



### Woodland condition on Red Hill

From 1990 to 2011, the condition of ACT-listed lowland woodland was mapped in relation to weed invasion and weed control. Weeds were mapped as to whether they occupied 50% or more of the understorey (poor condition), 50–25% of the understorey (moderate condition), 5–25% of the understorey (high condition) or less than 5% of the understorey (very high condition).

In 1990, weeds dominated 53% of the hill, and decreased to 13% in 2011 (Table 7.10). Correspondingly, in 1990, there was 21 ha of very high quality woodland on the hill, and in 2011 there was 131 ha (M Mulvaney, Senior Environmental Planner, Conservation Research, EPD, pers comm, 15 August 2015).

### Vegetation of the Kowen, Majura and Jerrabomberra districts

The Yellow Box – Apple Box woodland and Yellow Box – Blakely's Red Gum woodland communities are both components of the White Box – Yellow Box – Blakely's Red Gum grassy woodland and derived grasslands listed under the EPBC Act, and Yellow Box – Blakely's Red Gum grassy woodland listed under the Nature Conservation Act. At the time of writing, 8151 ha of vegetation in the ACT was regarded as meeting EPBC Act criteria, and 13 765 ha met the Nature Conservation Act criteria.<sup>60</sup> Conservation reserves within the ACT contained 3364 ha of the EPBC Act-listed community and 5699 ha of the Nature Conservation Act-listed community.<sup>60</sup>

### Grasslands

#### Extent of Natural Temperate Grassland

Natural Temperate Grassland is one of the most threatened natural plant communities in Australia. Before European settlement, such grasslands occupied 11% of the ACT. Today, they occupy less than 1% of the ACT, and what remains is degraded and continually threatened by human activity and invasion by exotic plant species.<sup>66</sup>

The once-extensive Natural Temperate Grassland within the ACT is now highly fragmented and greatly reduced in area. Grasslands are now confined to 38 small and isolated patches in the ACT. About 1000 ha of these patches are in a more or less natural condition, and a further 550 ha are in poorer condition. The patches of grassland are embedded in highly degraded grasslands dominated by weeds (plant species of exotic origin or native species not natural to the area). These isolated patches range in size from less than 1 ha to 300 ha.<sup>66</sup>

Natural Temperate Grassland is declared an endangered ecological community under both the EPBC Act and the Nature Conservation Act. However, Action Plan 28 only considers grasslands below 625 m to be part of the endangered ecological community, whereas the EPBC Act considers grasslands up to 1200 m to be part of the community. To date, 1049 ha of ACT grasslands below 625 m and 207 ha above 625 m have been mapped. For grasslands below 625 m, there has been a slight decline in the extent of the grasslands, from 1106 ha to 1049 ha. This change is mainly attributable to more accurate mapping, which excluded some native pasture in the Majura and

**Table 7.10 Condition of woodland on Red Hill, 1990, 2004 and 2011**

Condition of woodland	Area 1990 (ha) (% of total)	Area 2004 (ha) (% of total)	Area 2011 (ha) (% of total)
Poor or substantially modified	168 (53%)	29 (9%)	40 (13%)
Moderate or secondary grassland	71 (22%)	26 (9%)	114 (36%)
Moderately modified (equivalent to either moderate or high in the 1988 and 2011 surveys)	–	174 (63%)	–
High	56 (18%)	–	29 (8%)
Very high or partially modified	21 (7%)	46 (16%)	131 (42%)

ha = hectare; – = not applicable

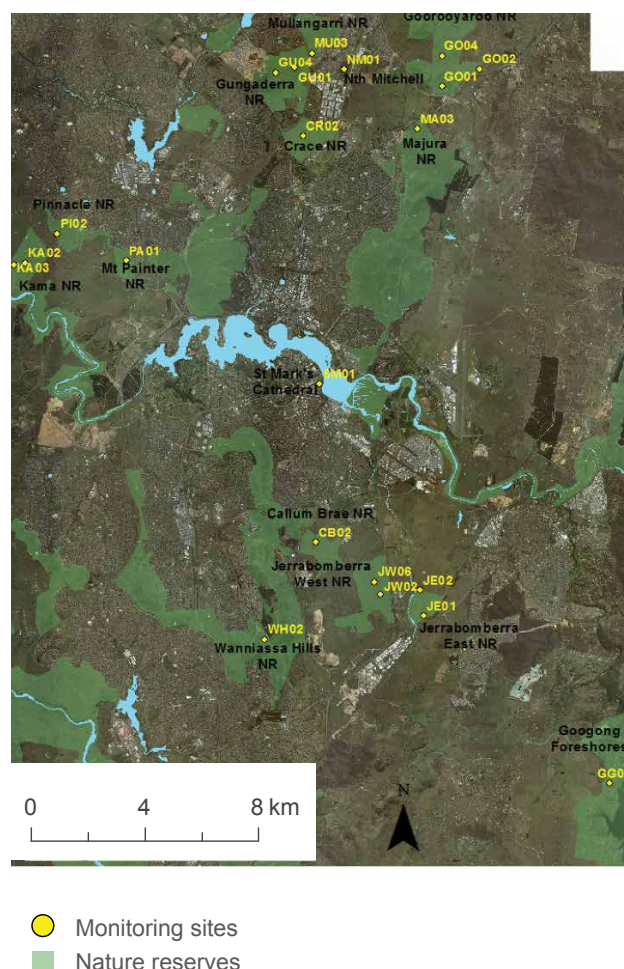


Jerrabomberra valleys that had been formerly mapped as Natural Temperate Grassland.

#### *Trends in grassland condition*

A 2014 research project examined trends in a range of floristic and vegetation structure attributes across 24 monitoring plots located in the grasslands and grassy woodlands of the ACT in 2009, 2012, 2013 and 2014 (Figure 7.17).<sup>67</sup>

- Overall, native species richness and the floristic value score (FVS)<sup>j,64</sup> remained relatively stable (less than  $\pm 25\%$  change) at most plots. Native species richness showed the least amount of change.
- Trends in the FVS were driven by the presence or absence of several indicator species. (Indicator species are grazing-intolerant or declining species. It is thought that these species are rare for two reasons. Firstly, some species have always been rare, particularly species that are restricted in distribution. Secondly, many species are thought to have undergone serious declines since European settlement, from disturbances such as overgrazing and fertiliser use.)
- Exotic species richness fluctuated to a greater degree, especially between 2013 and 2014, with two-thirds of plots showing more than a 25% increase.
- Cover of exotic annual grasses and exotic broadleaves also increased significantly between 2013 and 2014. Some sites had an increase in significant weed species richness in 2014, although numbers remained low.
- Plots that showed considerable declines in both native species richness and the FVS during the most recent survey period (2013–14) were Dunlop Nature Reserve, Jerrabomberra West Nature Reserve (inside the enclosure), the Googong Foreshores and Mount Painter Nature Reserve.



**Figure 7.17** Location of surveyed plots across the northern ACT

Community case study 7.1 shows how groups in the ACT have been working to improve the state of the environment.

<sup>j</sup> The FVS is a commonly used method to assess the conservation value of sites in grassy ecosystems in the ACT and surrounding NSW region.



### **Community case study 7.1** **ParkCare and Landcare groups in the ACT**

For the past 25 years, ParkCare and Landcare groups have been working across the ACT's reserves and urban open space network to improve the state of the environment. These groups provide an opportunity for enthusiastic volunteers of all ages, backgrounds and abilities to become involved in planting trees, controlling weeds, repairing tracks, monitoring the environment, protecting natural and cultural heritage values, controlling erosion and much more. They take pride in ensuring that their 'local patch' is properly managed and appreciated.

Friends of Aranda Bushland is one of more than 60 ParkCare and Landcare groups within the ACT. This group of about 60 members has been progressively rehabilitating the Aranda Bushland since the 1990s. A core group of 20 active members regularly carries out weeding and restoration works using planting, woody weeds, logs and 'geofabric' to reduce erosion and stop gullies from forming. Seed is also collected from the area, and used for propagation and planting. The group is working towards short-, medium- and long-term goals, and strives to educate the public through

guided walks, interpretive signs and publishing *Our patch – a photographic field guide to the flora of the ACT*, now in its second edition. For the past 25 years, this group has achieved an almost complete reduction in weed infestation and, by planting locally indigenous Snow Gums, contributed to the restoration of Snow Gums in the Frost Hollow community.

The ACT Government and local community groups play an important role in supporting these volunteer groups by providing materials, training and on-ground support; introducing new volunteers; and networking and information sharing. This support comes through the ACT Government ParkCare Coordinator and Support Officer (ACT Parks and Conservation Service); the Regional Landcare Facilitator (Environment and Planning Directorate); the Southern ACT, Molonglo and Ginninderra catchment groups (through catchment and Waterwatch coordinators); and Greening Australia. Landcare ACT, the recently formed peak body, provides a voice for community Landcare and provides a connection to the national Landcare movement.



Friends of Aranda Bushland volunteers and Radford College students installing geofabric and pine logs to block off erosion at the head of a gully, June 2013

Photo: Professor Ian Falconer



## Other ecological communities

### *Riparian communities*

There are 17 riparian vegetation communities in the ACT.<sup>68</sup> The most recent systematic surveying of these communities was in 2009–2011.

The Murrumbidgee River flows for approximately 66 km south to north through the ACT, and contains close to 132 linear kilometres of riparian land (Figure 7.18).

In 2009, the vegetation and habitat was surveyed in key riparian zones along the Murrumbidgee River in the ACT, to identify the extent and condition of the riverine vegetation communities.<sup>69</sup> The survey found the overall state of the riparian zone vegetation in the ACT section of the Murrumbidgee River to be poor, and both the riparian zone and river valley environments appeared to be under significant stress.

There has been no comparable survey since 2009, so it is not possible to report on the current condition of the riparian zone vegetation in the ACT section of the Murrumbidgee River.

In 2011, a similar survey was conducted for the major tributaries of the Murrumbidgee in the ACT.<sup>70</sup> The objectives of this project were to map the distribution and assess the condition of the riparian vegetation along the five main tributaries of the Murrumbidgee River in the ACT (the Naas, Gudgenby, Paddys, Cotter and Molonglo rivers; Figure 7.19).

The condition of the riparian and associated hillslope vegetation along the surveyed rivers was found to vary widely across the region and within each river. Along the Cotter River, the condition was extremely good in Namadgi National Park, but poorer in the former softwood plantation area of the lower Cotter. The Naas, Gudgenby and Paddys rivers demonstrate the long-term effects of rural land use. However, in the sections of these rivers in Namadgi National Park, the riparian vegetation has recovered to good or even excellent condition. Parts of these waterways in rural land were in moderate to good condition, especially where there had been some effort to restrict stock access to the riverbanks. Many areas contain varying levels of exotic vegetation, but there are still sufficient pockets of residual natives to allow improvement of riparian condition with better rural land management. Both the upper Molonglo River in the Kowen Gorge

area and the lower Molonglo River downstream of Coppins Crossing retain riparian and some hillslope vegetation in good condition. Between Molonglo Gorge and Coppins Crossing, the river and the riparian zone have been severely affected by urban, infrastructure and other development.

The encroachment – and, in some cases, dominance – of weed species is a pervasive feature throughout all the river sections surveyed. This is especially true for Blackberry, willows, poplars and pine wildings.

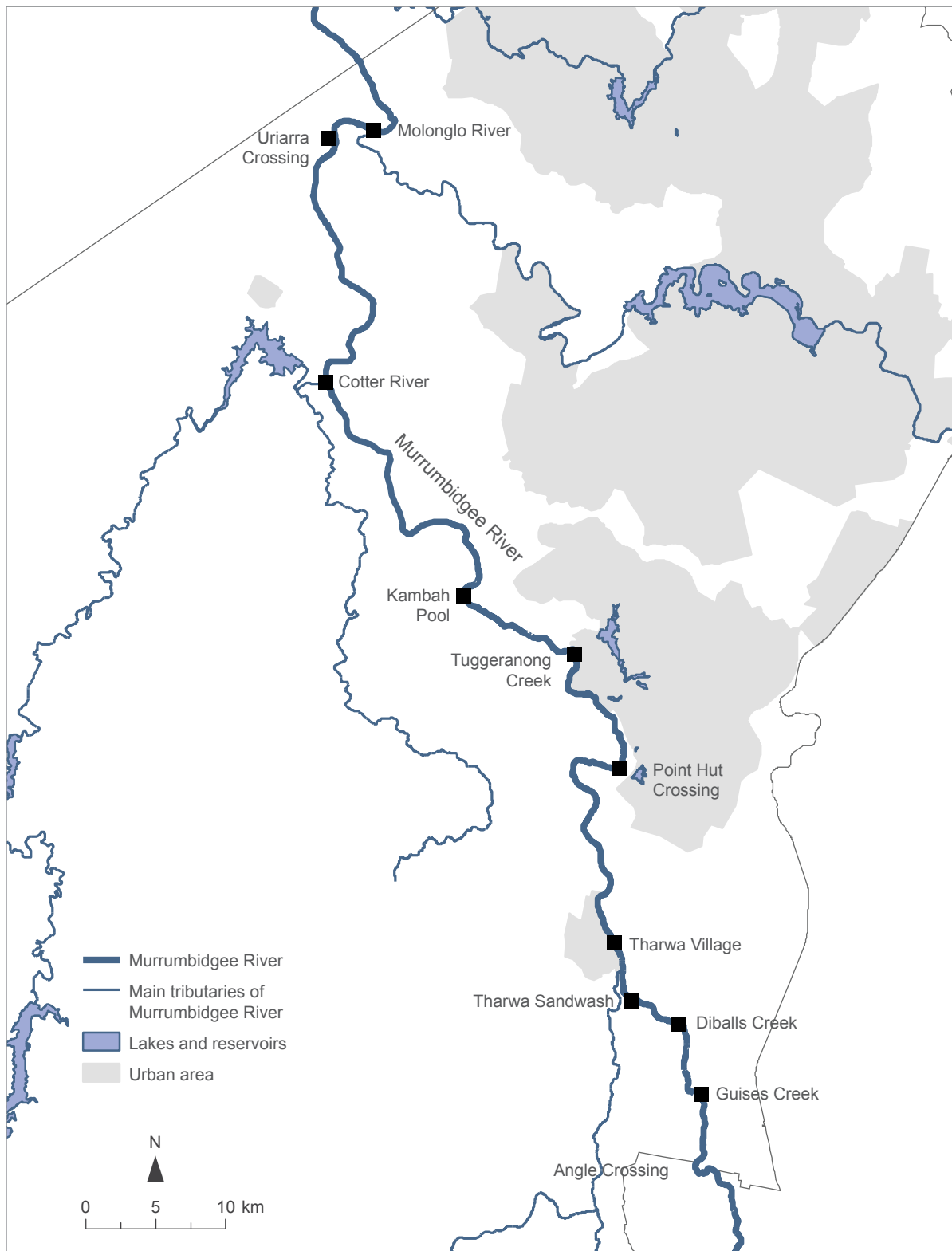
### *Sphagnum bogs and fens*

The ACT sphagnum bogs and fens ecological community covers almost 6 square kilometres of the ACT. The Directory of Important Wetlands in Australia lists 10 ACT wetlands that are part of the alpine sphagnum bogs and associated fens ecological community as nationally important wetlands: Cotter Source Bog, Cotter Flats, Ginini and Cheyenne flats, Rock Flats, Rotten Swamp, Scabby Range Lake, Snowy Flats, Nursery Swamp, the upper Cotter River and the upper Naas Creek (Figure 7.20). The ecological community is at its most northerly extent in the ACT.

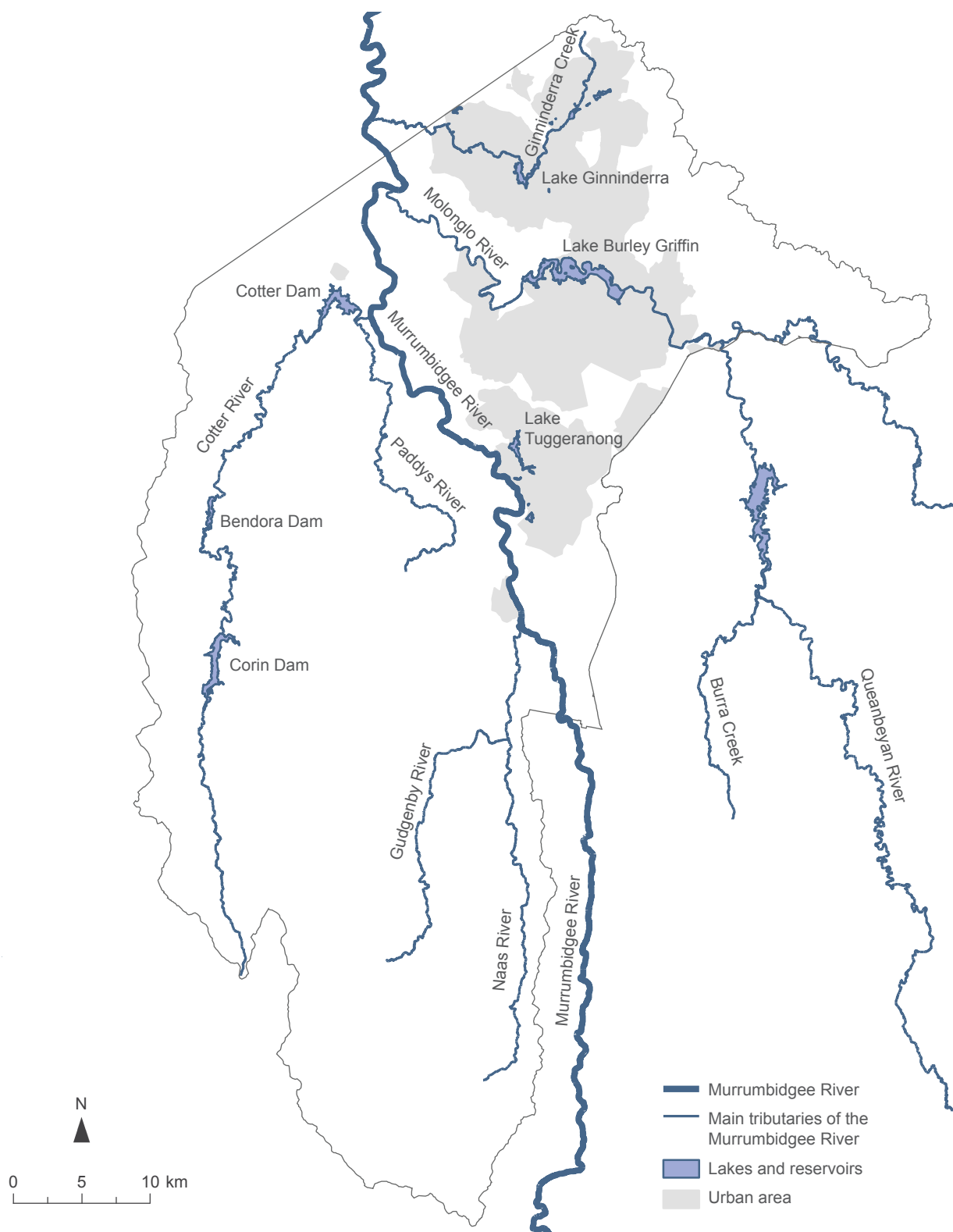
In January 2009, the Australian Government, under the EPBC Act, listed the alpine sphagnum bogs and associated fens ecological community as an endangered ecological community due to:

- its small geographic distribution, coupled with significant demonstrable threats (including climate change and fire)
- the continued decline of functionally important species
- the severe reduction of the community's integrity across its range.

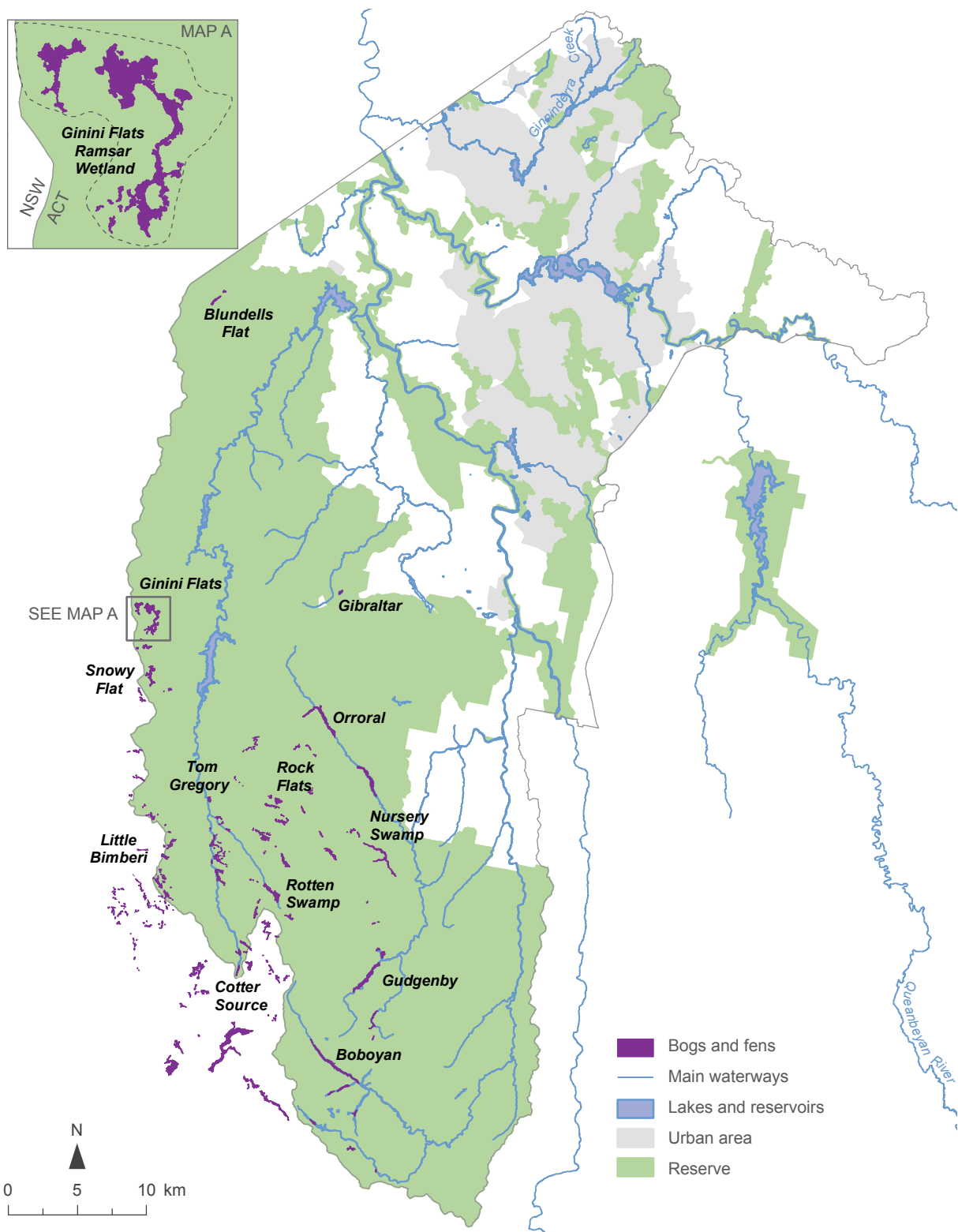




**Figure 7.18 Murrumbidgee River in the ACT**



**Figure 7.19** Major tributaries of the Murrumbidgee River in the ACT

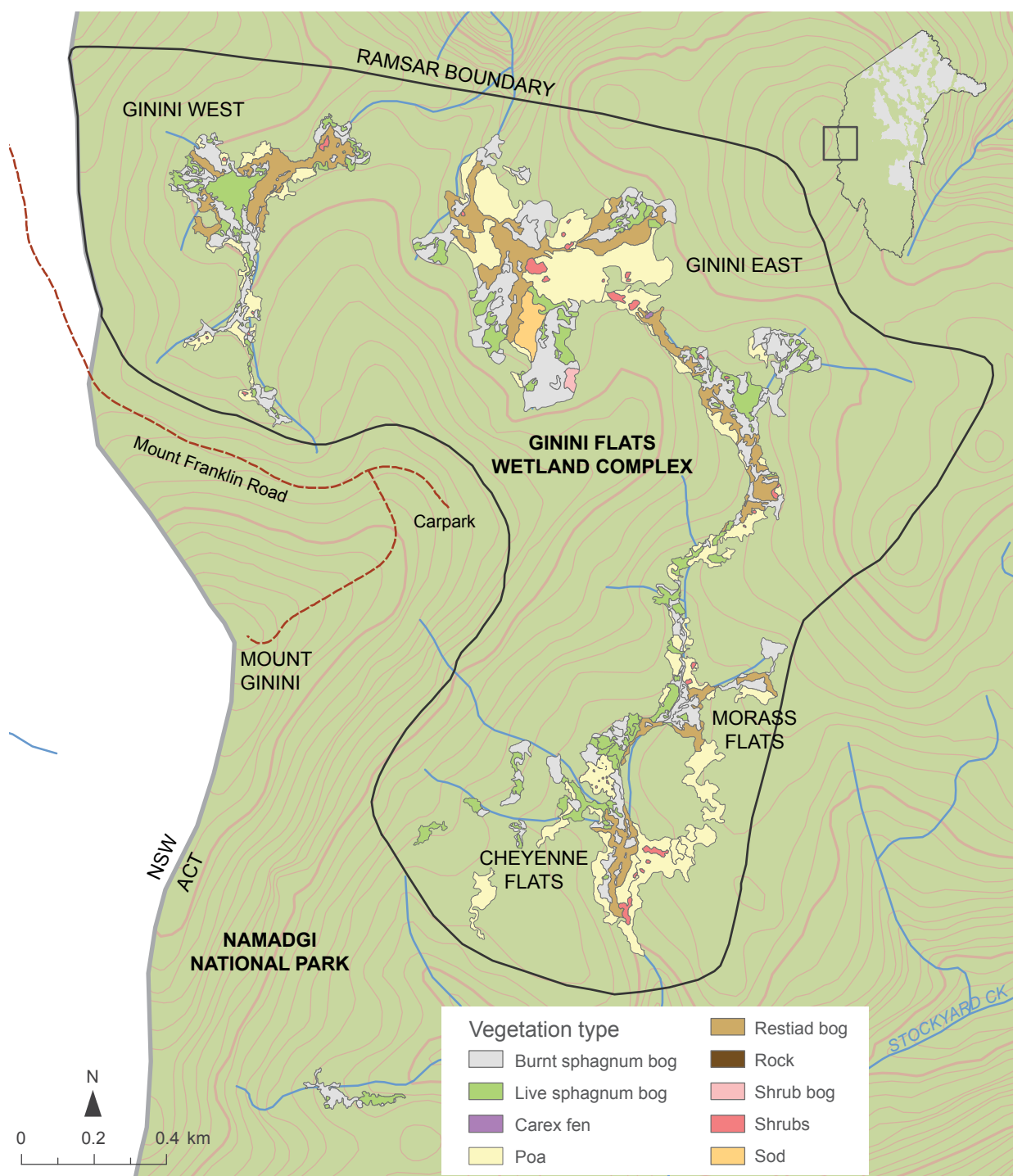


**Figure 7.20 ACT sphagnum bog and fen ecological communities**



The ACT sphagnum bogs and fens ecological communities include the Ginini Flats Wetland Complex (Figure 7.21). In 1996, this complex was designated as a Wetland of International Importance under the Ramsar Convention. The site is towards the northern

climatic extreme for alpine sphagnum bog wetlands, and is the largest intact bog and fen community in the Australian Alps. The site also provides habitat for Corroboree Frogs.



**Figure 7.21** Ginini Flats Wetland Complex





## Connectivity of terrestrial native vegetation

### Why is this indicator important?

The diversity and resilience of ecological communities relate directly to their spatial configuration, patch size, contiguity, condition and connectivity. Connectivity conservation seeks to improve wildlife habitat and habitat links across the landscape. Recent CSIRO work suggests that most animals of southern Australian woodlands and forests will not usually cross a canopy gap of more than 100 m, and will not travel more than 1.1 km from a patch of at least 10 ha of suitable living habitat (see Doerr et al 2010, cited in Barrett & Love<sup>71</sup>). Thus, the extent and spatial arrangement of habitat and canopy are essential to understanding wildlife movement, and how connectivity can be most readily restored.

Restoration of habitat and connection increases effective habitat size and access, enables migration and movement to avoid temporary stressors, and aids the recovery potential and recolonisation of degraded areas.

Large stretches of continuous native vegetation communities are often necessary for maintaining viable populations of species. Fragmentation (eg due to clearance or major roads) can cause populations (especially small populations) to become vulnerable and can reduce gene pools through loss of biodiversity.

### Current monitoring status and interpretation issues

This indicator reports on the state and/or trend of the extent and, where possible, the connectivity of terrestrial native vegetation in the ACT. The quality and quantity of the reporting are commensurate with the monitoring data available in the reporting period.

In 2012, available vegetation and land-use data, and innovative fine-scale modelling techniques and tools were used to model fauna habitat and connectivity values across the ACT.<sup>71</sup>

Across the ACT, SPOT-5 satellite imagery and radar measurements of tree density were used to establish a map of tree canopy, accurate to the single paddock tree scale.

Woodland, forest and generalist habitats were mapped and rated by using a combination of about 15 existing vegetation, street tree and land-use maps; satellite foliage cover and tree density analysis; and the spatial relationship of a particular habitat patch to another habitat patch. Large patches close to other habitat patches scored highly, while isolated small patches scored lowly.

Researchers then took random pairs of points from within any two patches of habitat in the ACT and nearby region, and determined what the easiest route was for a woodland, forest or generalist species to get from one point to the other. This analysis was repeated 550 000 times. Paths through well-connected habitat were repeatedly used to connect differing habitat patch pairs, and these well-used paths were identified as regional links.

Although regional links may be the least-cost<sup>k</sup> pathways, they may not be able to be used by wildlife. This was checked by overlaying a map showing where connections between stepping-stone trees exceed 100 m (local links) and the distribution of habitat patches greater than 10 ha. Existing habitat patches of 5–10 ha were also identified as areas of potential restoration focus.

This modelling, in conjunction with modelling conducted for the Gungahlin Strategic Assessment and the Jarramlee Offset (see information on environmental offsets in Section 7.3.2), provides the data for reporting on this indicator.

<sup>k</sup> Least-cost pathway analysis is a distance analysis tool (used in geographical information systems) that uses the least-cost path or the path between two locations that costs the least to those travelling along it to determine the most cost-effective route between a source and destination. Cost can be a function of time, distance or other criteria that are defined by the user.

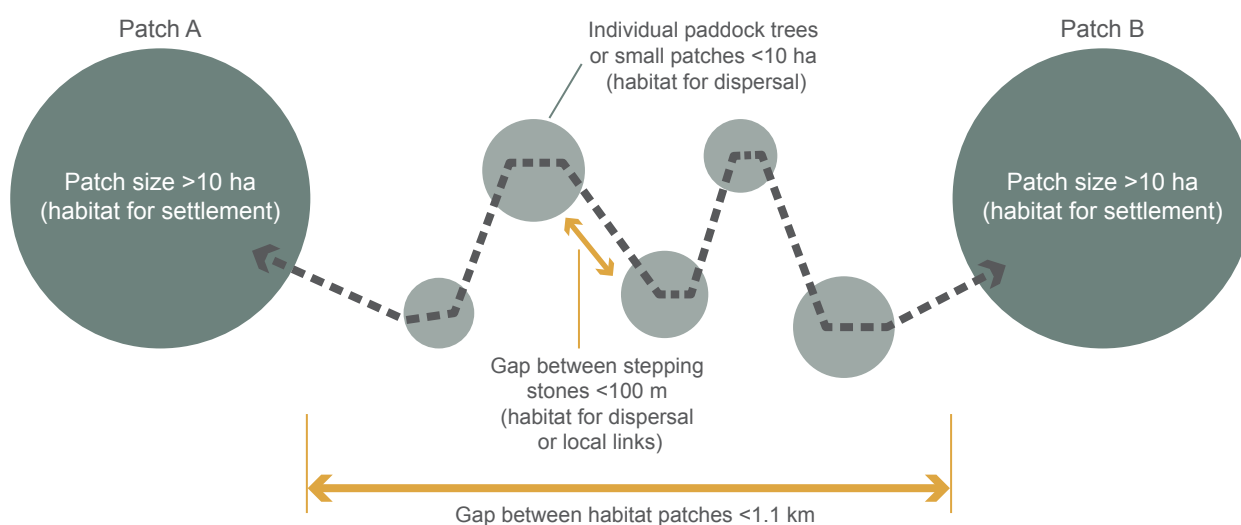


The modelling was conducted in accordance with four significant ecological principles:

- Modelling was conducted for both habitat settlement and habitat dispersal.<sup>72</sup>
- Gap-crossing thresholds were identified (Figure 7.22).
- Habitat condition modelling was based on vegetation attributes – structure and composition – known to influence habitat suitability for both settlement and dispersal.
- A cost–benefit approach was adopted to assess the costs of movement by an organisms across a landscape versus the benefits of access to habitat (defined as habitat condition). This cost–benefit assessment establishes a measure of spatial configuration known as the Neighbourhood Habitat Area.

### What does this indicator tell us?

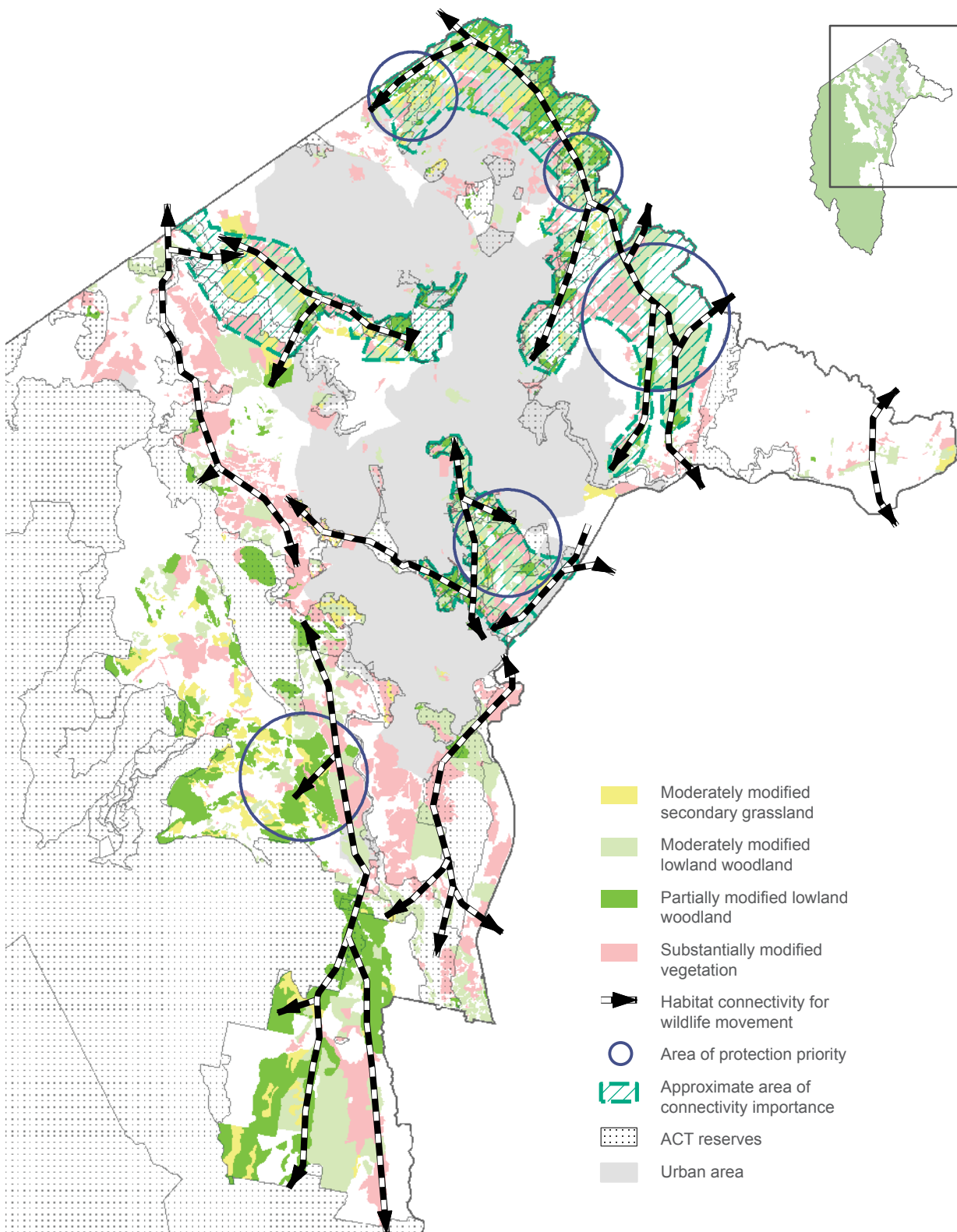
The Barrett and Love analysis<sup>71</sup> reveals the parts of the landscape that are key to existing wildlife movement and the areas where functioning connections can be restored with the least effort. It also highlights areas of key habitat or linkage value that need special consideration. Examples of how the data can be applied – including restoration and development in the Majura Valley, and conservation assessment within the Gungahlin Strategic Assessment, along with key woodland habitat and linkages across the ACT – are shown in Figures 7.23–7.25.



ha = hectare; km = kilometre; m = metre

Note: Darker patches represent habitat for settlement. The smaller light-grey patches show habitat for dispersal, and may consist of either individual paddock trees or small patches (<10 ha).

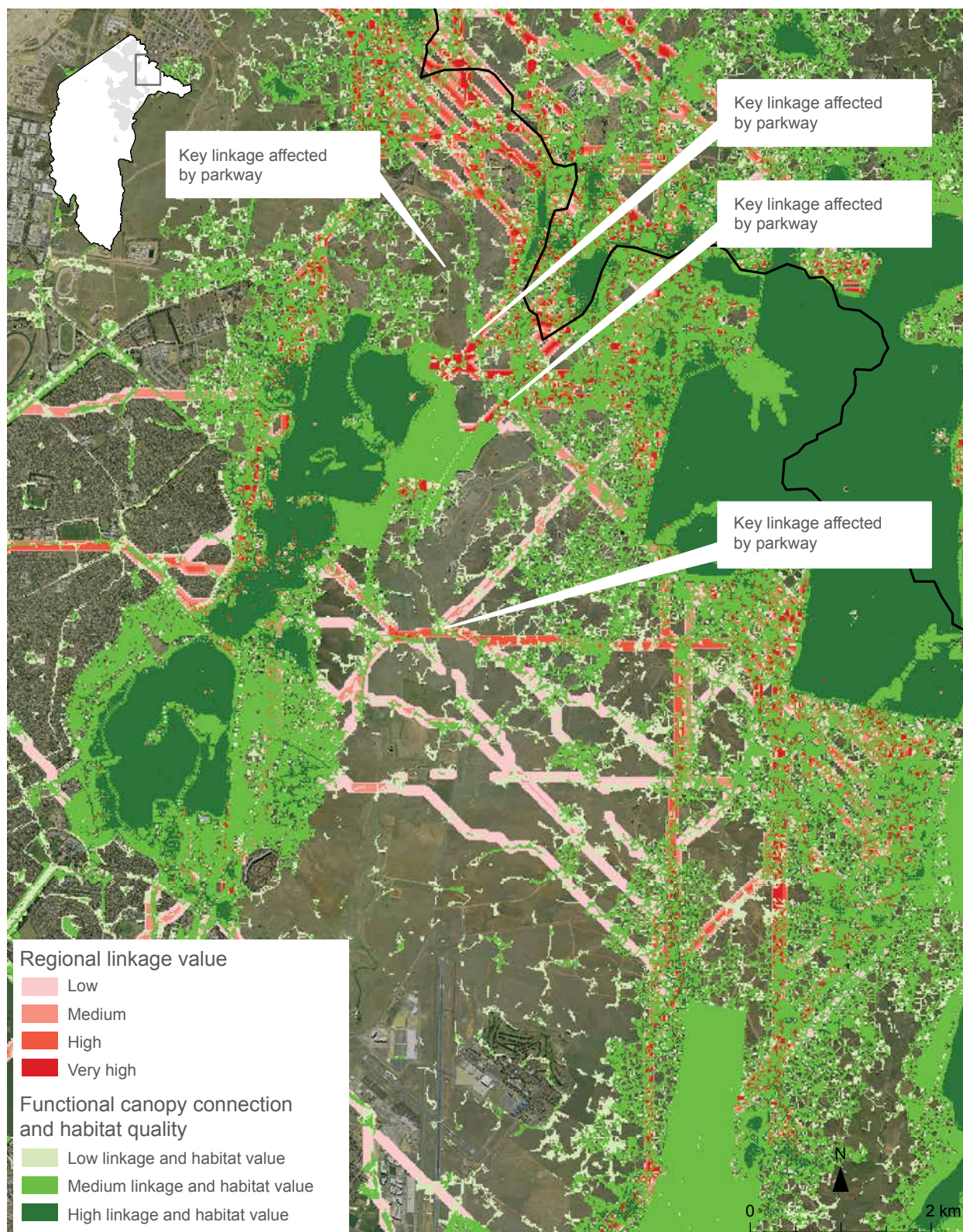
**Figure 7.22 Average gap-crossing thresholds**



Source: Map provided by Conservation and Planning Research

**Figure 7.23 ACT lowland woodlands condition and connection**

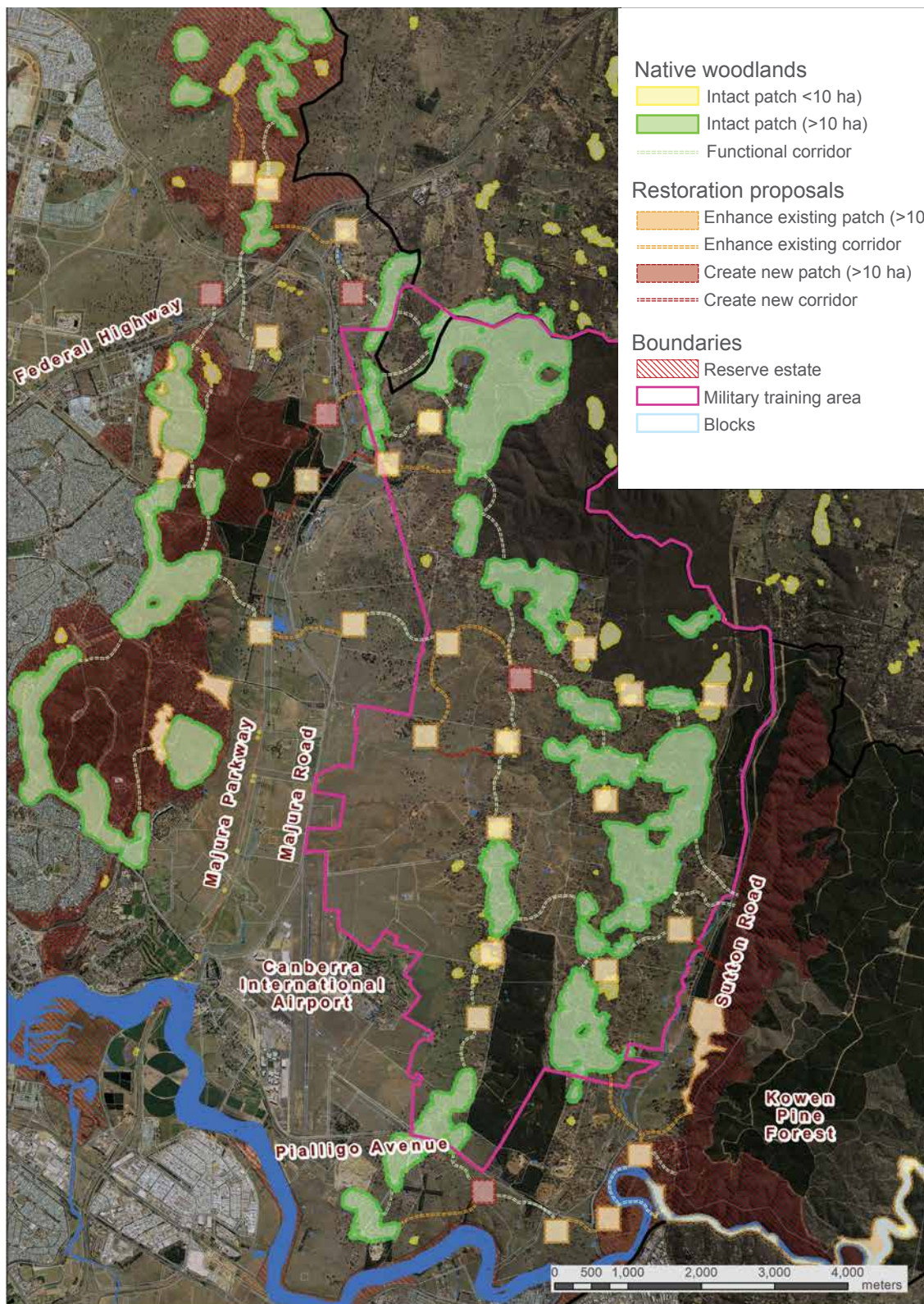




Source: Map provided by Conservation and Planning Research

**Figure 7.24** Use of the connectivity analysis to identify and protect key woodland wildlife movement points cut by the Majura Parkway





Source: ACT Government

**Figure 7.25** Use of the connectivity analysis to guide woodland restoration projects



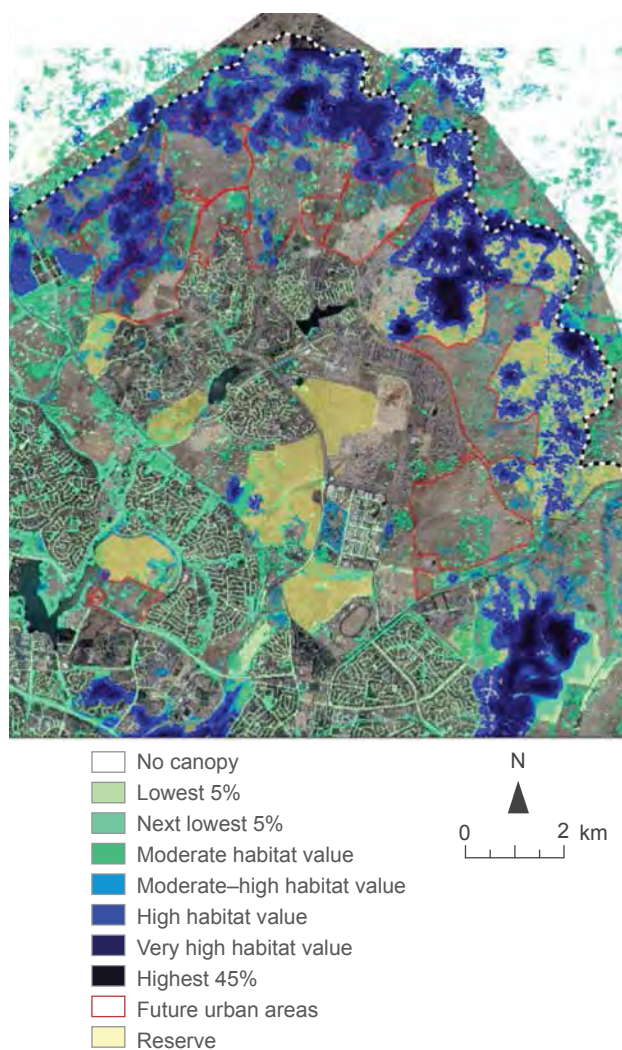


## ACT lowland woodland condition and connection

### *Forest and woodland connectivity across Gungahlin*

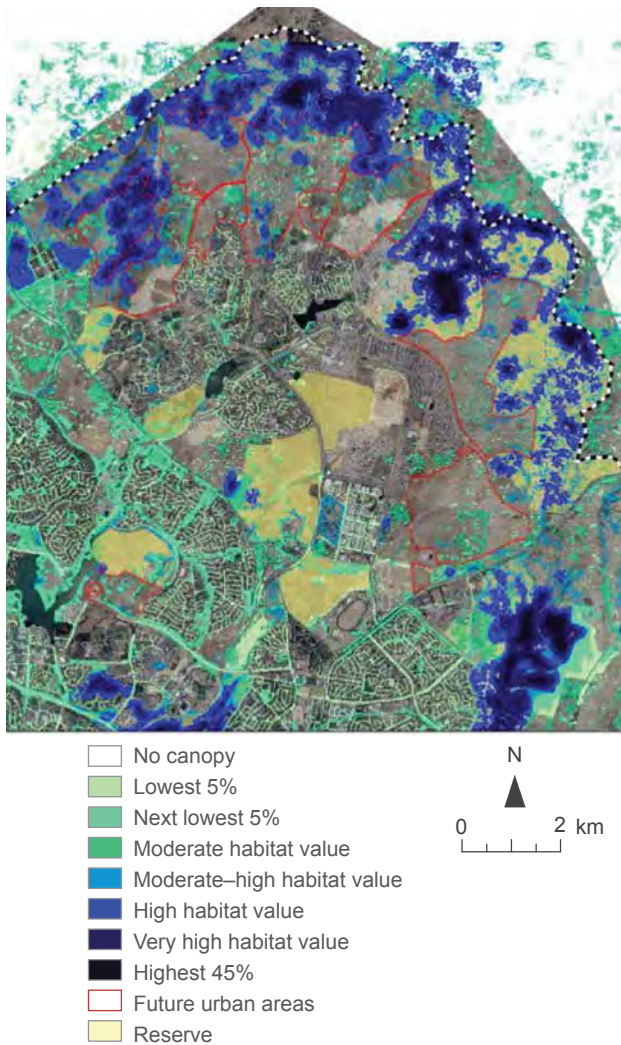
Figures 7.26–7.28 indicate areas of high habitat value across Gungahlin. Habitat value was determined for each 15-m grid, based on the size of suitable patches, how close they are to one another and habitat condition.

Most of the high-value habitat in Gungahlin is in Mulligans Flat and Goorooyarroo nature reserves, the northern lease area and Kinlyside. The habitat and linkage connectivity analysis suggests that specialist woodland species may have trouble crossing the northern lease area, but shows that there is good connectivity between the woodland patches of East Bonner, Little Mulligans Flat, Mulligans Flat, the mid-to northern section of Throsby neck, Goorooyarroo, and then onto Mount Majura, Mount Ainslie and the Majura Training Area. The woodland in Kenny also has some local connectivity value. The analysis also confirms that Kinlyside–Hall, the northern lease area, and the Mulligans Flat–Goorooyarroo grassy woodland complex are the key and best-connected habitat areas within Gungahlin, and that there are good connections to other woodland areas to the south and east across the Majura Valley and into NSW.



Note: The darker the shading, the higher the habitat value.

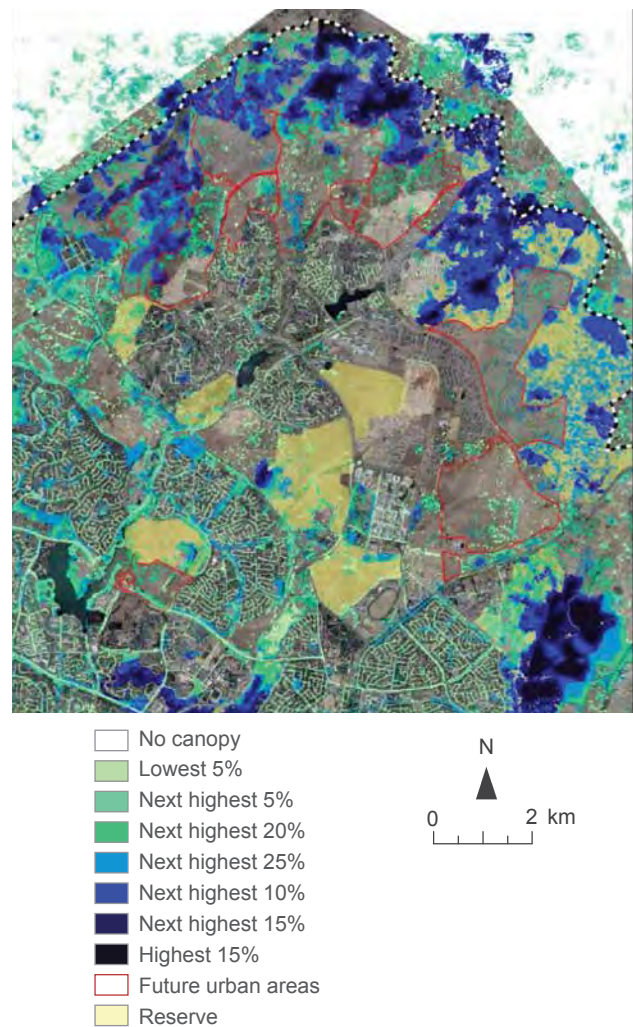
**Figure 7.26 Gungahlin general habitat**



Note: The darker the shading, the higher the habitat value

**Figure 7.27 Gungahlin woodland habitat**

The 2013 *Gungahlin Strategic Assessment: Biodiversity Plan* improved connectivity by adding forest and woodland communities to reserve areas (Table 7.11). This increased patch sizes, primarily for the Mulligans Flat–Goorooyarroo complex, and the northern hills, ridges and buffers of Kinlyside, to create a continuous area of habitat across the northern border of the ACT.



Note: The darker the shading, the higher the habitat value.

**Figure 7.28 Gungahlin forest habitat**

**Table 7.11 Area of nature reserve before and after the Gungahlin Biodiversity Plan**

Nature reserve	Area before (ha)	Area after (ha)
Percival Hill	79	79
Mulligans Flat north	130	130
Crace Grasslands	166	166
Mulanggari	148	148
Gungaderra	287	287
Northern hills, ridges and buffers	1122	1545
Mulligans Flat–Goorooyarroo	1394	1695
Kenny	0	154
<b>Total</b>	<b>3326</b>	<b>4204</b>

ha = hectare

**Connectivity at Jarramlee**

The Jarramlee offset site, as described in Section 7.3.1, is contiguous with the West Macgregor environmental offset site.

The Jarramlee and West Macgregor offset sites protect a relatively isolated patch of Golden Sun Moth habitat within Canberra's rural–urban fringe, which supports one of the largest known populations of Golden Sun Moth in the ACT. Although currently isolated, there is potential to connect Jarramlee with the nearby Golden Sun Moth population protected within the Dunlop Grasslands Nature Reserve and to patches of habitat along Gooromon Ponds Creek in NSW. Once established, this will create one of the largest patches of Golden Sun Moth habitat in Australia.

**Protected areas****Why is this indicator important?**

The National Reserve System (NRS) is Australia's network of protected areas, designed to conserve Australia's remaining biodiversity. The system aims to protect examples of the full range of Australian ecosystems, with their distinctive flora, fauna and landscapes, in areas across the continent.

The NRS currently has more than 10 000 protected areas, covering more than 137 million ha – 17.88% of Australia. It is made up of Commonwealth, state and territory reserves, Indigenous lands, and protected

areas run by nonprofit conservation organisations, as well as ecosystems protected by farmers on their private working properties. All 89 Australian bioregions<sup>1</sup> have some representation.

**Current monitoring status and interpretation issues**

Every two years, the Australian Government collects information on protected areas from state and territory governments, and other protected area managers. This information is published in the Collaborative Australian Protected Areas Database (CAPAD).

CAPAD provides a national perspective of the conservation of biodiversity in protected areas. It also allows Australia to regularly report on the status of protected areas to meet international obligations, such as those in the Convention on Biological Diversity.<sup>73</sup>

Under *Australia's Strategy for the National Reserve System 2009–2030*, the Australian Government and all state and territory governments have agreed to

<sup>1</sup> The Interim Biogeographic Regionalisation for Australia classifies Australia's landscapes into 89 large geographically distinct bioregions, based on common climate, geology, landform, native vegetation and species information (see [www.environment.gov.au/land/nrs/science/ibra#ibra](http://www.environment.gov.au/land/nrs/science/ibra#ibra)).





adopt international standards for the definition of a protected area and management categories used by the International Union for Conservation of Nature (IUCN).

All Australian governments have agreed to minimum standards that protected areas must meet to be included in and managed through the NRS:

- The land must be designated a 'protected area' to be conserved forever, with effective legal means guaranteeing its perpetual conservation.
- The land must contribute to the comprehensiveness, adequacy and representativeness of the NRS; in other words, it must meet certain scientific criteria and strategically improve the protected area network.<sup>m</sup>
- The land must be managed to protect and maintain biological diversity according to one of six international classes developed by the IUCN. The six-level system classifies protected areas according to their management objectives, which range from strict nature conservation to multi-use reserves.<sup>n</sup>

The fundamental principle underpinning the NRS – protecting a diversity of habitat types at multiple scales – will remain effective under the pressure of climate change as a practical mechanism for conserving values associated with Australian species, ecosystems and landscapes. However, with substantial changes in biodiversity and loss of biodiversity highly likely, additional criteria for selecting priority areas of habitat, including connectivity at multiple scales and refuges, are needed to support landscape-scale ecological processes that build the resilience of biodiversity to climate change.<sup>74</sup>

Data presented for the land-use category of 'conservation and other protected areas, recreation and parks' differ from the category used in Chapter 5: Land. In this chapter, it is based on the definition used in CAPAD and includes only land reserved for specific conservation purposes. In Chapter 5, data are presented in accordance with the Territory Plan, which is based on land zoning and may not reflect the actual current land use.

### What does this indicator tell us?

The ACT occupies only part of two bioregions<sup>75</sup> – the Australian Alps and the South-Eastern Highlands (Table 7.12) – but has the most extensive system of protected areas of any jurisdiction (Tables 7.13 and 7.14).

In 2007, the ACT was the only Australian jurisdiction to receive a World Wildlife Fund triple-A rating for its nature conservation estate in terms of its comprehensiveness, extent and standard of management.<sup>76</sup>



The Canberra Spider Orchid occurs on Mount Ainslie and Mount Majura and within the Majura Valley

Photo: Ester Beaton, ACT Government

m See the National Reserve System Scientific Framework for more information at [www.environment.gov.au/parks/nrs/science/scientific-framework.html](http://www.environment.gov.au/parks/nrs/science/scientific-framework.html).

n IUCN categories can be found at [www.iucn.org/about/work/programmes/gpap\\_home/gpap\\_quality/gpap\\_pacategories/](http://www.iucn.org/about/work/programmes/gpap_home/gpap_quality/gpap_pacategories/).

## 7 Biodiversity

**Table 7.12 Terrestrial protected areas in each bioregion (IBRA version 7) in the ACT, 2014**

IBRA name	IBRA area in ACT (ha)	Area protected (ha)	Percentage protected (%)	Percentage of total area protected
Australian Alps	54,131	54,131	99.47	41.57
South-Eastern Highlands	181,393	76,083	41.94	58.43
<b>Total</b>	<b>235,524</b>	<b>130,214</b>	<b>55.29</b>	<b>100.00</b>

ha = hectares; IBRA = Interim Biogeographic Regionalisation for Australia

Note: Total area of the ACT is 235 813 ha.

**Table 7.13 Terrestrial protected areas in Australia by jurisdiction, 2014**

Jurisdiction	Jurisdiction area (ha)	Number	Protected area (ha)	Average size (ha)	Percentage of jurisdiction protected	Contribution to NRS (%)
ACT	235,813	46	130,214	2,831	55.22	0.09
EXT	-	19	42,223	2,222	0.00	0.03
NSW	80,121,268	925	7,293,630	7,885	9.10	5.30
NT	134,778,762	81	25,129,386	310,239	18.64	18.27
QLD	172,973,671	1,086	14,108,222	12,991	8.16	10.26
SA	98,422,137	1,995	29,394,607	14,734	29.87	21.38
TAS	6,840,133	1,524	3,015,707	1,979	44.09	2.19
VIC	22,754,364	3,056	4,012,124	1,313	17.63	2.92
WA	252,700,808	1,607	54,375,439	33,837	21.52	39.54
<b>Total</b>	<b>768,826,956</b>	<b>10,339</b>	<b>137,501,551</b>	<b>13,299</b>	<b>17.88</b>	<b>100.00</b>
Area of Australia (ha)	768,826,956					

EXT = external; ha = hectares; NRS = National Reserve System



**Table 7.14 Terrestrial protected areas in ACT, 2014**

Type	Name	Area (ha)	Date declared
Botanic gardens (Cwlth)	Australian National	84	11/07/1980
	<b>Total</b>	<b>84</b>	<b>NA</b>
National park (Cwlth)	Namadgi	77 781	14/09/1993
	<b>Total</b>	<b>77 781</b>	<b>NA</b>
Nature reserve	Aranda Bushland	110	14/09/1993
	Black Mountain	462	14/09/1993
	Bruce Ridge	97	14/09/1993
	Bullen Range	4 024	14/09/1993
	Callum Brae	143	31/03/2008
	Cooleman Ridge	192	14/09/1993
	Crace	165	15/12/1995
	Dunlop Grassland	106	12/12/1997
	Farrer Ridge	195	14/09/1993
	Gigerline	1 476	14/09/1993
	Goorooyarroo	702	25/08/2006
	Gossan Hill	47	14/09/1993
	Gungaderra Grassland	275	15/12/1995
	Isaacs Ridge	325	14/09/1993
	Jerrabomberra Wetlands	215	14/09/1993
	Kama	155	12/12/2008
	Lower Molonglo River Corridor	569	14/09/1993
	McQuoids Hill	62	14/09/1993
	Molonglo Gorge	990	14/09/1993
	Mt Ainslie	770	14/09/1993
	Mt Majura	349	14/09/1993
	Mt Mugga Mugga	151	14/09/1993
	Mt Painter	90	14/09/1993
	Mt Pleasant	65	14/09/1993
	Mt Taylor	301	14/09/1993
	Mulanggari Grassland	119	15/12/1995

*continued*

Table 7.14 *continued*

Type	Name	Area (ha)	Date declared
Nature reserve <i>continued</i>	Mulligans Flat	812	20/05/1994
	O'Connor Ridge	59	14/09/1993
	Oakey Hill	66	14/09/1993
	Old Naas TSR	19	18/03/2013
	Percival Hill	79	18/05/2006
	Red Hill	298	14/09/1993
	Rob Roy	2 048	14/09/1993
	Stony Creek	827	14/09/1993
	Swamp Creek	155	31/03/2008
	The Pinnacle	136	14/09/1993
	Tidbinbilla	5 136	14/09/1993
	Tuggeranong Hill	337	14/09/1993
	Unnamed	220	14/09/1993
	Urambi Hills	239	14/09/1993
	Wanniassa Hills	282	14/09/1993
	West Jerrabomberra	261	31/03/2008
	Woodstock	343	14/09/1993
	<b>Total</b>	<b>23 472</b>	<b>–</b>
Wilderness zone	Namadgi	28 877	14/09/1993
	<b>Total</b>	<b>28 877</b>	<b>–</b>
<b>Total</b>		<b>130 214</b>	<b>–</b>

– = not applicable; ha = hectare; TSR = travelling stock reserve

Note: Total area of the ACT is 235 813 ha.

## Rare and insufficiently known species and ecological communities

### Why is this indicator important?

'Rare' species may not be currently threatened, but, because they have a small population or distribution, they can be particularly at risk of disturbance.

'Insufficiently known species' can also be at risk, but we do not know enough about their populations or ecology to be able to assess the risk.

The ecosystem consequences of losing rare or insufficiently known species are poorly known. Extinction of such species can influence ecosystem functioning and resilience if the species lost possess traits that directly or indirectly influence ecosystem function.<sup>77</sup> Each species can have distinct traits involved in unique ecological functions. As pressures on the environment grow, these unique features are particularly vulnerable to extinction, because rare species are likely to disappear first.



### Current monitoring status and interpretation issues

In the ACT, the Scientific Committee<sup>o</sup> compiles a list of working categories that are akin to watching briefs. Species and ecological communities included on these lists are not protected under the Nature Conservation Act or EPBC Act, but may be at risk. The categories included in this list are:

- rare species or ecological communities with small distributions or small populations that, although not currently endangered or vulnerable, are at significant risk from events such as land-use changes, reduced protection measures or major disturbance
- insufficiently known species or ecological communities suspected to be endangered or vulnerable but for which there is inadequate information to make an assessment of risk of extinction based on distribution, population status or other attributes. The species or ecological communities may have poorly known distributions, and the taxonomy of populations or species may be uncertain, or populations may appear to be declining. Threatening processes may also be identified as insufficiently known. Items identified as insufficiently known are flagged for further survey or taxonomic research, and kept under review.<sup>p</sup>

This indicator reports on the state and/or trend of the extent and, where possible, the condition of each rare and insufficiently known species or ecological community. The quality and quantity of the reporting are commensurate with the monitoring data available in the reporting period.

Note that the *Nature Conservation Act 2014* includes provisions to list species in the categories 'rare' and 'data deficient'. Once listed in either of these categories, species are given statutory protection as 'protected species'. Criteria and guidelines for listing under these categories are currently under development. No species are currently listed as either rare or data deficient under the Nature Conservation Act.

<sup>o</sup> Previously, the Flora and Fauna Committee (Nature Conservation Act pre-2014 amendments).

<sup>p</sup> The *Nature Conservation Act 2014* contains the categories 'rare' and 'data deficient'. The Scientific Committee's categories will be revised pursuant to this Act.

### What does this indicator tell us?

The Scientific Committee reviewed the species listed as rare during the reporting period. The Committee agreed to include the Crested Shrike-Tit in this category, given that it is becoming increasingly stressed and is reliant on woodlands. The current list of the species in the Committee's rare working category is:<sup>78</sup>

- Eastern Bent-Wing Bat (*Miniopterus schreibersii*)
- Australian Painted Snipe (*Rostratula australis*)
- Black Falcon (*Falco subniger*)
- Crested Shrike-Tit (*Falcunculus frontatus*)
- Powerful Owl (*Ninox strenua*)
- White-Bellied Sea-Eagle (*Haliaeetus leucogaster*)
- Kydra Dampiera (*Dampiera fusca*).

The Committee also reviewed the species listed as insufficiently known during the reporting period. The Committee agreed to include the Masked Owl in this category, given the limited information available on this species. The current list of species in the Committee's insufficiently known working category is:

- Diamond Firetail (*Stagonopleura guttata*)
- Dusky Woodswallow (*Artamus cyanopterus*)
- Flame Robin (*Petroica phoenicea*)
- Masked Owl (*Tyto novaehollandiae*)
- Black Gum (*Eucalyptus aggregata*)
- Snow Gum – Candlebark tableland woodland (*E. pauciflora* and *E. rubida*).

### Rare species

#### Eastern Bent-Wing Bat

The Eastern Bent-Wing Bat population found in the ACT breeds in a cave at Wee Jasper (NSW) and occupies staging caves en route to the south coast or ranges when breeding ceases. The migrations have been monitored at wind farms just across the border, and no Eastern Bent-Wing Bat fatalities have been recorded in three years of study.

The Cotter Caves once housed a colony of Eastern Bent-Wing Bats. In the 1930s to 1950s, bats were always present during cave inspections. Visitor disturbance and gating of the cave entrance (which interfered with the bat sonar, and deterred or prevented entrance to the caves) led to a decline,



and bat sightings are now infrequent.<sup>79</sup> The most recent recorded evidence of the bats was in October 2013. Government rangers visited the Cotter Caves and found evidence of guano, but no signs of groups or individuals roosting (J Overall, Ranger – Southern Murrumbidgee, pers comm, 14 October 2013).

#### *Australian Painted Snipe*

The Australian Painted Snipe is an unusual sighting in the ACT region. Reporting rates in 2013–14 were down 26% on 2012–13, but were well up on both the 10- and 30-year averages.<sup>80</sup>

#### *Black Falcon*

The Black Falcon is an inland raptor that continues to be recorded infrequently in the ACT region; its presence here is probably dictated by conditions inland. There were 9 recorded sightings of the species in 2012–13 in the ACT and 16 in 2013–14. This is significantly higher than the 30-year average of 2.3 birds per year.<sup>81</sup>

#### *Crested Shrike-Tit*

The Crested Shrike-Tit is considered to be rare by the Scientific Committee, because its reporting rate has fallen significantly since its peak in the 1990s. However, there were 23 recorded sightings of the species in 2012–13 in the ACT and 40 in 2013–14. The 30-year average is 28.1 birds per year.<sup>82</sup>

#### *Powerful Owl*

There have been no dedicated surveys of the Powerful Owl – a rare breeding resident – since 1995. This was when it was estimated that there were 14 or so territorial pairs in the ACT, mostly in Namadgi National Park.

Powerful Owls have been recorded in seven of the years from 2005 to 2015. COG reports no records in 2011–12. In 2014, CPR staff recorded Powerful Owls near Bendora Dam, Yaouk Gap and Fishing Gap (G Baines, Senior Vegetation Ecologist, Conservation Research, EPD, pers comm, 3 August 2015). The most recent breeding record was in 1988.<sup>83</sup>

In 2015, a Powerful Owl took up long-term residence in Haig Park near the Canberra central business district. COG member Terry Bell said that the big predator had been caught on camera devouring Sugar

Gliders and its feathery cousins, such as Canberra's emblem bird, the Gang-Gang Cockatoo.<sup>84</sup>

#### *White-Bellied Sea-Eagle*

An uncommon nonbreeding visitor, the White-Bellied Sea-Eagle is occasionally seen over ACT lakes and rivers, or travelling between them. There were 47 recorded sightings of the species in 2012–13 in the ACT and almost double this (92) in 2013–14. This is significantly higher than the 30-year average of 15.9 birds per year.<sup>85</sup>

#### *Kydra Dampiera*

Kydra Dampiera is a small perennial shrub<sup>86</sup> that has been monitored in the ACT since its discovery after the 2003 fires. The shrub germinates in large numbers after fires and then rapidly declines. The species was most recently surveyed in 2011. The species occurs within Namadgi National Park and, in 2011, approximately 150 plants were surveyed. The numbers of plants recorded have declined after a peak in 2009. This decline is consistent with the known ecology of this species – few if any standing plants are observed in populations 20–30 years after fire, with the species persisting only in seed banks.

### Insufficiently known species

#### *Diamond Firetail*

The Diamond Firetail is an uncommon breeding resident, which prefers undisturbed woodland with shrubs and eucalypts. The reporting rate for 2012–13 is 15% less than for 2013–14. It is also about 30% lower than both the 10- and 30-year averages.<sup>87</sup>

#### *Dusky Woodswallow*

A not-uncommon breeding woodland species, the Dusky Woodswallow is a summer migrant, but has been recorded overwintering in the region. The abundance and reporting rate appear to be rising from the extremely low levels of 2011–12, with 299 birds recorded in 2012–13 and 369 in 2013–14, which are above the 30-year average of 177.2.<sup>88</sup>

#### *Flame Robin*

The reporting percentage for the Flame Robin continues to show a steady decline from 5.1% in 2008 (the highest since 1994) to 2.6% in 2013–14.<sup>89</sup>



#### *Masked Owl*

There have been no sightings of the Masked Owl for the past decade.

#### *Black Gum*

The ACT Black Gum population is small, but this appears to be typical for this species. There is only one 'natural' (nonplanted) site in the ACT – a cluster of about 16 individuals located in the Kowen–Kings Highway area. Since 1995, nine saplings have grown to reproductive age, one mature tree has died, and two have probably been removed by road works. Grazing of seedlings and road works continue to threaten this population. These trees are known to hybridise with Candlebark Gum (*E. rubida*), a species common in the location where Black Gum grows (G Baines, Senior Vegetation Ecologist, Conservation Research, EPD, pers comm, 3 August 2015).

#### *Snow Gum – Candlebark tableland woodland*

Current (2015) information indicates that there are 32 potential sites mapped for a Snow Gum – Candlebark tableland woodland community, with a total area of around 225 ha. The community is very fragmented, and many areas are in a degraded condition. New areas are being identified through a government vegetation mapping project, but it is unlikely that any new large areas will be found (G Baines, Senior Vegetation Ecologist, Conservation Research, EPD, pers comm, 3 August 2015).

Case study 7.2 (page 278) discusses another species about which there is little information – the Mountain Spiny Crayfish.



Sugar Glider: an individual of this species was seen to be devoured by a Powerful Owl in Haig Park in Canberra's central business district

Photo: Ester Beaton, ACT Government





## Case study 7.2 Mountain Spiny Crayfish

There are two known species of Mountain Spiny Crayfish in the ACT: *Euastacus crassus* and *E. rieki*. Little is known about the biology, distribution or status of either species in the ACT or elsewhere. The species are thought to primarily inhabit montane to alpine creeks and bogs. This makes them temperature dependent and therefore likely to be at risk of climate change.

The CPR Aquatic Team collected two berried females among 50 individuals collected as part of a surveying program in the subalpine bogs, creeks and rivers in the ACT. The program is designed to determine the

distribution and relative abundance of *E. crassus* and *E. rieki*.

This is the first breeding information regarding *E. rieki*. It indicates that berried females remain active and are likely to hold their eggs over winter, despite the frequent snow cover and subzero temperatures. Improved monitoring of alpine areas will be important in understanding potential impacts from climate change on this species.<sup>90</sup>



Berried *Euastacus rieki* located in July 2014 in a subalpine bog in Namadgi National Park. This is the first female with eggs ever to be recorded – a tremendous leap towards filling the huge knowledge gaps on this cryptic species

Photo: ACT Government



## Assessment summaries for indicators of biodiversity state and trend

Indicator	Reasoning	Assessment grade					Confidence	
		Very poor	Poor	Fair	Good	Very good	In state grade	In trend grade
Extent and condition of threatened flora and fauna species	By definition, these species will be in poor (vulnerable species) or very poor (endangered species) condition. The trends are mostly hard to discern from the fragmentary data presented, but the majority of cases suggest a continued decline							
Extent and condition of threatened ecological communities	By definition, threatened communities are in poor condition. It appears that, for the majority of communities, there have been improvements due to management, although there have been some declines (eg sphagnum bogs and fens)							
Connectivity of terrestrial native vegetation (ecological community)	The Gungahlin Strategic Assessment led to significant planning of, and monitoring for, connectivity values. Fine-scale modelling of fauna habitat and connectivity across the ACT means that these values are now well understood. However, this knowledge needs to be applied to management and planning decisions to ensure that connectivity values continue to improve. Until the modelling methodology is reapplied, the trend is stable – we are losing connectivity through developments such as the Majura Parkway and the building of new suburbs; however, we are protecting the key links and revegetating some others							
Protected areas	More than half of the ACT's entire land area is protected in perpetuity as part of the National Reserve System. The incomplete confidence in the grade reflects: <ul style="list-style-type: none"> <li>the poor condition of the ACT's biodiversity values in our protected areas</li> <li>the fact that the capacity of the reserve system to protect biodiversity in the face of climate change is unclear</li> <li>the fact that the conservation outcomes for biodiversity resulting from land added to the reserve system for offset purposes are unknown</li> </ul>							

## 7 Biodiversity



Indicator	Reasoning	Assessment grade					Confidence	
		Very poor	Poor	Fair	Good	Very good	In state grade	In trend grade
Rare and insufficiently known species and ecological communities	By definition, we cannot say much about the trend for these species. Those that are rare might be naturally rare or might be in decline. It seems that most on the list are in the latter category; hence, the overall grade is very poor, but some might argue for poor	<div><div>?</div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>

Recent trends	<div><div>↗</div></div> Improving	<div><div>—</div></div> Stable	Confidence	<div><div>●</div></div> Adequate high-quality evidence and high level of consensus
	<div><div>↘</div></div> Deteriorating	<div><div>?</div></div> Unclear		<div><div>◐</div></div> Limited evidence or limited consensus
				<div><div>○</div></div> Evidence and consensus too low to make an assessment



Relatively little is known about the habitat or distribution of the Perunga Grasshopper

Photo: Emma Cook, ACT Government