can be used Figure 5 shows areas identified as A grade or B1.

4. Previous weed management and landholder activity

Limited data on areas of previous weed management investment and landholder activity is available for the region. Digital records have been kept by the CCG since 2012 of weed control activities coordinated by CCG on private and public land.

Figure 6 shows areas of weed control activities coordinated by CCG or where landholders have received CCG assistance to undertake weed control themselves.
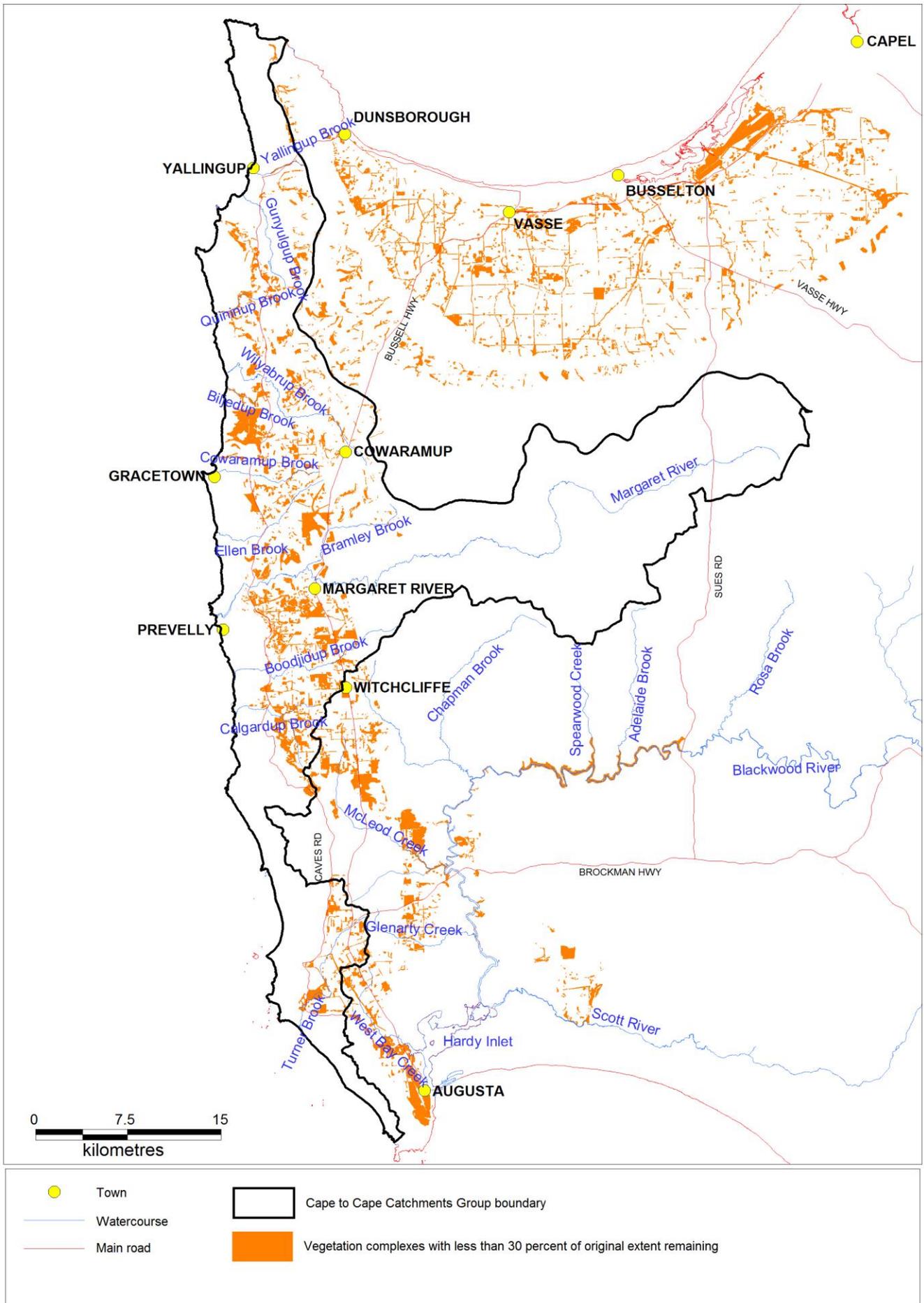
Figure 2: Vegetation complexes with less than 30% of original extent remaining
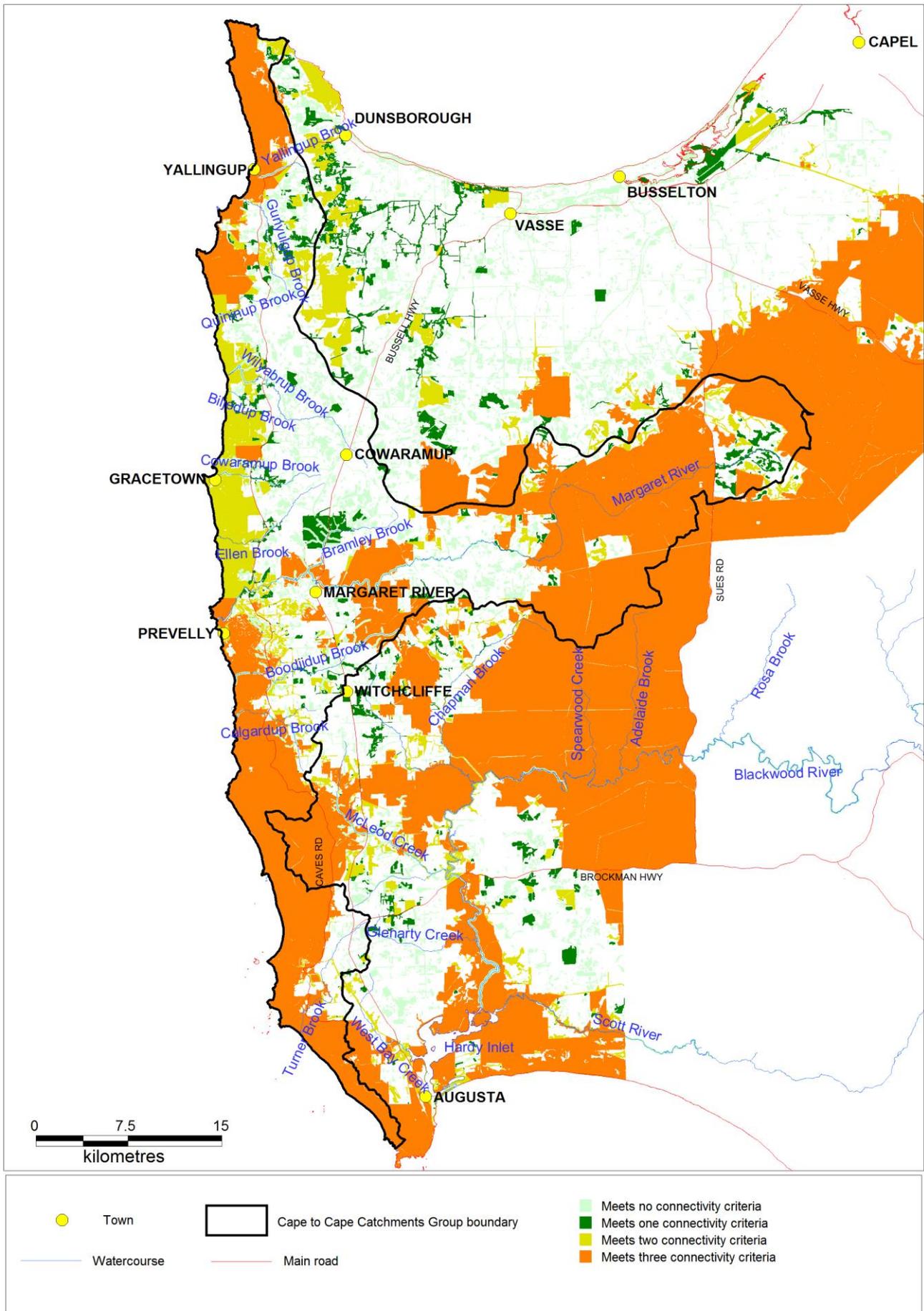
Figure 3: Value of remnant in relation to size, shape and connection with other areas of remnant vegetation in the landscape
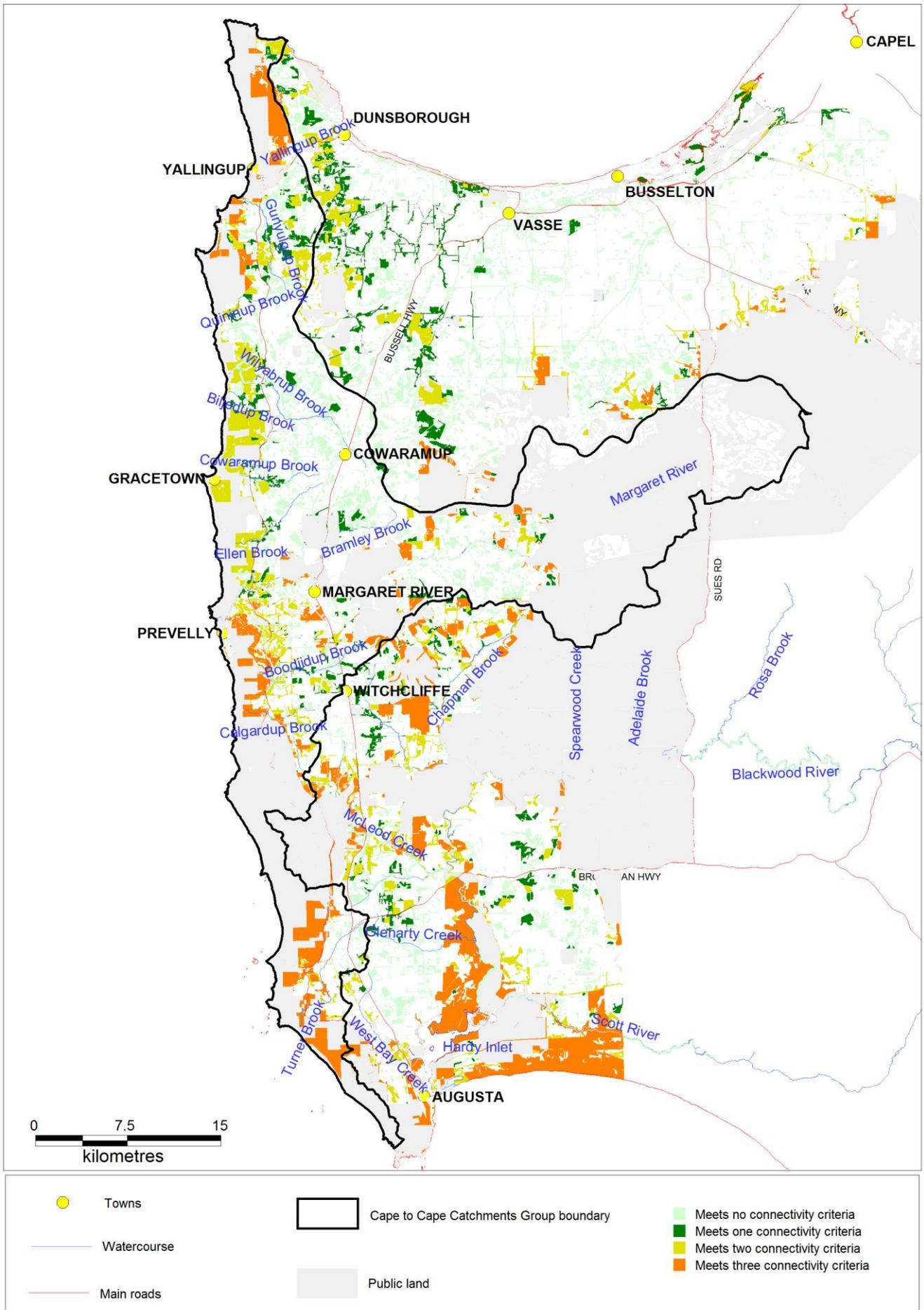
Figure 4: Remnant vegetation connectivity value as depicted in Figure 3 with public, reserved land omitted
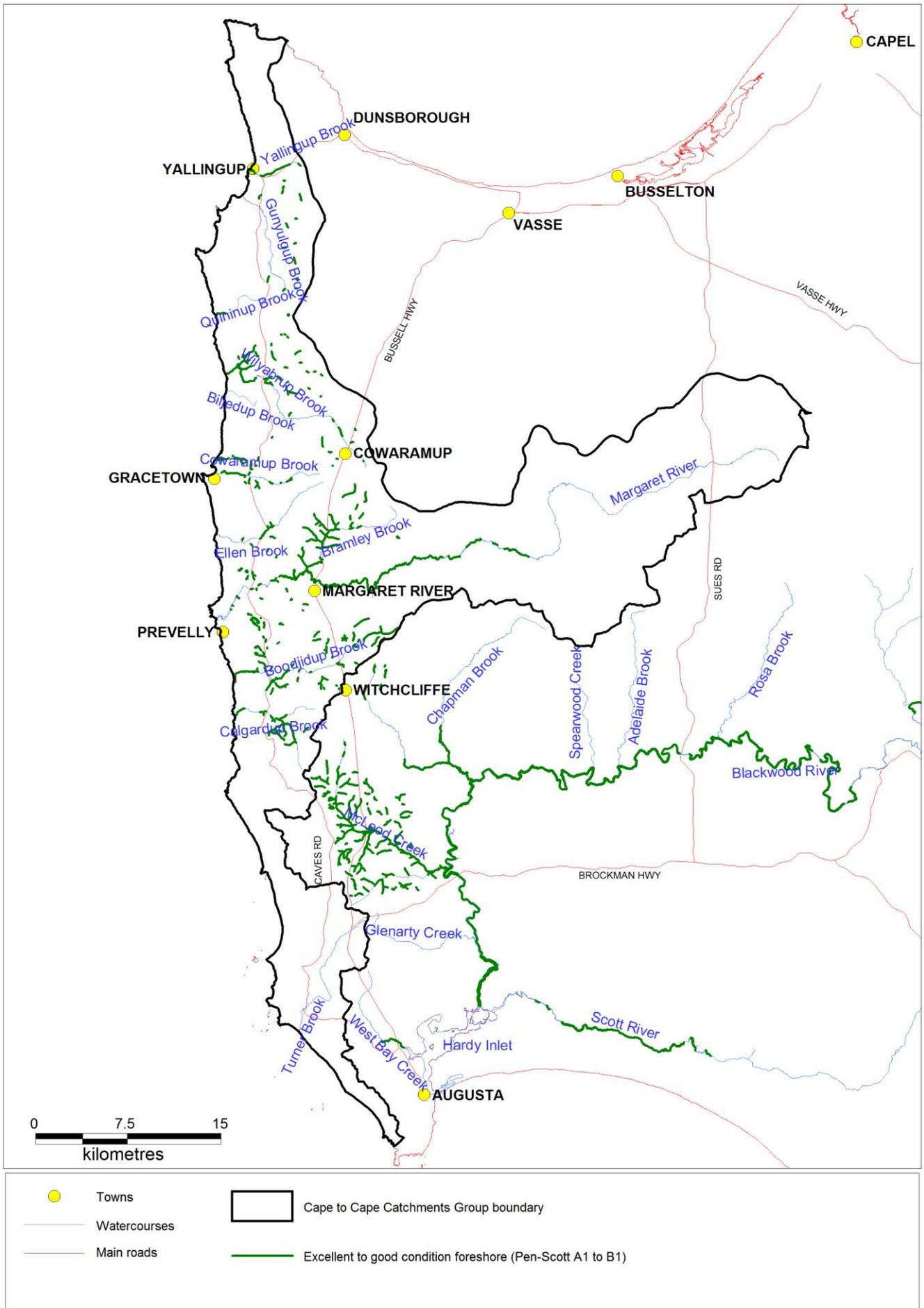
Figure 5: Foreshore areas in excellent to good condition (A1 to B1)
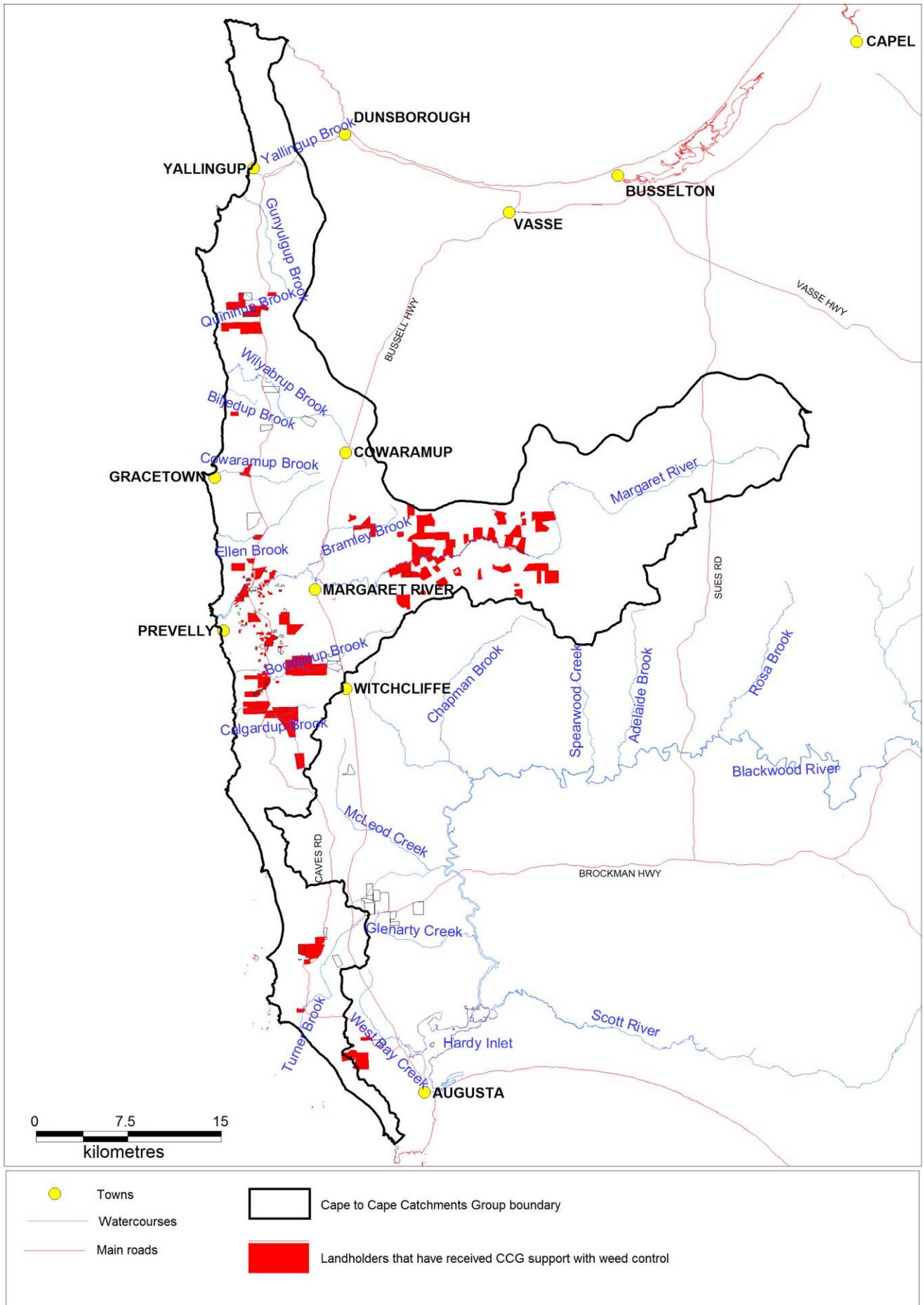
Figure 6: Properties that have received support with weed management activities from CCG since 2011
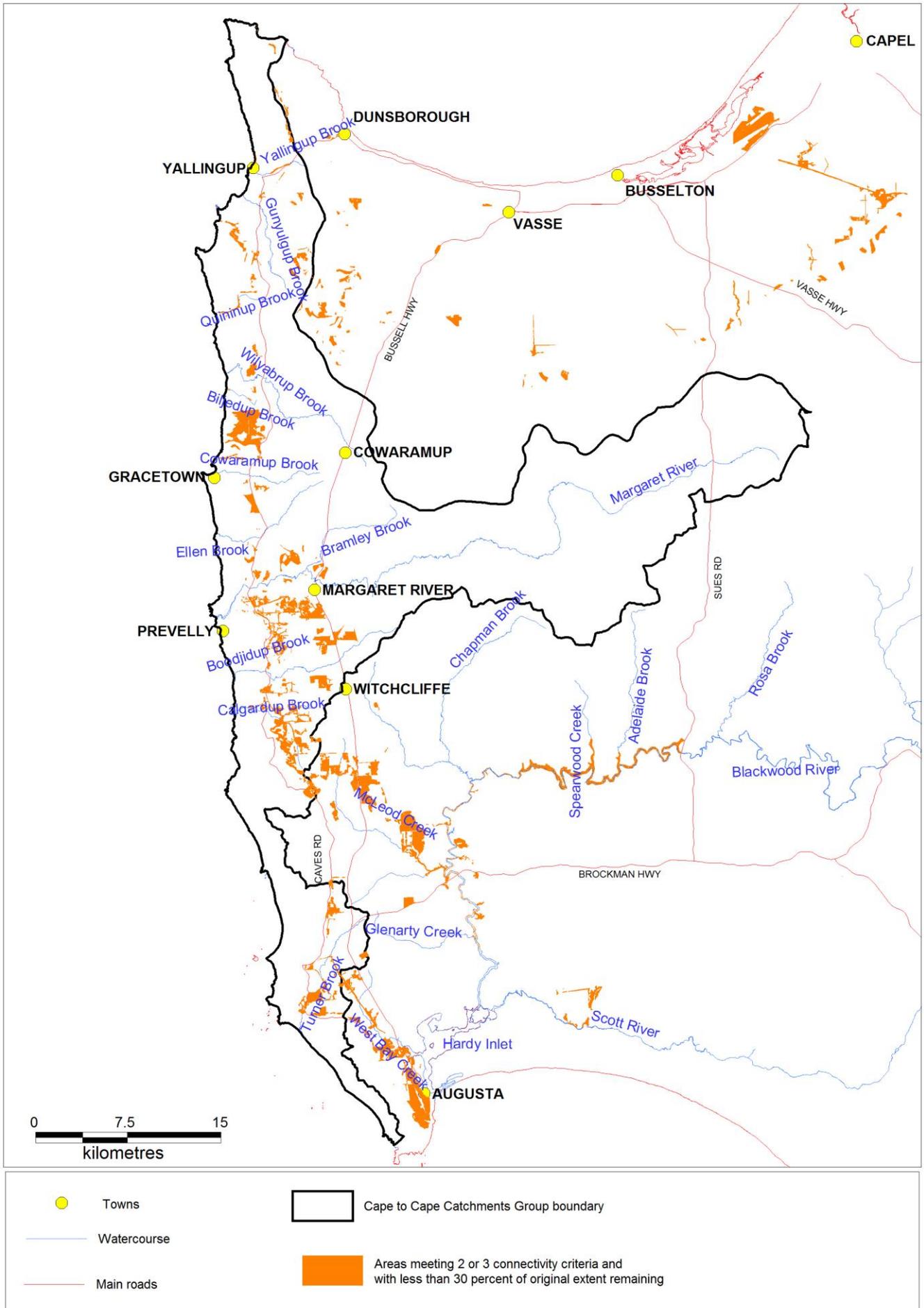
Figure 7: Areas that meet 2 or 3 connectivity criteria and have less than 30 % of original extent remaining
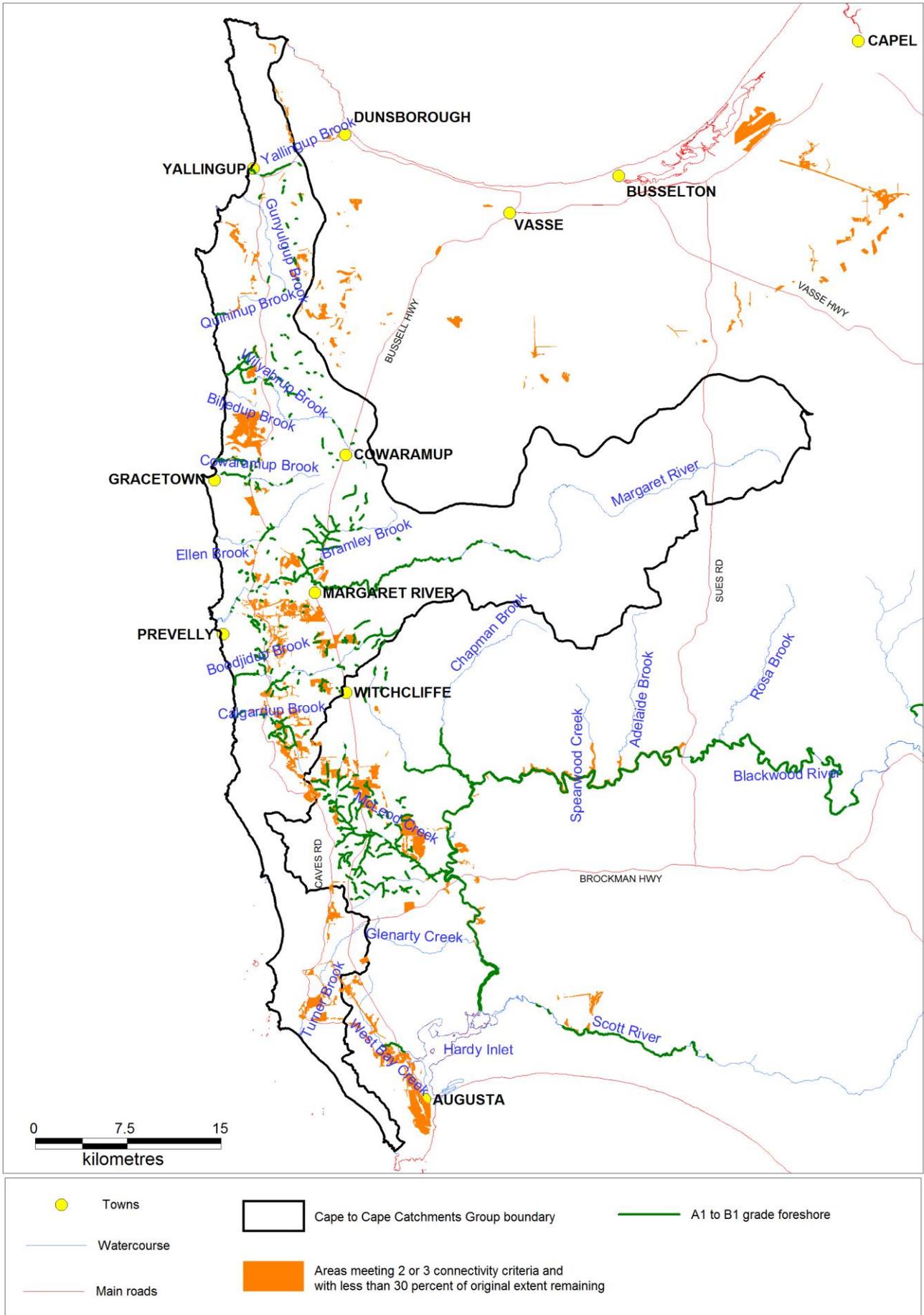
Figure 8: Areas that meet 2 or 3 connectivity criteria and have less than 30 % of the original extent remaining, overlayed with good quality foreshore

4. Recommendations

Objective: Facilitate collaboration and coordination to achieve effective environmental weed management in the region.

Recommended actions:

| 1.1	Create a formal environmental weed management group.
	NRM groups, local and state government work well together in the subject area to coordinate weed control across tenure. This collaboration is undertaken informally by staff responsible for managing weed control activities. It is recommended that this collaboration be strengthened by creating a formal regional environmental weed management group.
	Formalising a group would ensure recognition and support of the group by upper management of participating organisations, and would improve sustained and consistent coordination and collaboration. Suggested participants include CCG, Lower Blackwood LCDC, Yallingup LCDC, DPaW (including both off-reserve and reserve management), AMRShire, and CoB.
	The functions of the group could include: coordination of on-ground work; review and update of priorities; information sharing on emerging weed problems; rapid response to significant emerging weeds; coordinated behavioural change strategies and education programs; and standardised data capture and recording procedures.
	The option of this group becoming a Recognised Biosecurity Group should be considered by participants.
1.2	Facilitate strategic, coordinated weed control on private property by motivating and assisting landholders with control of priority species in high priority areas.
1.3	Facilitate strategic, coordinated weed control across tenure focusing on priority species in high priority areas.
1.4	Work with local plant retailers, landscape architect/designers, professional landscapers, gardeners and tree services to limit introduction and spread of weeds, with a focus in the lifetime of this strategy on woody weeds.
	Woody weeds are of particular concern as they are being widely planted across the landscape. Landholders with the best intention to revegetate their properties are still planting species that are ranked highly in the species prioritisation undertaken for this strategy.
1.5	Support the development and implementation of weed management plans, agreements and MOUs between councils, agencies, NRM groups and private land managers to formalise and improve coordinated weed management.
1.6	Support the integration of weed management into operational areas of councils such as reserve management, stormwater management, road design, construction and maintenance.

Objective 2: Increase the willingness and capacity of landholders to undertake effective weed management.

Recommended actions:

2.1	Use a community based social marketing approach to improve understanding of how to influence community behaviour in regard to introduction, spread and control of environmental weeds. Develop and trial behavioural change strategies to improve weed management.
2.2	Provide technical advice and funding assistance to landholders to manage environmental weeds. Whilst delivering weed control projects on private property consider the following:

- Implement activities to inform, encourage and support landholders. The aim should be to influence what is the social norm. Increase landholder interest, connection with their local area and community, motivation and technical knowledge. For example, through face to face contact with project officers, regular community get togethers, on-going updates on weed control program, recognition of work through public forums, property visits, field walks, talks on biodiversity values of the local area, involvement in environmental education activities, monitoring and reporting.

- Use a cost sharing arrangement whenever possible when providing financial support to landholders to achieve weed control. Cost sharing significantly increases the resources available for weed control and the landholder's ownership of the problem and weed management. A long term solution requires that landholders are committed to the work.

- Within the constraints of available resources provide on-going community engagement and support. Wherever possible avoid one-off or short term engagement and support.

2.3	Provide training opportunities to all stakeholders in weed management.
2.4	Provide educational resources to the community on environmental weeds and their management.

Objective 3: Increase awareness within the community of environmental weed issues.

Recommended actions:

3.1	Use a community based social marketing approach to improve understanding of how to increase awareness of environmental weed issues and influence community behaviour in regard to introduction, spread and control of environmental weeds. Develop community awareness strategies in response.
3.2	Install and maintain signs and displays about environmental weeds throughout the area, for example, at entries into towns, recreational areas, Shire offices, nurseries, real estate offices, rural supply shops.

3.3	Develop written communication and ensure it is available to the public at appropriate locations.
3.4	Use established networks such as CCG Streamlines network, Shire pages in the paper, newspapers to regularly disseminate information about environmental weeds throughout the community.
3.5	Develop networks with professional landscapers, landscape architects/ designers, gardeners, local government planners, planning consultants, real estate agents and undertake activities to increase their awareness about environmental weeds and their management in our community.
3.6	Raise awareness of woody weeds and garden escapees and alternatives that can be grown.

Objective 4: Prevent new weed problems.

Recommended actions:

4.1	Use local, state and national information networks to keep up to date about species identified as potential problems eg WONS, Alert list.
4.2	Develop community networks to assist in early detection of new weed problems. Provide information and training as required.
4.3	Provide information to the general community about new and emerging weeds.
4.4	Keep reliable and consistent records of new and emerging weeds.
4.5	Develop weed management plans for the new and emerging weeds identified in Table 1. Weed management plans should outline a five year strategic approach to managing the species and include information about current known locations, assessment and mapping to improve knowledge of presence and extent, communication activities and proposed control activities. Keeping records of weed location and extent, and weed control activities is a high priority.
4.6	Increase the use of hygienic practices to prevent the introduction and spread of weeds.

Objective 5: Reduce the impact of existing weeds on the region.

Recommended actions:

| 5.1 | Develop weed management plans for the established weeds identified in Table 2. Weed management plans should outline a five year strategic approach to managing the species and include information about high priority areas for protection, current known weed locations, assessment and mapping to improve knowledge of weed presence and extent, communication activities and proposed control activities. Keeping records of weed location and extent, and weed |

control activities is a high priority.

| 5.2 | The management recommendation for the species in Table 4 is to prevent their spread to priority sites. Relevant priority sites should be identified and a plan developed and implemented to monitor current weed presence and extent, weed control activities and future weed incursion in these areas. |
| | Keeping records of weed location and extent, and weed control activities is a high priority. |

Objective 6: Improve and standardise data capture techniques, monitoring, reporting and evaluation processes across the region.

Recommended actions:

| 6.1 | Develop standardised data capture and recording procedures for environmental weed species extent, distribution and control activities so that data can be easily shared and mapped across the region. See Appendix 3 for description of current procedures of relevant land managers. |

Objective 7: Enhance the use of legislation and enforcement measures.

Recommended actions:

| 7.1 | Investigate the option of prescribing pest plants under the *Biosecurity and Agriculture Management Act 2007* in the AMR Shire and CoB. See Appendix 4 for information on prescribing pest plants. |

Objective 8: Pursue research opportunities and partnerships and resource assessment projects to improve understanding and effective management of weed issues in the region.

Recommended actions:

8.1	Identify and prioritise knowledge gaps to improve effective management and scientific understanding of weed issues in the region.
8.2	Undertake vegetation condition mapping particularly focusing on areas identified as having high biodiversity values.
8.3	Undertake weed presence and extent mapping focusing on the highest priority species identified in this strategy and high priority areas.

5. References

Australian Weeds Strategy – A national strategy for weed management in Australia. Natural Resource Management Ministerial Council (2006), Australian Government department of the Environment and Water Resources, Canberra, ACT.

Local Biodiversity Program. Metadata Statement – 2013 Native vegetation by Vegetation Complex

NSW DPI and OEH (2011) *Biodiversity priorities for widespread weeds*. Report prepared for the 13 Catchment Management Authorities (CMA) by NSW Department of Primary Industries and Office of Environment and Heritage, Orange.

Randall, R.P. (2000) Which are my worst weeds? A simple ranking system for prioritising weeds. *Plant Protection Quarterly.* 15 (3) 109-115

Weed Prioritisation Process for DPaW (formerly DEC) – *"An integrated approach to Weed Management on DPaW-managed lands in WA".* (As at November 2013)

The Environmental Weed Strategy of Western Australia (EWSWA) (1999) provided a ranking of weed species on a state-wide basis against three criteria – invasiveness, distribution and environmental impacts. A total of 1350 weeds were rated through this process as either high, moderate, mild or low, with 34 weed species being rated as high.

The state-wide ratings from the Strategy are deemed too broad to be of use from an on-ground operational perspective and are now out of date. In addition to these factors, the Strategy was meant to have developed an integrated approach to environmental weed management that included site led and resource led control (EWSWA, 1999) however, due to funding constraints, it did not carry out an assessment and ranking of weed species against the biodiversity assets they threaten nor did it consider feasibility of control.

In an effort to address these issues and implement an integrated approach to weed management on DPaW-managed lands in WA, the Weed Prioritisation Process for DPaW was developed in 2008. This process was based on the Environmental Weed Census and Prioritisation, Swan Natural Resource Management Region project developed by Karen Bettink and Greg Keighery (2008). A focus of the process is to consider both: 1) a "species-led"; and 2) an "asset-protection-based" approach to control the threat of environmental weeds within WA.

It was proposed that the Weed Prioritisation Process for DPaW prioritise weeds in each DPaW Region, with the aim being to establish both a species-led and an asset-protection-based approach to weed management. The species-led process assessed weed species for their invasiveness, ecological impacts, potential and current distribution and feasibility of control. The resulting priorities focus on infestations of species which are considered to be high impact, rapidly invasive and still at a population size which is feasible to eradicate or contain to a manageable size. Hence, weed species which are already widespread **did not** rank as a high priority through this part of the process.

The next stage of the process is to investigate the use of an asset-protection-based approach to guide the management of widespread weeds. This approach will focus on identifying high value biodiversity assets, the weeds that pose a threat to these assets and the sites where control will have the greatest biodiversity benefit and cost effectiveness. Social, cultural and economic assets as well as good neighbour issues will be considered at a later stage of the process.

Please note: these results are for the species led approach which focuses on infestations of species which are considered to be high impact, rapidly invasive and still at a population size which is feasible to eradicate or contain to a manageable size. As a result, widespread species that are high impact and rapidly invasive are going to rank low as it is not feasible to eradicate or contain the species. These species will be dealt with through the asset based approach.

Acknowledgements – DPaW would like to acknowledge the individuals, and the organisations which they have represented, for participating in the regional workshops. A special acknowledgement must be given to Mr Greg Keighery for providing his expertise and involvement in all of the nine regional workshops and assisting in the completion of each regional prioritisation.

METHODOLOGY – SPECIES-LED PRIORITISATION PROCESS

A series of "species-led" prioritisation workshops were held in each of the nine DPaW regions between 2008 and 2010.

The "species-led" workshops have aimed to score all weeds which occurred in each of the DPaW regions according to a series of key attributes. These attributes have been based upon the "*Swan Catchment Council Environmental weed list legend July 2008*" (refer to Appendix 1 for an extract of descriptions for fields used in the species based prioritisation process for DPaW Regions).

The intent of these workshops was to assist DPaW regions in priority setting for weed management on DPaW-managed lands. To ensure standardisation across each of the Regions it was important to ensure that all workshop attendees understood the descriptions and codes relevant to each field. It was important to highlight that this initial part of the process was a species based prioritisation and therefore it was important to consider the feasibility of eradicating or containing the species across the region.

Each species was then rated and any discussions about the species regarding its location, impacts and so on within the region were recorded in the notes column. Although discussions were had on whether a species was on a National, State or other list, it is important to note that these listings did not automatically equate with the species being one of the highest priorities for the region.

This process resulted in five (5) ratings for each weed species based on their invasiveness, ecological impacts, potential and current distribution and feasibility of control. In an attempt to synthesise these ratings to develop a more useable and overall ranking for weed species within each DPaW Region, the Weed Species Ranking Process was implemented. This process was intended to highlight the species that have the highest ecological impact, most extensive potential distribution, highest invasiveness, lowest current distribution and highest feasibility of control within a Regional context based on the information available at the time (refer to Appendix 3 for further information on the Weed Species Ranking Process).

The matrices from the Weed Species Ranking Process were applied to the ratings presented in the regional species-led prioritisation spreadsheets through an automated process and the results presented in three separate tables:

Table 1 RANKED - provides the species rankings for a region (these are listed alphabetically by scientific name under each of the categories of very high (VH), high (H), medium (M), low (L) and negligible (N)). The species ranking matches the Step 4 matrix so that the suggested management actions are also listed (i.e. A, B, C, D, E, F, G, H and I).

Table 2 FAR - provides a list of all species that received a ranking of further assessment required (FAR) for that region due to unknown ratings combining for two factors (listed alphabetically by scientific name).

Table 3 ALERT - provides a list of species that are considered ALERTS (listed alphabetically by scientific name). A species was considered to be an ALERT if it was - not found in WA, not found in the DPaW region but known to exist in an adjacent region or found in the region but not on DPaW-managed lands or waters.

The first biennial review of weed species ratings and rankings has been undertaken for all regions except Kimberley, which will take place in 2014. Regions and Districts are the custodians of their spreadsheets and update them as new species, infestations or changes to existing infestations are identified. This information is collated every two years when a biennial review is undertaken and changes are publicised.

DPaW Regional staff will use the results of the "species-led" weed prioritisation process to identify important weed priorities for control within each Region. If you require further information on the weed lists, the identified top weeds of any region, or if you have any feedback on the process please contact the Weeds Program Coordinator on (08) 9334 0312 or the relevant DPaW Regional Office.

ASSET- PROTECTION-BASED PRIORITISATION PROCESS - WIDESPREAD WEEDS

The ratings from the species-based prioritisation process is being used to identify which widespread, or established, weeds have a high impact and are rapidly invasive. This list will assist with prioritising weed control during the asset-protection-based process.

References

Bettink, K. and Keighery, G. (2008). *Environmental weed census and prioritisation, Swan NRM Region.*

Bettink, K. and Keighery, G. (2008). *SCC environmental weed list legend July 2008.*

Department of Conservation and Land Management (1999). *Environmental Weed Strategy for Western Australia.* Como.

Appendix 1: Extract of descriptions for fields used in the species based prioritisation process for DPaW Regions. Modified from the "SCC environmental weed list legend July 2008".

FIELD	DESCRIPTION	CODE	
Potential Distribution	Area of potential habitat in the Region that could be occupied or the area at risk of invasion by the weed. (E.g. % of land suitable for the weed)	L M H E U	Limited/Localised <10% Moderate 10-40% High 40-80% Extensive (widespread) >80% Unknown
Current Distribution	Area of habitat in the Region currently occupied by the weed, in relation to the habitat that it could invade. (E.g. % of potential area currently infested)	L M H E U	Limited/Localised <10% Moderate 10-40% High 40-80% Extensive (widespread) >80% Unknown
Ecological Impact	Impact of species within the Region, from low impact (causes minimal disruption to ecological processes or loss of biodiversity) to high (causes acute disruption of ecological processes, dominates and/or significantly alters vegetation structure, composition and function of ecosystems). Examples of impact attributes to consider: • changed fire regime • changed nutrient conditions • changed hydrological patterns • changed soil erosion patterns • changed geomorphological processes • changed biomass distribution • changed light distribution • loss of biodiversity • substantially reduces regeneration opportunities of native plants • allelopathic effects	L M H U	Low Medium High Unknown
Invasiveness	Rate of spread of a weed in native vegetation, encompassing factors of establishment, reproduction and long distance dispersal (>100m). Examples of establishment factors include: • ability to outcompete (light, moisture, nutrients, rapid root growth) • sexual or asexual establishment • need for disturbance to establish Examples of reproduction factors include: • time to seeding • seed production • vegetative reproduction Examples of long distance dispersal mechanisms include: • wind • water	S M R U	Slow Moderate Rapid Unknown

	• flying/ground animals • deliberate/accidental human spread • vehicles • produce contaminant	
Feasibility of Control	The longer a coordinated control program takes to achieve its desired goal, the more expensive and less feasible it becomes. Is it feasible to eradicate or at least contain the infestation? Examples of key factors to consider include: • how widespread a weed is • ease of finding infestations • Ease of killing (controlling) infestations • cost of controlling infestations & commitment to long term funding • difficulty of limiting the weed's dispersal • sources of reinfestation from adjacent lands • willingness of landholders and governments to control the weed • commercial use of the plant • longevity of seed survival	L Low M Medium H High U Unknown

APPENDIX 3 - Weed Species Ranking Process Summary

Purpose:

The weed species ranking process was implemented in an attempt to synthesise the large amount of information documented during the regional weed species-led prioritisation workshops to develop a more useable and overall ranking for weed species within each DPaW Region. The process was intended to highlight the species that have the highest ecological impact, most extensive potential distribution, highest invasiveness, lowest current distribution and highest feasibility of control within a Regional context based on the information available at the time. It was envisioned that the results of this ranking process would be used by staff to guide the decision-making process for determining on-ground weed management priorities (e.g. on-ground control, applying for funding etc) from a species-led perspective.

Methodology:

Four matrices were developed to combine the five key factors that were assessed and given ratings in the initial species-led prioritisation process: invasiveness, ecological impact, potential distribution, current distribution and feasibility of control. The matrices were developed in line with the 'National Post-Border Weed Risk Management Protocol'. The national protocol essentially substitutes invasiveness for likelihood so this follows the standard risk assessment process of consequence x likelihood = risk.

Essentially this ranking process is based on two key questions:
- Does a weed pose a significant <u>risk</u> to biodiversity?
- What is our <u>ability to manage</u> the weed?

The four matrices that were developed are presented in Appendix 1 and are (in order):

Step 1: potential distribution x impact = weed consequence

Step 2: invasiveness x weed consequence = weed risk

Step 3: current distribution x feasibility of control = weed management ability

Step 4: weed management ability x weed risk = weed species ranking

The matrices result in 6 weed species rankings (very high, high, medium, low, negligible and further assessment required). Broad qualitative rankings were chosen (rather than more detailed quantitative scores) in line with the somewhat subjective nature of the species-led prioritisation process. As our confidence in the data that is used in the prioritisation process improves, the ranking process can also be refined to reflect this. The final matrix (the weed species ranking) and the resulting final ranking also include examples of management actions that may be appropriate for a species of that ranking. Please note that these are indicative as to what type of management is appropriate for a species of that ranking and are not meant to be prescriptive.

This process was designed as a regional species-led prioritisation process. The ratings assigned are based on the species characteristics across the whole region not just a part of it (i.e. not just one ecosystem type (e.g. wetlands) or one District (e.g. Swan Coastal District). There will always be an argument that these rankings are not applicable to a particular patch of land. A good example is that the species characteristics may differ between the mainland and islands. However the value of developing a standardised prioritisation process for areas of land less than a regional area or IBRA region is questionable unless there is significant diversity in the Region.

Outcome:
The matrices were applied to the ratings presented in the regional species-led prioritisation spreadsheets through an automated process and the results are presented in three separate tables.

Table 1 provides the species rankings for a region (these are listed alphabetically by scientific name under each of the categories of very high (VH), high (H), medium (M), low (L) and negligible (N)). The species ranking matches the Step 4 matrix so that the suggested management actions are also listed (i.e. A, B, C, D, E, F, G, H and I).

Table 2 provides a list of all species that received a ranking of further assessment required (FAR) for that region due to unknown ratings combining for two factors (listed alphabetically by scientific name).

Table 3 provides a list of species that are considered ALERTS (listed alphabetically by scientific name). A species was considered to be an ALERT if it was - not found in WA, not found in the DPaW region but known to exist in an adjacent region or found in the region but not on DPaW-managed lands or waters.

We cannot emphasise enough that these regional weed species rankings are based primarily on the weed species characteristics. We have recently commenced the process for developing an asset-based prioritisation process which is the other half of the toolkit for directing weed management. Furthermore, in this process there is always an element of local manager's discretion. While this ranking process should assist in setting directions for weed management priorities from a species-led perspective, it is not necessarily black and white; managers may want to consider any species with a low current distribution as a high priority for action or a different level of action may be justified for reasons that are not covered by the species-led prioritisation (or asset-based prioritisation processes) e.g. good neighbour.

Appendix 1 Weed Species Ranking Matrices

STEP 1: WEED CONSEQUENCE

		IMPACT			
		High (H)	Medium (M)	Low (L)	Unknown (U)
POTENTIAL DISTRIBUTION	Extensive (E)	VH	H	M	M
	High (H)	H	M	L	L
	Medium (M)	M	M	L	L
	Low (L)	M	L	N	L
	Unknown (U)	M	L	L	FAR

VH - very high
H - high
M - medium
L - low
N - negligible
FAR - further assessment required and species will not proceed through ranking process, however this species may require ongoing monitoring in the field

STEP 2: WEED RISK

		CONSEQUENCE				
		Very High (VH)	High (H)	Medium (M)	Low (L)	Negligible (N)
INVASIVENESS	Rapid (R)	VH	H	M	M	L
	Moderate (M)	H	M	L	L	N
	Slow (S)	M	L	L	N	N
	Unknown (U)	M	L	L	L	L

VH - very high
H - high
M - medium
L - low
N - negligible

STEP 3: WEED MANAGEMENT ABILITY

		CONTROL FEASIBILITY			
		High (H)	Medium (M)	Low (L)	Unknown (U)
CURRENT DISTRIBUTION	Low (L)	VH	H	M	VH
	Medium (M)	H	M	L	H
	High (H)	M	L	L	M
	Extensive (E)	L	L	N	L
	Unknown (U)	M	L	L	FAR

VH - very high
H - high
M - medium
L - low
N - negligible
FAR - further assessment required and species will not proceed through ranking process, however this species may require ongoing monitoring in the field

STEP 4: WEED SPECIES RANKING

		RISK				
		Very High (VH)	High (H)	Medium (M)	Low (L)	Negligible (N)
MANAGEMENT ABILITY	Very High (VH)	VH (H,I)	H (H,I)	M (D,E,F,G)	L (B,C,D)	N (A,B)
	High (H)	H (H,I)	H (G,H,I)	M (D,E,F)	L (B,C,D)	N (A)
	Medium (M)	M (D,E,F,G)	M (D,E,F)	L (D)	L (C)	N (A)
	Low (L)	L (D,E)	L (D)	L (B,C)	N (B)	N (A)
	Negligible (N)	L (D)	L (D)	N (B)	N (B)	N (A)

VH - very high (objective is eradication)

H - high (objective is eradication or control to reduce)

M - medium (objective is control to reduce or containment)

L - low (objective is containment at key sites only)

N - negligible (no action to be undertaken but may include monitoring only)

Examples of management actions that may be considered for each ranking:

A - no action (the weed species ranking is so low as to not warrant any investment in regional strategic management actions)
B - monitor only (aims to detect any significant changes in the species' weed risk or management ability)
C - improve general weed management (aims to minimise weed impact and maintain the overall biodiversity, social, cultural and economic values in the region through improved general weed management)
D - protect priority sites (aims to prevent spread of weed species to key sites/assets of high biodiversity, social, cultural or economic value)
E - targeted control to reduce infestations at priority sites (may include biocontrol) (aims to significantly reduce the impact of a weed species on key sites/assets of high biodiversity, social, cultural or economic value through targeted management)
F - contain regional spread (aims to prevent the ongoing spread of the weed species in the region)
G - reduce regional infestations (may include biocontrol) (aims to significantly reduce the extent of the weed species in the region)
H - regional eradication (aims to remove the weed species from the region)
I - statewide eradication (aims to remove the weed species from the state)

Appendix 2: Full list of weeds assessed for this strategy

Scientific Name	Common Name	Ranking and management recommendations for landscape units				
		Jarrah-marri forest and woodland	Leeuwin-Naturaliste ridge	Scott coastal plain	Riparian	Coastal dunes
Acacia baileyana	Cootamundra wattle	N (A,B)	N (A,B)	N (A,B)		
Acacia elata	Mountain cedar wattle	N (A,B)		N (A,B)	N (A,B)	
Acacia iteaphylla	Flinders Range wattle	M (D,E,F,G)	M (D,E,F,G)	N (A,B)		
Acacia longifolia	Sydney golden wattle	M (D,E,F,G)	M (D,E,F,G)	M (D,E,F)	M (D,E,F)	L (C)
Acacia melanoxylon	Blackwood	L (B,C,D)		L (B,C,D)	M (D,E,F)	
Amaryllis belladonna	Easter lily				N (A)	
Ammophila arenaria	Marram grass					N (A)
Anredera cordifolia	Madeira vine	L (B,C,D)	M (D,E,F,G)	L (B,C,D)	M (D,E,F,G)	
Arundo donax	Giant reed	L (B,C,D)		L (B,C,D)	L (B,C,D)	
Asparagus aethiopicus	Asparagus fern	N (A,B)	N (A,B)	N (A,B)		
Asparagus asparagoides	Bridal creeper	N (B)	N (B)	L (C)	N (B)	
Asparagus declinatus	Asparagus fern	L (D)	L (D)	N (A)	M (D,E,F)	
Asparagus scandens	Asparagus fern/climbing asparagus	N (A,B)	L (B,C,D)	N (A)	M (D,E,F,G)	
Briza maxima	Blowfly grass					N (B)
Cenchrus clandestinus	Kikuyu grass	N (A)	N (A)	N (B)	L (D)	
Cenchrus macrourus	African feathergrass	L (B,C,D)		L (C)	M (D,E,F)	
Centranthus ruber	Valerian	N (A,B)		N (A,B)		
Chamaecytisus palmensis	Tree lucerne, tagasaste	L (C)	L (B,C,D)	L (B,C,D)		
Chasmanthe floribunda	African cornflag	L (B,C,D)	L (B,C,D)	L (B,C,D)		
Coprosma repens	Mirror plant	N (A,B)	N (A,B)	N (A,B)		
Cortaderia selloana	Pampas grass	N (A)	N (A)	N (A)	N (A,B)	
Cotoneaster pannosus	Cotoneaster	N (A)		N (A)		
Cyathea cooperi	Rough tree fern				L (C)	
Cynodon dactylon	Couch	N (A)	N (A)	N (A)	N (A)	
Dimorphotheca odorata	Veld daisy					N (A)
Dipogon lignosus	Dolichos pea	M (D,E,F)	M (D,E,F)	N (A)	M (D,E,F)	
Dodonaea viscosa subsp. viscosa	Sticky hopbush	N (A,B)	N (A,B)	N (A)		
Echium fastuosum	Pride of Madeira		L (B,C,D)			
Echium plantagineum	Paterson's curse		L (B,C,D)			
Ehrharta brevifolia var. cuspidata	Veldtgrass	N (A)	N (A)	N (A)		
Ehrharta calycina	Perennial veldtgrass	L (B,C,D)	N (A)	N (A)		
Ehrharta erecta	Panic veldtgrass	N (A)	N (A)	N (A)		
Ehrharta longiflora	Annual veldtgrass	N (A)	N (A)	N (A)		N (B)

Scientific name	Common name					
Ehrharta villosa	Pypgrass					L (D,E)
Eragrostis curvula	African love grass	L (B,C,D)	N (A)	N (A)		
Eucalyptus grandis	Rose gum, flooded gum		N (A)			
Eucalyptus botryoides	Bangalay	L (B,C,D)		L (B,C,D)		
Eucalyptus camaldulensis	River gum	FAR		FAR		
Eucalyptus citriodora	Lemon-scented gum	FAR	L (B,C,D)	FAR		
Eucalyptus globulus	Blue gum	N (A,B)	L (B,C,D)	N (A,B)		
Eucalyptus gomphocephala	Tuart		N (A)			
Eucalyptus maculata	Spotted gum	FAR	N (A)	FAR		
Eucalyptus microcorys		FAR		FAR		
Euphorbia paralias	Sea spurge					L (B,C)
Euphorbia terracina	Geraldton carnation weed		M (D,E,F,G)			M (D,E,F,G)
Ficus carica	Edible fig, common fig				M (D,E,F)	
Freesia alba x leichtlinii	Freesia	L (C)	L (C)	L (C)		
Genista linifolia	Flaxleaf broom	M (D,E,F,G)	L (B,C,D)	L (B,C,D)		
Genista monspessulana	Broom	M (D,E,F,G)	L (B,C,D)	L (B,C,D)		
Gladiolus undulatus	Wavy gladiolus	L (C)	L (C)	N (A)	L (D)	
Gomphocarpus fruticosus	Swan plant, narrowleaf cottonbush	M (D,E,F)	M (D,E,F)	N (A)		
Gomphocarpus physocarpus	Balloon cottonbush	M (D,E,F)	M (D,E,F)	L (C)		
Histiopteris incisa	Bat's wing fern				L (C)	
Holcus lanatus	Yorkshire fog				N (B)	
Homalanthus novo-guineensis	Bleeding heart				N (A,B)	
Hyparrhenia hirta	Tambookie grass	L (B,C)	L (B,C)	L (C)		
Hypericum perforatum var. angustifolium	St John's wort	L (B,C,D)	N (A,B)	N (A)		
Ipomoea indica	Morning glory				L (B,C,D)	
Ixia spp.	Ixia	L (B,C,D)	L (B,C,D)	N (A)		
Kunzea baxteri	Kunzea		L (B,C,D)			
Lachenalia aloides	Soldiers	L (B,C,D)	L (B,C,D)	N (A)		
Lagunaria patersonia subsp. Patersonia	Norfolk Island hibiscus					N (A,B)
Lagurus ovatus	Hare's tail grass					N (B)
Lavender spp.	Italian lavender, French lavender		N (A)			
Leptospermum laevigatum	Victorian teatree	L (B,C,D)	M (D,E,F,G)	L (B,C,D)		L (B,C,D)
Limonium lobatum	Statice					N (A)
Lonicera japonica	Japanese honeysuckle				L (B,C,D)	
Melaleuca armillaris	Bracelet honey-myrtle	L (B,C,D)	L (B,C,D)	L (B,C,D)		
Moraea flaccida	One-leaf cape tulip	L (B,C,D)	L (B,C,D)	N (A)		

Species	Common name					
Myriophyllum aquaticum	Parrot's Feather Myriophyllum, Brazilian Water Milfoil				FAR	
Olea europaea subsp. europaea	Olive	M (D,E,F)	M (D,E,F)	N (A)		
Parentucellia viscosa	Sticky bartsia				L (D)	
Paspalum dilatatum	Paspalum				L (C)	
Paspalum distichum	Water couch				L (C)	
Paspalum vaginatum	Saltwater couch				L (C)	
Pelargonium capitatum	Rose pelargonium					L (D)
Pinus radiate	Pine	L (B,C,D)	L (B,C,D)	L (B,C,D)		
Pittosporum undulatum	Sweet pittosporum	L (B,C,D)	M (D,E,F)	N (A)	M (D,E,F)	
Polygala myrtifolia and virgata	Myrtleleaf milkwort	L (C)	L (C)	N (A)		
Psoralea pinnata	Taylorina, psoralea	N (A)	N (A)	N (A)		
Roldana petasites		L (B,C,D)	L (B,C,D)			
Rubus anglocandicans	European blackberry	N (A)		L (B,C,D)	M (D,E,F)	
Senecio elegans	Purple groundsel					N (B)
Tetragonia decumbens	Sea spinach					L (D)
Trachyandra divaricata	Dune onion weed					L (B,C)
Tritonia crocata	Tritonia	L (B,C,D)	L (B,C,D)			
Tritonia gladioralis	Tritonia, lined tritonia	L (B,C,D)	L (B,C,D)			
Typha orientalis	Bulrush				L (C)	
Vinca major	Blue periwinkle	L (B,C,D)	L (B,C,D)	N (A)	L (B,C,D)	
Watsonia spp.	Watsonia	M (D,E,F)	M (D,E,F)	L (B,C,D)	M (D,E,F)	
Zantedeschia aethiopica	Arum lily	M (D,E,F,G)	M (D,E,F,G)	M (D,E,F)	M (D,E,F,G)	L (B,C,D)

Appendix 3: Current data recording procedures implemented by DPaW and CCG

DPaW and CCG are currently two organizations in the region using standardized digital data recording for weed infestations and control. Information stored and collected for each of these organistaions is detailed below.

DPaW:

DPaW use point, polygon and polyline shapefiles to record data. The main dataset used is a point based shapefile, with the polgon and polyline shapefiles providing additional information for the spatial extent of infestations where they have been mapped or cover a wide and obvious area (ie. an example for a polyline would be along a roadside or boundary). The fields used in the point shapefile are listed below.

Common name	Easting	Comments
Latin name	Northing	Control undertaken
Priority	Latitude	Date control commenced
Date surveyed	Longitude	Chemical used
Tenure	GPS reading taken	Season control undertaken
Location	Size of infestation (m²)	Date of treatment
Description	Number of plants	Treatment methodology

CCG:

CCG captures digital weed mapping and weed control information with fields used listed below.

Weed control:

Landholder	Method
Date of control	Chemical used
Project name	Hrs of control
Project officer	Litres sprayed
Weed species	Comment
Contractor	Area of infestation

Weed mapping:

Weed density
Weed species
Date of control
Landholder
Project
Project officer
Source of information

Weed density criteria	
1	Absent
2	Less than 1%
3	1% to 10%
4	11% to 50%
5	Greater than 50 %

The following information comes from https://www.agric.wa.gov.au/pest-plants/prescribing-pest-plants

Prescribing pest plants

Background

Since 1 May 2013, local authorities have been able to prescribe problematic plant species as pest plants under section 193 of the *Biosecurity and Agriculture Management Act 2007* (BAM Act) Act. This can be applied to any plant that, in the local authority's opinion, is likely to adversely affect the environment of the district, the value of property in the district, or the health, comfort or convenience of the district's inhabitants.

General pest plant principles

It is each local authority's responsibility to schedule a plant for pest plant status and administer the pest plant sections of the BAM Act in respect of that plant.

Once a local authority has gazetted a pest plant local law, it has considerable power to enforce control measures on all private land. A local authority may, by written notice, direct any occupier or owner of private land within its district to destroy, eradicate or otherwise control pest plants (BAM Act, section 193). The notice may specify the manner in which the pest plant will be controlled, the level of control required and the period during which that control will be effected.

Plants no longer categorised as declared plants can be prescribed as pest plants.

Procedure for prescribing pest plants

A local authority should consider a range of criteria before a pest plant is prescribed. A summary of criteria to consider is located on the page general guidelines for assessing plants for pest plant status. These guidelines enable a local authority to objectively decide whether or not a plant should be prescribed as a pest plant for the district.

Approval of pest plant local laws

The proposed local law is enacted in accordance with provisions of *the Local Government Act 1995* (section 3.12). The proposal should be forwarded to the Department of Local Government and Communities, to certify correct application of the Local Government Act in respect of pest plants.

During the prescribed period of consultation required for enactment of local laws, the Department of Local Government and Communities must (in accordance with the Local Government Act) forward a copy of the proposed local law and a copy of the public notice, to the Minister for Agriculture and Food.

In accordance with the BAM Act, a pest plant cannot be prescribed for an area if that plant is already declared in that area. If a plant is already declared in an area, its declared plant status would need to be cancelled before it can be prescribed as a pest plant for that area.

Local authorities should check to verify that any plant proposed to be a pest plant is not already declared under the BAM Act. This information can be found on the Western Australian Organism List (WAOL).

Details of pest plant local laws can be found on the Department of Local Government and Communities local laws register. Under the Local Government Act, a local authority is to carry out a review of the local law

within eight years from the day when a local law commenced, in order to determine whether or not it considers that the law should be repealed or amended.

Landholder responsibilities in relation to pest plants

Once a pest plant has been prescribed in a district, landholders (landowners/occupiers) within the district are required to control pest plants on and in relation to their land in accordance with instructions specified in notices served by the local government.

Where a landholder does not comply with a notice served by a local authority, the authority may destroy, eradicate or otherwise control pest plants at the expense of the owner or occupier to whom the notice was given, and recover the costs associated with the control work from that landowner/occupier.

Contract work is performed on the understanding that the local authority has given sufficient notice to the landholder to comply with their responsibilities to control pest plants. Costs arising from contract work to control pest plants become a debt of the local authority concerned.

In respect of government departments the following is to be noted:

- Local authorities do not have the authority to direct government departments to comply with a pest plant local law or undertake pest plant local law requirements on government land.

- Entry into private property to enforce the control of pest plants, is authorised under the Local Government Act — not under the BAM Act.