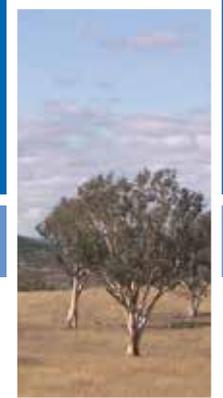
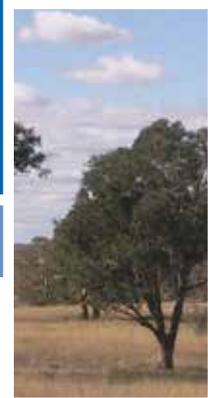




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## BOX-GUM WOODLAND IN THE ACT

Owen Maguire and Michael Mulvaney

Technical Report 25

November 2011

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# **BOX-GUM WOODLAND IN THE ACT**

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Environment and Sustainable Development Directorate  
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# 1 Introduction

Lowland woodland has been mapped across the ACT, based primarily on the results of two survey programs that were undertaken from 1995 to 1997 and 2001 to 2002. This mapping was published in the *ACT Lowland Woodland Conservation Strategy* (ACT Government 2004). The mapping specifically identified Yellow Box – Blakely’s Red Gum Grassy Woodland, which on 19 May 1997, was listed as an endangered ecological community, under the *Nature Conservation Act 1980* (ACT). Since 2004, the occurrence of Yellow Box – Blakely’s Red Gum Grassy Woodland within the ACT has changed, with some loss largely through urban expansion and some gain through natural or enhanced regeneration of what in 2004 was classified as ‘native pasture’. This report updates the endangered woodland mapping to better indicate its current extent.

On 17 May 2006, White Box – Yellow Box – Blakely’s Red Gum Grassy Woodland and Derived Native Grassland was listed as critically endangered under the *Environment Protection Biodiversity Conservation Act 1999* (Cwlth), herein referred to as the EPBC Act. Effectively, this listing is for the same ecological community as that listed under ACT legislation; however, white box does not occur in the ACT. The listing has the effect that Commonwealth approval is now required for any activity that has the potential to have a significant impact on the critically endangered woodland. The criteria used by the Commonwealth to determine whether or not a particular area of vegetation is critically endangered woodland, is different to that utilised in the 2002–2004 mapping of Yellow Box – Blakely’s Red Gum Grassy Woodland. This means that the total extent and distribution of the EPBC listed woodland across the ACT is currently unknown. Without this wider context, determining the significance of loss or degradation of a particular patch of woodland has proven problematic. Through the approval process, the Commonwealth strives to at least maintain the existing national occurrence of the critically endangered woodland and to ensure that, wherever possible, activities avoid and minimise any adverse impacts. As a last resort an offset may be required. Mapping the distribution of EPBC listed woodland across the ACT would assist development planning to avoid such areas, as well as indicating more clearly, potential offset areas.

The major purpose of this report is to re-interpret the 2002–2004 woodland mapping, as well as combining the results of more recent, but localised vegetation surveys, to produce an initial mapping of the extent of EPBC listed, critically endangered woodland across the ACT.

## 2 ACT Woodland Mapping: Previous Survey Methods

### 2.1 Rapid assessment technique for woodland structure and tree composition, 1995–1997

Preliminary surveys undertaken between 1995 and 1997 were used to map areas of woodland in the ACT. These surveys differentiated between ‘less modified woodland’ and ‘highly modified woodland’ and identified areas that were Yellow Box – Red Gum Grassy Woodland. Surveys were undertaken on both public and private land. Some areas were not surveyed, including woodland within some pine plantations (managed by the (then) ACT Forests), and marginal woodland areas in Namadgi National Park and Tidbinbilla Nature Reserve.

Woodland patches were identified on aerial photographs, and defined as polygons (survey units) on the basis of uniformity of tree cover. These polygons were then surveyed and information on the

tree composition and the relative abundance of each tree species collected. Qualitative notes were also made on the presence of regeneration, estimation of the relative exotic/native content of the ground layer, and some habitat features such as the presence of hollow-bearing trees.

Data from these surveys were used to support the listing of the Yellow Box – Red Gum Grassy Woodland as an endangered ecological community in 1997. The data also guided the actions set out in the Action Plan for Yellow Box – Red Gum Grassy Woodland prepared under the *Nature Conservation Act 1980* (ACT) (Action Plan 10) (ACT Government 1999). Action Plan 10 identified the requirement for more detailed study of understorey vegetation and where possible for fauna surveys, to facilitate conservation management and land use planning in areas that contain the endangered community. Action Plan 10 was superseded by Action Plan 27 (the ACT Lowland Woodland Conservation Strategy) in 2004 (ACT Government 2004).

## **2.2 Rapid assessment technique for surveying lowland vegetation and habitat, 2001–2005**

The polygons used in the woodland structure and tree composition study (1995–1997) formed the basis for a more comprehensive ecological survey. In some cases the original polygons were re-defined to include only one particular woodland community type, rather than just areas of similar tree cover. Thus some polygons were divided up into smaller polygons, while others were amalgamated. The aim was to have each polygon defined by a relatively homogenous structure and composition of both the upper and lower vegetation strata.

Separate polygons were traversed on foot, by a meandering transect. The species (fauna and flora) recorded were not intended to represent a full species count, rather they provided an assessment of the levels of diversity and disturbance present in each of the polygons. Most of the survey effort occurred in the spring and early summer of 2001 and 2002, with surveys focused on the following areas:

- all of the north Gungahlin, Kinlyside, Goorooyaroo, Kenny and north Watson areas
- Jerrabomberra Valley
- west Belconnen
- woodland and grassland in all of Canberra Nature Park
- native woodland areas in pine plantations in Stromlo and Isaacs managed by ACT Forests.

Thus the 2004 woodland mapping of rural areas in the ACT was largely based on the 1995–1997 tree data and an estimate of native understorey cover alone.

For each polygon surveyed in the rapid woodland assessment, the following vegetation data was collected:

- a list of all plant species observed and their cover/abundance across the polygon in each vegetation stratum (ground, shrub, mid-storey, canopy)
- whether significant weed species occurred within a polygon
- the overall percentage ground cover of native plant species

- the overall percentage ground cover of exotic plant species
- the percentage of the canopy cover provided by each canopy species present
- the percentage of the mid-storey cover provided by each mid-storey species
- the height and overall percentage cover of each vegetation stratum (layer) present
- a description of the vegetation community present in each polygon
- whether the polygon contained native, disturbance sensitive plants (such as lilies and orchids) or largely consisted of native plants more tolerant to disturbance (such as native grasses, sedges or widespread herbs like *Geranium solanderi*, *Chrysocephalum apiculatum*, *Wahlenbergia* spp., *Rumex brownii* or *Hydrocotyle laxiflora*).

Each polygon was also given a condition ratio according to the following:

- **Partially modified:** high diversity and cover of native species including disturbance sensitive species
- **Moderately modified:** moderate diversity and cover of native species, but mainly disturbance tolerant species
- **Substantially modified:** low to very low diversity of native species, mainly disturbance tolerant native grasses, and usually a high cover of exotic perennial and annual species.

The total extent of lowland woodland mapped in 2004, together with the area of mapped Yellow Box – Red Gum Grassy Woodland is shown in Map 1. The mapping incorporates data from 3081 polygons, of which approximately 1000 polygons were subject to the more intensive woodland assessment survey.

### 3 Difference between Commonwealth/ACT Listing of Yellow Box – Red Gum Grassy Woodland

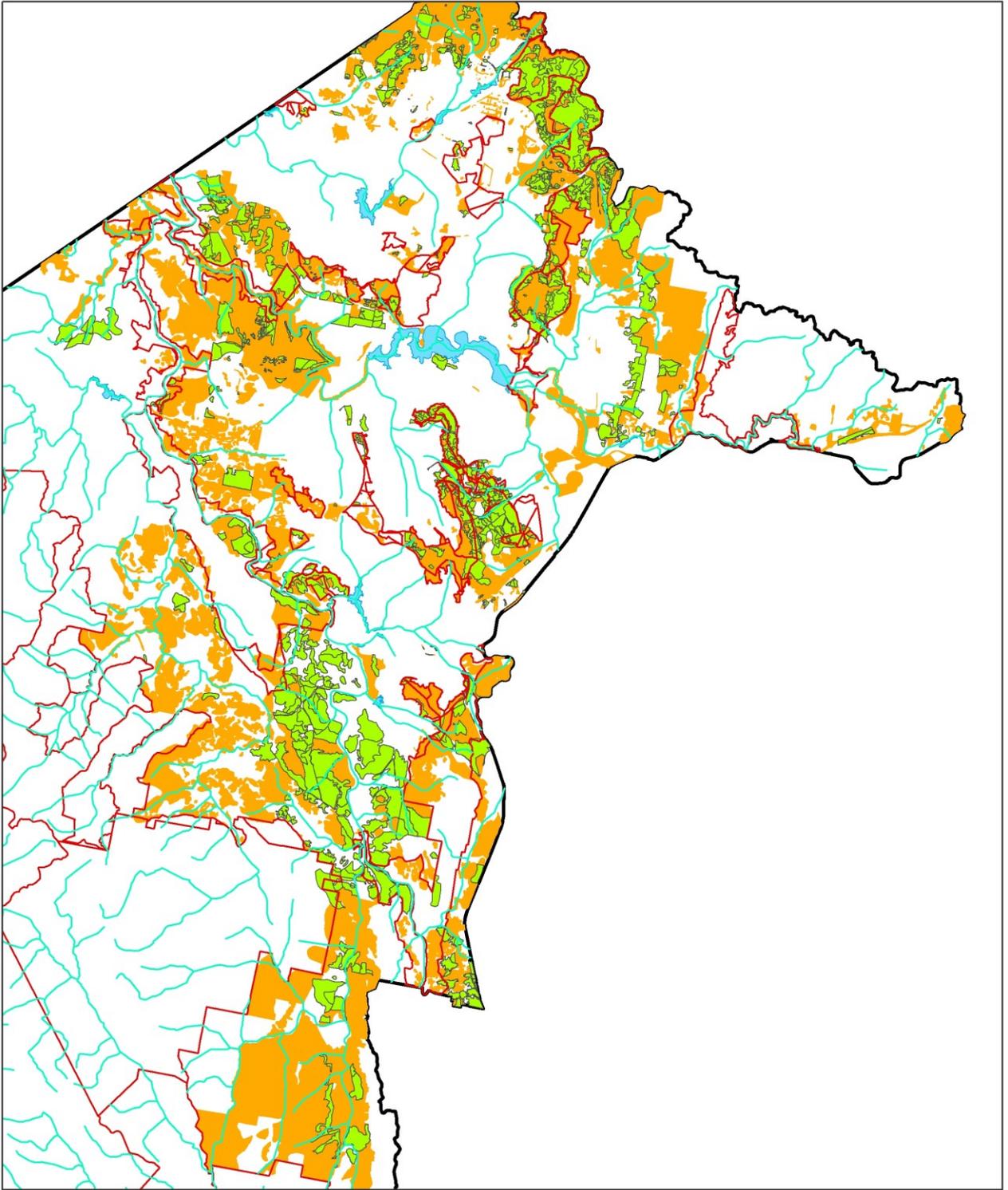
To qualify as White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland under the EPBC Act, at least 50% of the perennial vegetation in the ground layer (below one metre) must comprise native species, and the canopy must be dominated by, or have previously been dominated by, one of the characteristic canopy species (i.e. yellow box, Blakely's red gum or white box).

Woodland with a native understorey and yellow box and/or Blakely's red gum as dominant species is considered by the Commonwealth to be part of the listed critically endangered ecological community if any one or more of the following criteria are met:

- 1 The vegetation patch must be greater than 0.1 ha, with a diverse ground layer made up of 12 or more native non-grass species, including a pre-defined 'important' species.

(The listing under the EPBC Act includes a list of all 'important' species, which includes many species that are generally absent under prolonged grazing).

- 2 Patches of native vegetation greater than 2 ha that include at least 20 trees per ha, with a circumference of at least 125 cm at 130 cm above the ground.



**Map 1**  
**Lowland Woodland**  
**Within ACT**  
**Action Plan 27 (2005)**

**Legend**

-  Lakes/waterways
-  Conservation Reserve
-  Box-Gum Woodland
-  Other Lowland Woodland

0 2.5 5 10 15

1:250,000 Kilometres



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Patches of native vegetation greater than 2 ha, that contain at least two trees with a circumference of at least 125 cm at 130 cm above the ground and at least two trees with a circumference of between 15 cm and 125 cm at 130 cm above the ground.

Yellow Box – Red Gum Grassy Woodland endangered ecological community was mapped in 1997 and 2004 as any of the polygons in which more than 40% of the trees were yellow box and/or Blakely's red gum, and there was greater than 50% cover of native ground layer species. Areas in which most or all trees had been cleared (secondary grassland) were also mapped as the community; provided the area was considered to have once supported yellow box or red gum trees, the secondary grassland was predominately native, and retained a moderate diversity of native species.

Woodland that meets the EPBC listing criteria is therefore a better condition subset of the woodland defined in Action Plan 10 (ACT Government 1999) and Action Plan 27 (ACT Government 2004). This report maps the woodland that meets the differing ACT and Commonwealth inclusion criteria. The ACT criteria have been changed slightly by:

- excluding areas with a greater than 30% shrub cover
- changing the 'greater than 50% cover of native ground layer species' to '50% or more of the perennial ground cover must be native'
- including patches of at least 20 mature yellow box or red gum trees that have a continuous canopy cover, but may have an exotic understorey.

## **4 Methods Used in 2011 Mapping Update**

This study has mapped the extent of Yellow Box – Red Gum Grassy Woodland listed under Commonwealth and ACT legislation, through re-interpretation of the data collected in the periods 1995 to 1997 and in 2001 to 2005. The study also incorporates information from recent, but localised, vegetation surveys undertaken for development proposals or reserve management. Classification of the current vegetation in an existing polygon was determined according to the following order of priority:

- 1** removal of polygons or part polygons in which the vegetation had been cleared for urban development
- 2** use of new polygons from recent vegetation surveys that mapped both Commonwealth and ACT listed box – gum woodland
- 3** application of expert knowledge of the current vegetation type and condition of a particular polygon held by staff of the Conservation Planning and Research Unit (Environment and Sustainable Development Directorate, ACT Government)
- 4** assuming that box – gum woodland, occurring in conservation reserves, which from 2001 to 2005 had been mapped as partially or moderately modified would currently be of sufficient condition to meet listing criteria under the EPBC Act
- 5** undertaking limited site inspection as part of this project

- 6 re-interpretation of the data sheets collected from 2001 to 2005
- 7 re-interpretation of the data sheets collected from 1995 to 1997.

#### **4.1 ACT urban footprint**

Use was made of the ACT Government Urban Geographic Information System (GIS) layer, which is based on 2009 ADS-40 aerial photography and delimits areas under urban uses. Google Earth, which for the northern area of Gungahlin displays imagery taken on 15/4/2010, was also used in a few locations to identify recently cleared areas. A few areas of recent clearance, largely in Gungahlin, Molonglo, North Weston and at the Canberra Airport were identified through use of information contained in recent development applications or referrals.

This updated urban development layer was used to erase areas from the previous woodland mapping and also to generate the number of hectares lost to urban development, since 2004 (Table 1).

#### **4.2 Recent woodland and vegetation community mapping**

The reports from which information was gleaned on the distribution of box – gum woodland, including mapping of areas that meet the listing criteria under the EPBC Act, are contained in the bibliography. Map 2 shows the extent of vegetation mapping in each of these sources. Again the combination of data from recently mapped areas was used to erase corresponding areas from the previous woodland mapping.

#### **4.3 Expert advice**

Greg Baines and Michael Mulvaney of Conservation Planning and Research provided advice on the extent and condition of box – gum woodland occurring within Red Hill, Isaacs Ridge, Oakey Ridge, Mt Tuggeranong and Mt Taylor reserves and neighbouring areas, as well as parts of the Murrumbidgee River Corridor. Use was also made of unpublished vegetation mapping of O'Connor Ridge, Gossan Hill and Aranda Bushland, undertaken by Conservation Planning and Research.

#### **4.4 Assumption concerning Canberra Nature Park woodland**

The woodland polygons within Canberra Nature Park were all subject to the more intensive species and cover estimate data collection from 2001 to 2005. If at that time polygons within the reserve network were identified as Yellow Box – Red Gum Grassy Woodland in partially or moderately modified condition, then it was assumed that this vegetation, having been subject to many years of conservation management, would meet the criteria for listing under the EPBC Act.

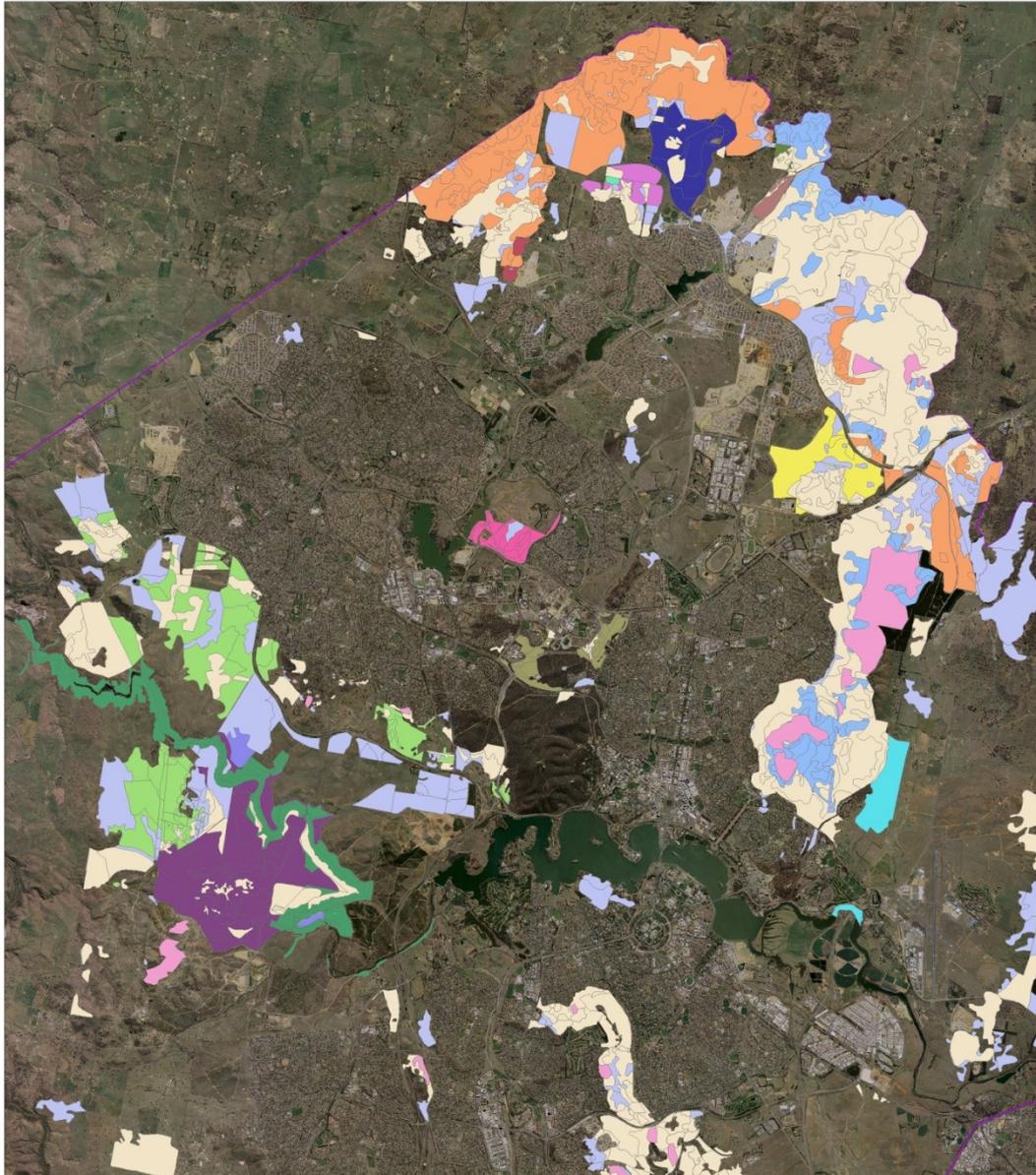
#### **4.5 Site inspections**

The authors undertook site inspections of woodland in rural areas in which large areas of Yellow Box – Red Gum Grassy Woodland had previously been mapped, and where this past mapping was solely reliant on the 1995–1997 surveys. Areas inspected included:

- west of the Murrumbidgee River from Point Hut Crossing to Tharwa
- Naas Valley and some surrounding ranges
- Uriarra to Stromlo

- parts of the Tidbinbilla and Cotter river catchments.

## Map 2. Source Dataset Map of ACT



### Legend

 AECOM Belco to City Transitway	 Bonner Stage 4 East ecological assessment of development options
 CPR advice	 Ecological Appraisal for Proposed Urban Area of Jacka, ACT
 CPR mapping	 Kenny background investigations ecological assessment
 Casey Stage 3 ecological assessment	 Lawson land release environmental studies
 Development of Forde North ecological assessment	 Majura parkway flora and fauna impact assessment
 ELA EPBC	 Molonglo Valley offsets survey EPBC listed box-gum woodland mapping
 ELA Gungahlin Veg Survey & Mapping Report	 Moncrieff residential estate flora and fauna assessment
 ELA Riparian	 Schweickle & Baines, Allocas. vert. in Nthn ACT
 ELA Stage 2	 Schweickle & Baines, veg mapping of Goorooyaroo, Mulligans Flat, Mt Majura & Mt Ainslie NR's

0 1 2 4 6 8 Kilometers



## 4.6 Re-interpretation of data sheets

The data sheets from the rapid woodland assessment (s. 2.1; s. 2.2) and to a less extent some of the data from the tree composition mapping (s. 4) were obtained for any polygons identified as containing box – gum woodland and which had not already been considered under the methods listed above.

A polygon was mapped as satisfying the criteria for listing under the EPBC Act if it had a predominately native understorey and:

- the species lists collated for the polygon included at least one ‘important’ species and 12 or more native non-grass species; or
- both mature and regenerating yellow box or red gum trees were present.

## 4.7 Access to GIS information

Two maps have been produced as part of the above analysis and are available through ACTMAPi. The layers are a map of Yellow Box – Blakely's Red Gum Grassy Woodland (under ACT criteria (Nature Conservation Act)) and the subset of this woodland which meets the Commonwealth listing criteria for White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland under the EPBC Act.

## 5 Results

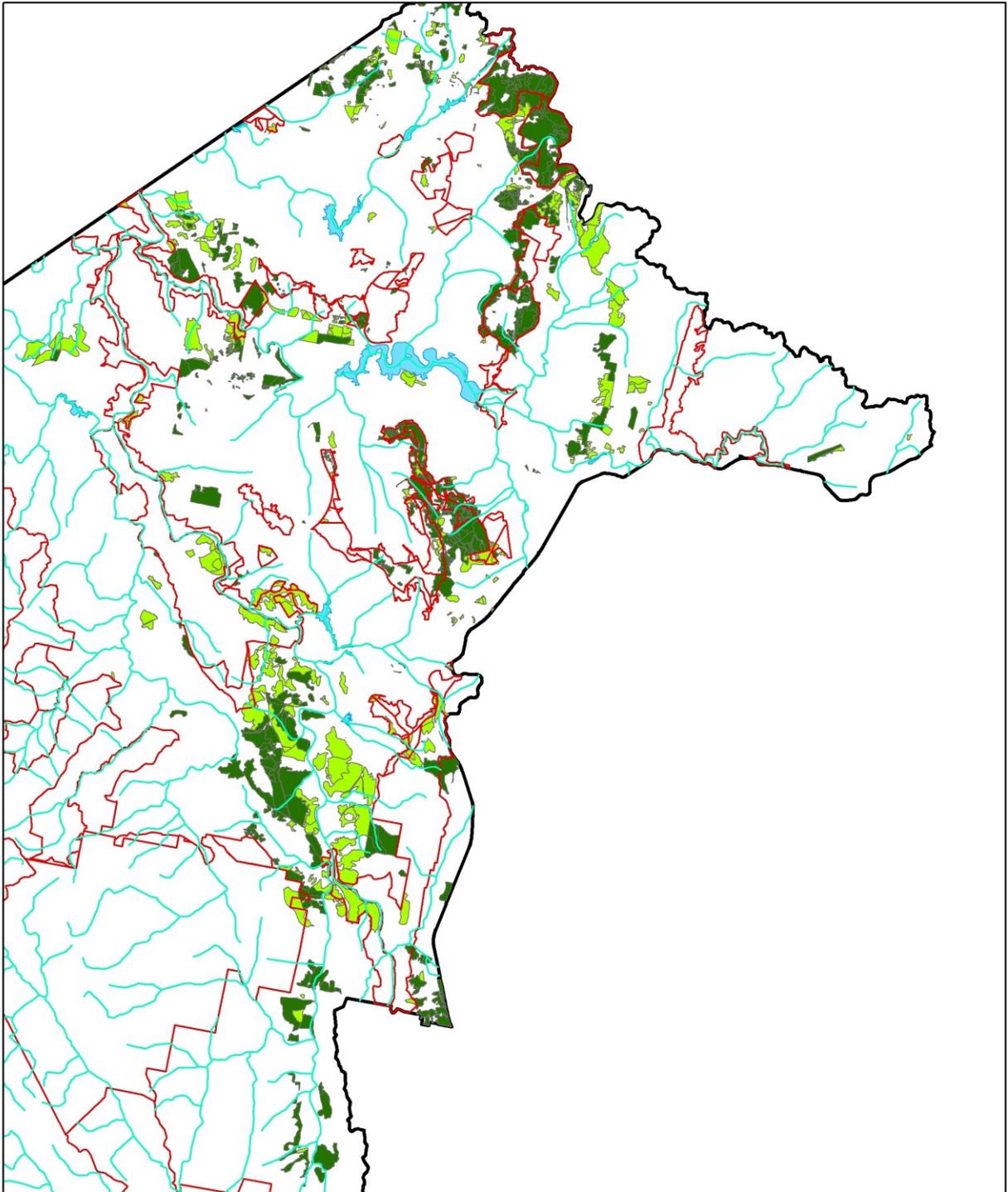
Across the ACT, 13 765 ha of Yellow Box – Blakely's Red Gum Grassy Woodland was mapped, of which 8151 ha (59%) meets the listing criteria under the EPBC Act for White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland. The distribution of the box –gum woodland types is shown in Maps 3 to 5.

The current nature reserve network contains 5699 ha of box –gum woodland, including 3364 ha of woodland that meets the listing criteria under the EPBC Act. For both the total remaining extent of box –gum woodland listed under ACT legislation and that component of the ACT total listed under the EPBC Act, just over 40 per cent is within the ACT conservation reserve network.

Since the last mapping in 2004, about 1206 ha (including 933 ha of woodland listed under the EPBC Act) has been added to the reserve network, while around 192 ha of box –gum woodland has been lost to urban development. The mapping data are summarised in Table 1.

**Table 1** Extent of mapped box –gum woodland in the ACT

Box –gum woodland in ACT	Total extent mapped in 2004 (ha)	Total extent mapped in 2011 (ha)	Woodland lost to urban development since 2004 (ha)	Extent of woodland in conservation reserves (ha)	Woodland added to reserve network since 2004 (ha)
ACT listed	12034	13765	192	5699	1206
Cwlth listed	Not mapped	8151	Unknown	3364	933



**Map 3  
Box Gum Woodland  
within ACT (2011)**

**Legend**

-  Lakes/waterways
-  Conservation Reserve
-  EPBC Woodland
-  Box-Gum Woodland

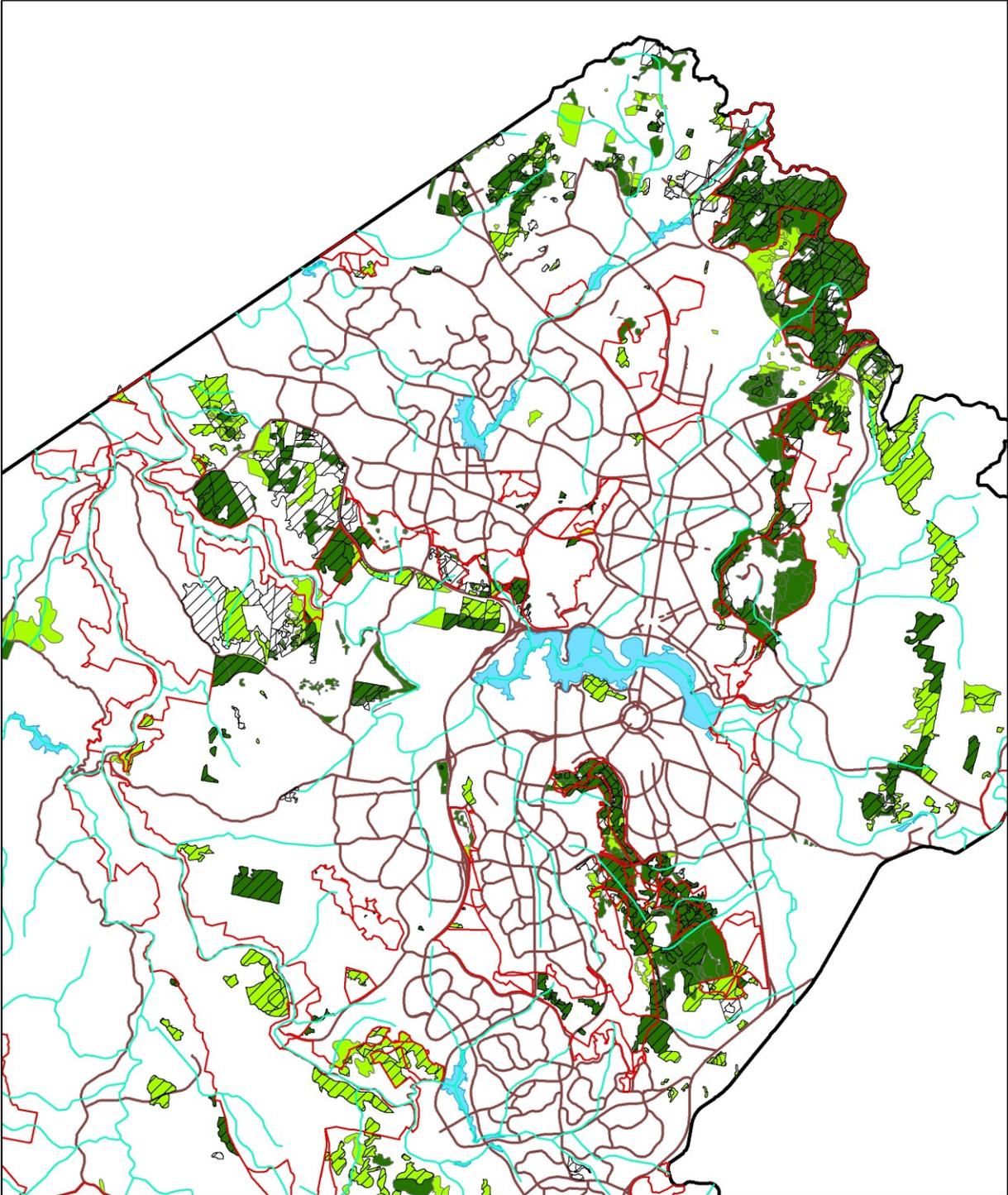
0 2.5 5 10 15



1:250,000 Kilometres

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**Map 4**  
**Box-Gum Woodland**  
**within Northern ACT (2011)**

**Legend**

-  Lakes/waterways
-  Conservation Reserve
-  Box-Gum Woodland (Action Plan 27)
-  EPBC Woodland
-  Box-Gum Woodland

0 1.25 2.5 5 7.5

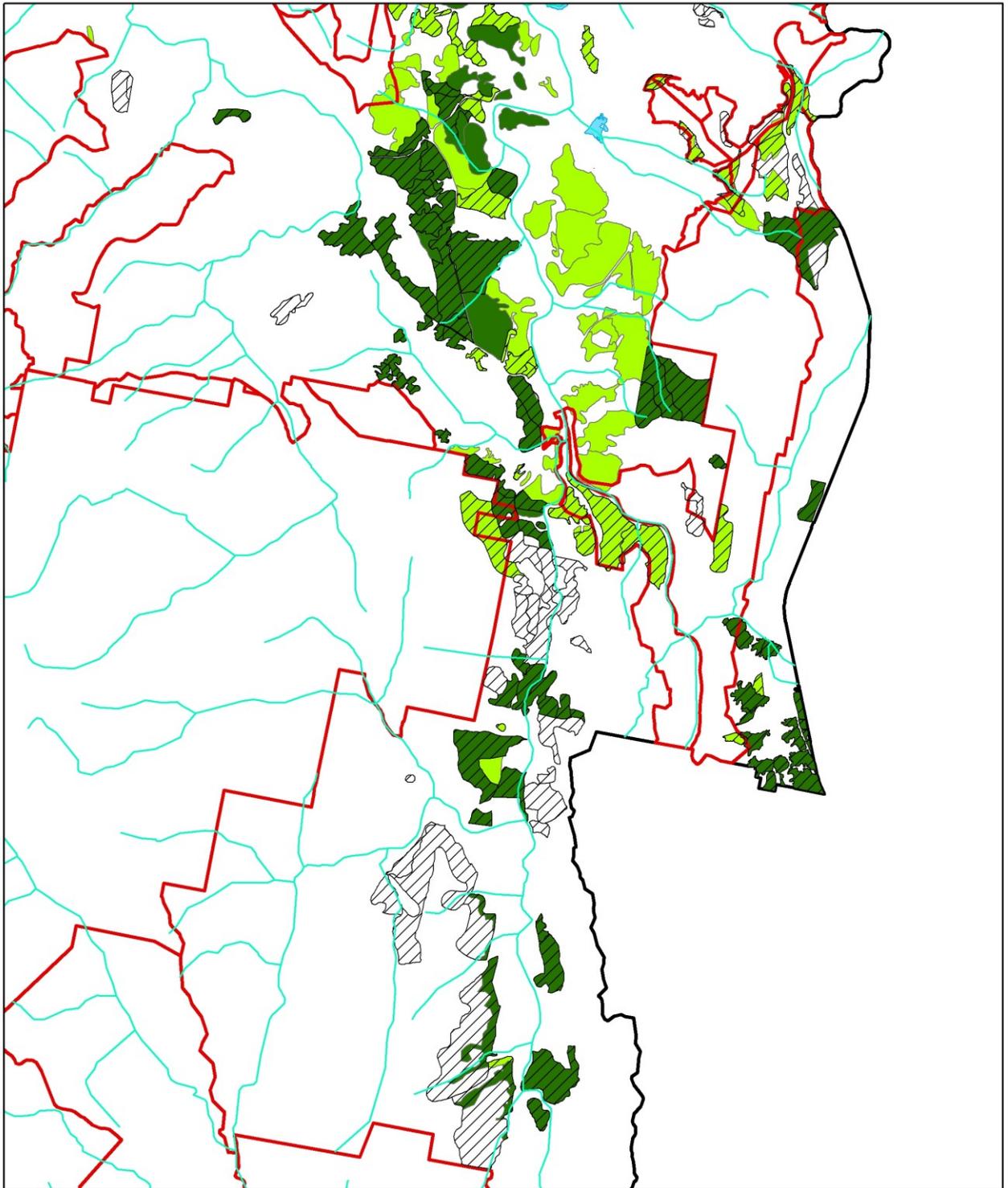


1:150,000 Kilometres



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<p><b>Map 5</b> <b>Box-Gum Woodland</b> <b>within Southern ACT (2011)</b></p>	<p><b>Legend</b></p> <ul style="list-style-type: none"> <li> Lakes/waterways</li> <li> Box-Gum Woodland (Action Plan 27)</li> <li> Conservation Reserve</li> <li> EPBC Woodland</li> <li> Box-Gum Woodland</li> </ul>	<p>0 1.25 2.5 5 7.5</p> <p><b>Kilometres</b></p> <p>1:115,000</p> <p></p> <p><small>Disclaimer: ACT Government does not warrant that the data is free from errors Data Copyright: © Australian Capital Territory, Canberra 2012</small></p> <p> <b>ACT</b> Government Environment and Sustainable Development</p>
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## 6 Discussion

Overall, the 2011 mapping has identified 1731 ha more Yellow Box – Blakely’s Red Gum Grassy Woodland in the ACT than the 2004 mapping. However, there was also approximately 2000 ha of vegetation, mapped in 2004 as box – gum woodland, which was classified in the 2011 mapping as not being part of the community. Thus about 3700 ha of woodland was mapped differently in the 2004 and 2011 box – gum woodland maps respectively. The areas of difference are shown in Map 6.

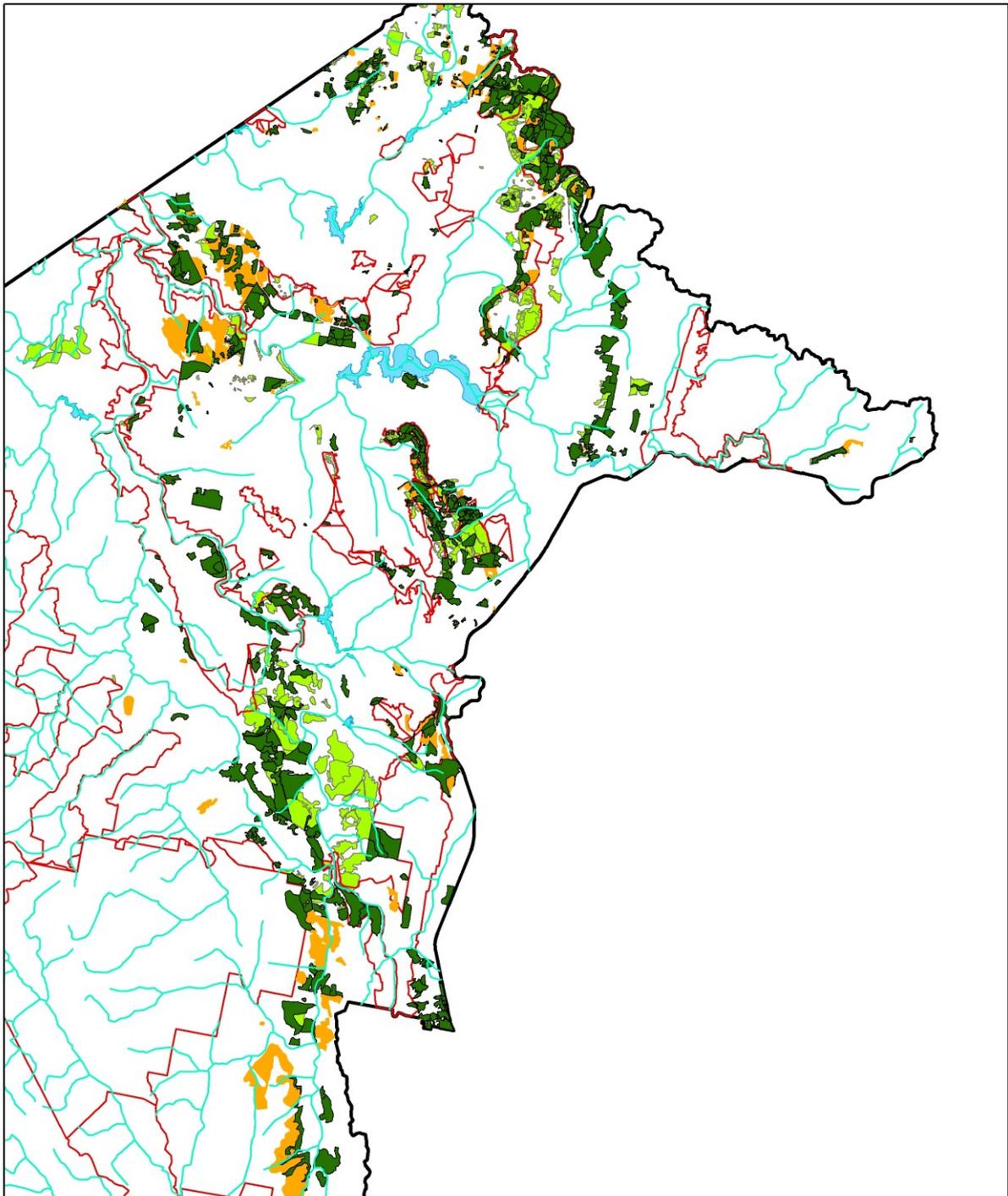
Woodland areas mapped in 2004 as Yellow Box – Blakely’s Red Gum Grassy Woodland, but not included in the total area of the community in 2011, mainly consisted of:

- 190 ha lost to urban development (mainly in Gungahlin)
- about 1200 ha of woodland in the Naas Valley and Murrumbidgee River corridor south of Tharwa. This woodland occurs on ridges and steeper slopes above the Naas and Murrumbidgee valleys (such as Fitzs Hill) where yellow box may be present as a sub-dominant, but the community is now classified as Norton’s box (*Eucalyptus nortonii*) dominated shrubby open forest (Office of Environment and Heritage NSW 2011)
- about 350 ha of woodland along Uriarra Road, which now has some areas of cultivation, or other areas where exotic perennial grasses predominate
- about 200 ha in the vicinity of Central Molonglo, which has been the subject of more recent detailed survey by Eco Logical Australia (2010a, 2010b, 2010c).

The main areas of Yellow Box – Blakely’s Red Gum Grassy Woodland mapped in 2011 that were not included in the community in 2004, primarily consisted of:

- about 1600 ha of grazed woodland in the Murrumbidgee Valley, between Pine Island and the Tharwa Sandwash, where the ground layer is now dominated by native grasses. The change in ground cover may be due to a retraction of exotic perennial grass cover during the drought that characterised most years between the 2004 and 2011 surveys (during which time stock numbers were reduced)
- about 450 ha in the proposed suburbs of Kenny and Throsby, which have been subject to recent detailed surveys, which have shown the extent of perennial native vegetation to be more widespread than in 2004 (Eco Logical Australia 2011; David Hogg Pty Ltd 2010b)
- about 300 ha on the lower slopes of Mt Ainslie and Mt Majura as mapped by Schweickle and Baines (2009)
- about 275 ha in Callum Brae and Isaacs Ridge nature reserves
- 260 ha in the vicinity of Uriarra Village
- about 200 ha in the Moncreiff, Taylor and Jacka areas of Gungahlin, which were subject to detailed survey between 2005 and 2011. The extent of perennial native vegetation was more widespread than in 2001–2002 (Eco Logical Australia 2011; Geoff Butler & Associates and Vertego Environmental Consultants 2005; Mulvaney 2011)

- about 150 ha in the vicinity of Central Molonglo, which was the subject of detailed survey in 2010 (Eco Logical Australia 2010a, 2010b, 2010c).



<p><b>Map 6</b>  <b>Differences between</b>  <b>Action Plan 27 (2004)</b>  <b>and 2011 Box-Gum</b>  <b>Woodland Mapping</b></p>	<p><b>Legend</b></p>		<p>0 2.5 5 10 15  <b>Kilometres</b></p> <p>1:250,000</p> <p>Disclaimers: ACT Government does not warrant that the data is free from errors.          Data Copyright: © Australian Capital Territory, Canberra 2012</p> <p><b>ACT</b>          Government          Environment and Sustainable Development</p>
	<p>— Lakes/waterways</p> <p>■ Box-Gum Woodland in Action Plan 27 and 2011</p> <p>■ Box-Gum Woodland - Action Plan 27 only</p> <p>□ Conservation Reserve</p> <p>■ Box-Gum Woodland - Additional 2011 areas</p>	<p>N</p>	

Woodlands mapped as Yellow Box – Blakely’s Red Gum Grassy Woodland, but which did not meet the listing criteria under the EPBC Act are mainly woodland areas subject to grazing. These areas are in the Murrumbidgee and Molonglo valleys and the Majura Training Area. However, it should be borne in mind that areas in the Majura Training Area, upper Molonglo valley and parts of the Murrumbidgee valley were not subject to a detailed on-ground inspection in 2011. It is also probable, as has happened in other woodland areas such as Callum Brae, Kenny and Molonglo, that if grazing is removed or significantly reduced, that many of these areas are capable, in a relatively short time, of regenerating to an improved condition that would meet the listing criteria under the EPBC Act.

The ability of box – gum woodland to regenerate over a relatively short time frame is one of the key findings of the 2011 mapping project. Thus the mapping update is only a fix in time and the boundaries between areas with exotic perennial understorey, native understorey and native understorey that meets listing criteria under the EPBC Act should be viewed as fluid rather than fixed. Movement can occur in both directions depending on grazing management.

This project relied on line-work generated by consultants in 2009–2011 surveys, or as part of the 1995–1997 or 2001–2005 vegetation studies. It must be noted that the line-work has variable reliability and spatial accuracy at a fine scale. It is expected that the line-work will change as a result of the impending ACT Vegetation Map project, being undertaken by Conservation Planning and Research, although this change is not anticipated to result in major changes overall to the estimated extent of box – gum woodland.

The update indicates a significant improvement in the extent, condition and protection of box – gum woodland between the two periods of mapping. As well as an increase of 1700 ha in the estimated extent, an amount equivalent to about six times the area cleared for urban development has been added to the reserve network. The condition and extent of remaining woodland is likely to continue to improve as a result of actions initiated under the \$1 million ACT woodland restoration program being undertaken up to 2015. The improved mapping referred in this report will assist in guiding where restoration efforts should be focused.

This update also affirms and strengthens a key finding of the *ACT Lowland Woodland Conservation Strategy* (ACT Government 2004) that ‘in terms of size, connectivity, diversity and habitat for threatened species, ACT remnants of lowland woodland are exceptional, especially the presence of larger patches (over 100 ha) in good condition’ (p. 18).

In the Commonwealth listing of the White Box – Yellow Box – Blakely’s Red Gum Grassy Woodlands and Derived Native Grasslands, it is noted that less than 5% of the original extent of the ecological community is estimated to remain across its former range in south-eastern Australia (Australian Government 2006). By contrast, in the ACT about 25% of the estimated original extent remains in a condition that meets the listing requirement under the EPBC Act.

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### **Personal Communications**

Information on survey methods used in the ACT by Conservation Planning and Research (and its predecessors), 1988 to 2008, supplied to Emma Cook and Greg Baines (Conservation Planning and Research) by Sarah Sharp (formerly Conservation Planning and Research).