

2.2 TOPOGRAPHY, DRAINAGE AND SOILS

Topography is a key parameter for defining the landscape and has implications for track alignments, recreational areas, erosion management, flood zone constraints and ecosystems. Topography and drainage features within the study area (e.g. ponds and probable maximum flood extent) are illustrated in **Figure 5**, based on studies and designs conducted for the urban development. An analysis of slope is given in **Figure 6**.

The main river channel is deeply incised for much of its length to Coppins Crossing. The ephemeral drainage channels, such as Holdens Creek are indicated in **Figure 5**. Water flow in the Lower Molonglo River has been significantly altered by upstream impacts including the urban development of Canberra and construction of Scrivener Dam. Further changes will occur as a result of development of adjoining suburbs.



Undulating terrain draining to river

Volcanic rocks dominate the geology of the area and outcrop in the riverbed and banks. Terraces and alluvial flats border the river channel from 2-5 m above the normal (low) flow level. Rock and boulder terraces are positioned in some sections of the river. Terraces were formed during previous high discharge floods, but following the construction of Scrivener Dam have become relict features upon which vegetation has become established (ACT Government 2007).

The slope analysis in **Figure 6** indicates that the river flats and terraces generally have a slope of less than 10%. Most of the riparian corridor is bounded by steeper slopes of between 10 - 20%, including the hills on the north-eastern side of the river. Excellent views are available from some of the upper slopes and hill-tops.

Soils are typically shallow or skeletal and mostly infertile. Soils across the study area have been extensively disturbed by past grazing and forestry activities. Erosion is evident at a few locations where the river bank is exposed. Some unsealed tracks have been eroded, particularly after recent heavy rainfall.

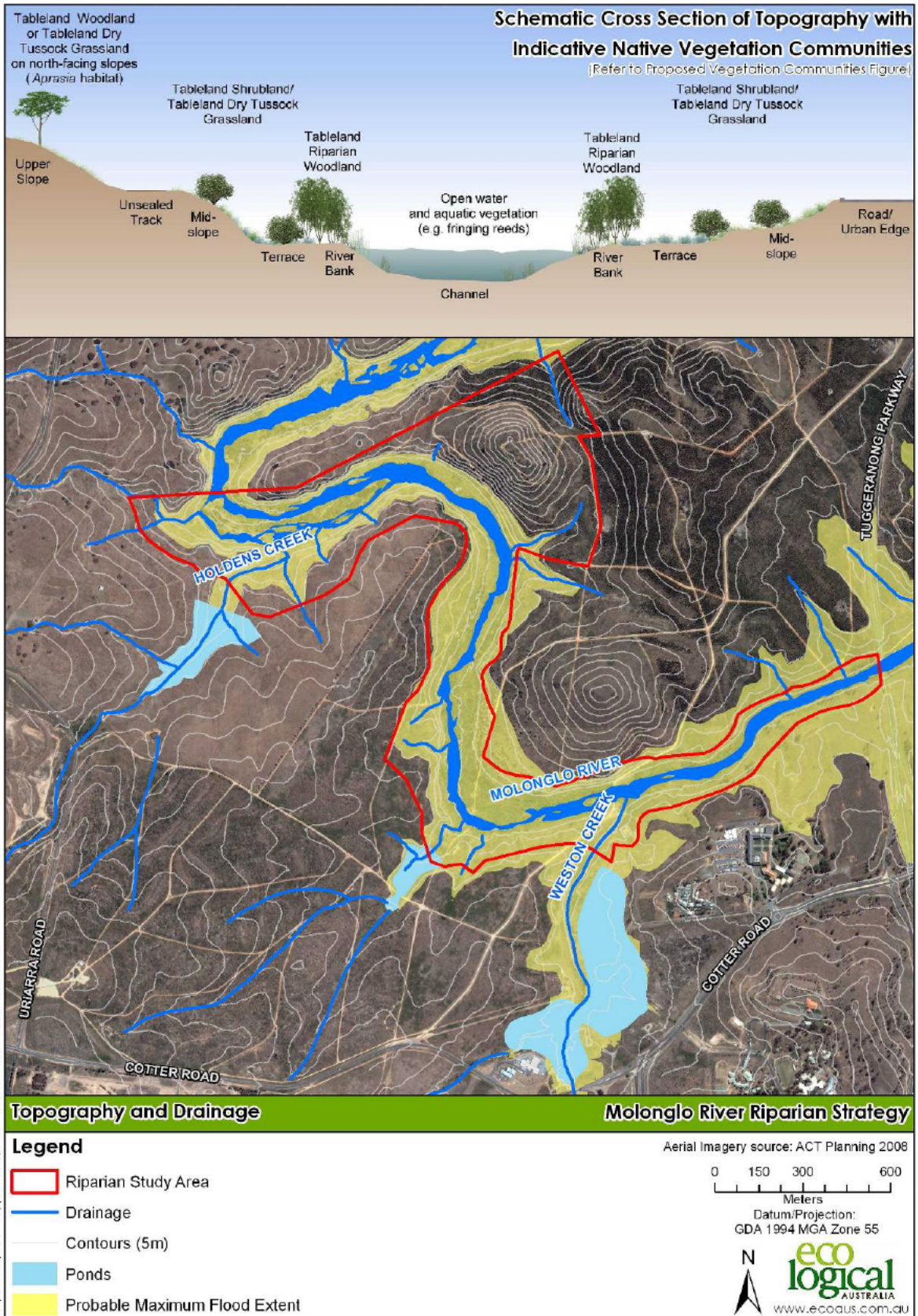


Figure 5: Topography and drainage

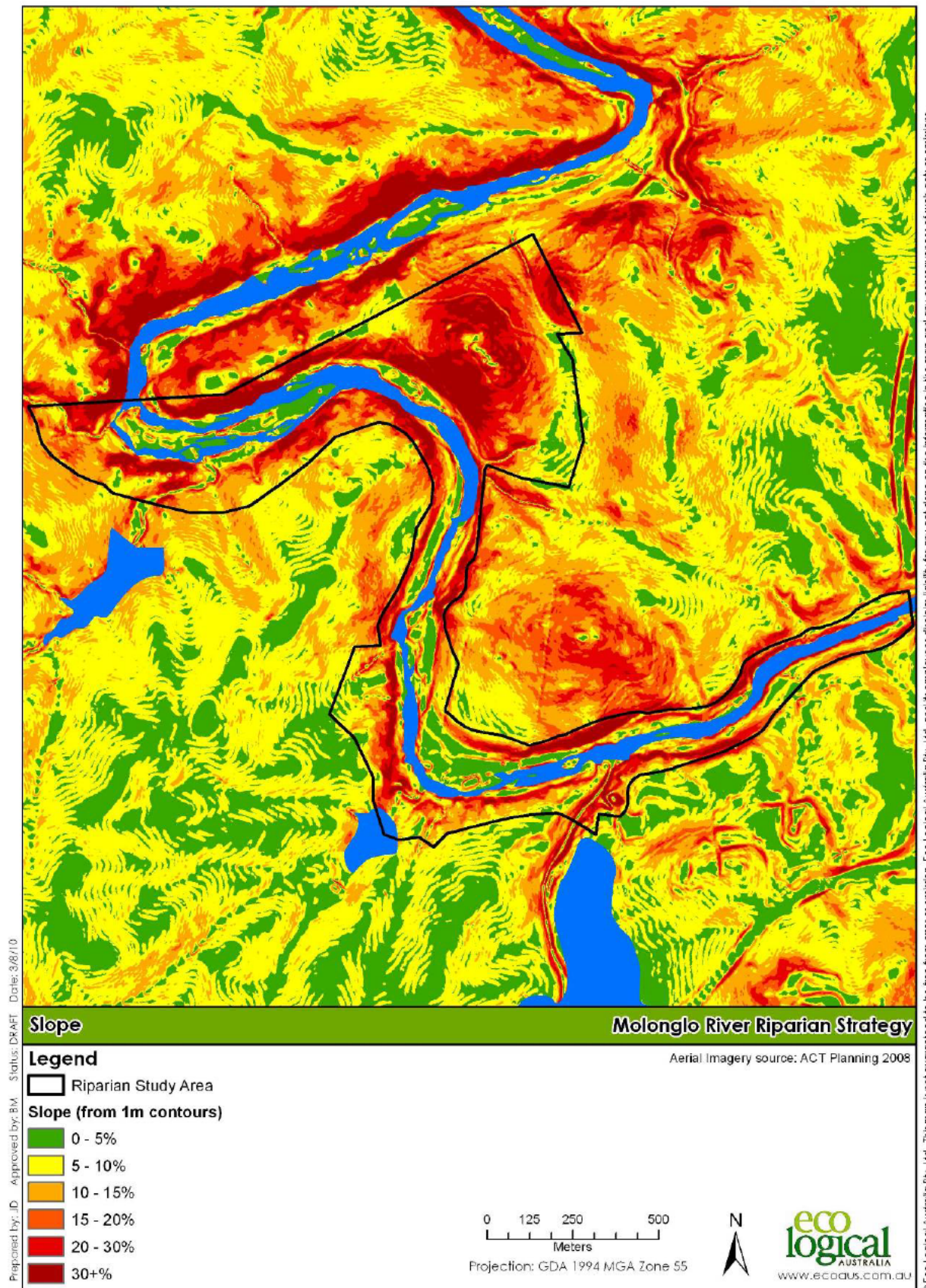


Figure 6: Slope analysis

2.3 TERRESTRIAL ECOLOGY

ELA (2008, 2009b) undertook ecological survey and mapping for the Molonglo River corridor between Scrivener Dam and the confluence of the Molonglo River with the Murrumbidgee River. Further investigation was undertaken in early 2010 during preparation of this Strategy. Results of field investigations and a literature/data review inform this section of the report.

The vegetation, river corridor and water quality within the study area have been severely modified by pine forestry, agriculture (primarily grazing), the construction of Scrivener Dam and the fires in 2003. Extensive weed infestation throughout most of the study area means that native vegetation communities cannot be easily defined. There are some small pockets where remnant vegetation exists, such as the stand of mature Casuarinas on the mid-stream bank in the downstream section of the study area.

Overall the condition of ecosystems within the corridor can be grouped into:

- Tuggeranong Parkway to Misery Hill – severely modified environment that was a pine plantation. Dense weed infestation prevents access to the river along most of its length. There is some gully erosion along tributaries but most of the main river channel is stable. Water quality is poor as a result of urban runoff upstream especially from Yarralumla and Weston Creeks but also from Lake Burley Griffin which has suffered algal blooms in recent years (as a result of high nutrient loads from the urban area, Queanbeyan and farm land within the Molonglo River Catchment).
- Misery Hill to the downstream study boundary – moderately modified environment that continues to be grazed by stock. This area has moderate to low levels of weed infestation, but retains significant ecological values. Some parts of this area provide habitat for the threatened Pink-tailed Worm Lizard (*Aprasia parapulchella*).

2.3.1 Flora and fauna

Despite the highly modified state of the study area, there is some valuable habitat available for native fauna. Examples include:

- Dead trees, particularly where located in the river, offer sites for roosting and nesting. Australasian Darters (*Anhinga novaehollandiae*) were observed nesting in a dead tree in the upper section of the study area
- Dense thickets of weeds (e.g. Blackberry *Rubus fruticosus* agg.) provides habitat for small birds such as wrens
- Rocky, derived grasslands provide habitat for the Pink-tailed Worm Lizard (*Aprasia parapulchella*)
- Derived grasslands and open woodlands provide habitat for Eastern Grey Kangaroos (*Macropus giganteus*)
- Aquatic habitat (fringing reeds, open water, exposed rocks at the edge of the river) provide habitat for frogs, fish and reptiles (e.g. Eastern Water Dragon *Physignathus lesueurii*)

The Molonglo riparian area will act as a local refuge for small birds and other fauna during times of stress, such as drought. The corridor is also of local importance to movement of many species of birds across the landscape such as silvereyes, thornbills, honeyeaters and native finches.

Threatened* and migratory species that may be found in the area, and their conservation status, are listed according to habitat type in **Appendix D**. Species that have suitable habitat in the study area, but have not been recorded, include:

- Striped Legless Lizard (*Delma impar*)*
- Rainbow Bee Eater (*Merops ornatus*)
- Cattle Egret (*Ardea ibis*)
- Great Egret (*Ardea alba*)

A. parapulchella is the only threatened species¹ that has been recorded in the study area. Habitat for *A. parapulchella* is mapped in **Figure 7**. Refer to the following section for further details.

2.3.2 Pink-tailed Worm Lizard

Habitat

The following information regarding the Pink-tailed Worm Lizard (*Aprasia parapulchella*) was prepared by Dr William S. Osborne, Institute for Applied Ecology, University of Canberra (3 February 2010). The information is based in part on an earlier unpublished report to ACTPLA².

Detailed information is available on the habitat of the Pink-tailed Worm Lizard (Osborne et al. 1991; Jones 1992, 1999). The species lives beneath stones in burrows formed initially by ant colonies. The species feeds exclusively on ants, particularly on their eggs and larvae. In the ACT region, suitable habitat for the lizards occurs in association with open rocky areas on hillsides, particularly on slopes of the main river valleys. In this region, the species has only been found in areas underlain by acid volcanic rock types – Late Silurian acid volcanoclastic deposits (e.g. rhyodacite, rhyolite, dacite). The specific rock types are listed in Osborne et al. (1991) but a common feature of the sites is that they contain numerous scattered surface rocks which are well-weathered and partially embedded in the soil and grass. The lizards are commonly found beneath rocks that range from about 10 to 30 cm in diameter (Jones 1992).

Potential habitat in the ACT is characterised by an absence of trees (e.g. a lack of forest cover) and by a cover of predominantly native grasses, particularly kangaroo grass *Themeda australis*, red-leg grass *Bothriochloa macra* and *Lomandra filiformis* (Osborne et al. 1991; Jones 1992, 1999). The likelihood of the occurrence of *A. parapulchella* is increased with an increasing cover of kangaroo grass (*T. australis*). By contrast, increases in the occurrence of the grasses *Stipa falcata*, *Stipa bigeniculata* and *Poa labillardieri* decrease the likelihood of finding the species. Jones (1992) also found that a moderate number of disturbed sites dominated by exotic pasture species such as *Avena barbata*, *Vulpia bromoides*, *Hypocheirus radicata*, *Bromus hordaceus*, *Aira elegans* and *Trifolium arvense*, and the native species *Bothriochloa macra* (red-leg grass) supported at least some individuals. It is possible, however, that these disturbed sites will not support viable populations.

¹ Note that it is classified as threatened under the Commonwealth EPBC Act

² Osborne, W.S. (2007) *Environmental planning principles for the protection of the Pink-tailed Worm-lizard Aprasia parapulchella in the Lower Molonglo Valley, ACT*

Figure 7 shows areas of low, moderate and high quality habitat. Moderate and high quality areas are of particular interest and are defined as follows:

- High Quality Potential Habitat: Suitable rocky areas generally dominated by, or with a large component of Kangaroo Grass (*Themeda triandra*) and also often containing *Poa sieberiana* and, in some cases, a range of native forb species. Exotic annual species such as Haresfoot Clover (*Trifolium arevense*) and *Vulpia* spp. may also be present.
- Moderate Quality Potential Habitat: Suitable rocky areas usually dominated by Spear Grasses (*Austrostipa* spp.) and Wallaby Grasses (*Austrodanthonia* spp.). Native forb species and exotic annual grasses such as Haresfoot Clover (*Trifolium arevense*), Wild Oats (*Avena* sp.) and Saffron Thistle may also be present

What can we learn from populations previously protected in urban reserves?

In the ACT some areas supporting the lizards have been fully isolated in the urban matrix (e.g. Mt Taylor) and the longer-term survival prospects for these isolated populations are not known. The Mt Taylor population is of particular interest because it is a large population that has been surrounded by urban matrix for over twenty years. The reserve has been subject to a greatly increased frequency of unnatural fires (mainly from children lighting fires) and some areas of habitat have been disturbed by people collecting or moving rocks. Despite these activities the lizards were found by Osborne and McKergow (1992) to be very common. More recently David Wong (University of Canberra, unpublished data) found that a reasonably large population of Pink-tailed Worm Lizards still occurs in Coleman Ridge Nature Reserve in an area fronted on one side by suburbs and agriculture on the other side. This area has been urbanized for some thirty years.

Commonwealth EPBC Referral Decision requirements

The proposed development of the suburb of Coombs was referred to the (then) Department of the Environment, Water, Heritage and the Arts (now Sustainability, Environment, Water, Population and Communities) in 2009. As part of the assessment of the referral, the Department considered the potential for significant impacts on *A. parapulchella* from the proposed urban development. The referral decision (EPBC 2009/5050 dated 16/4/10) is replicated in **Appendix E** and states that 'the proposal is not a controlled action if undertaken in a particular manner'. Required management measures are discussed in **Section 5.1.6** and include a 20 m buffer surrounding high-moderate Pink-tailed Worm Lizard habitat.



Pink-tailed Worm Lizard

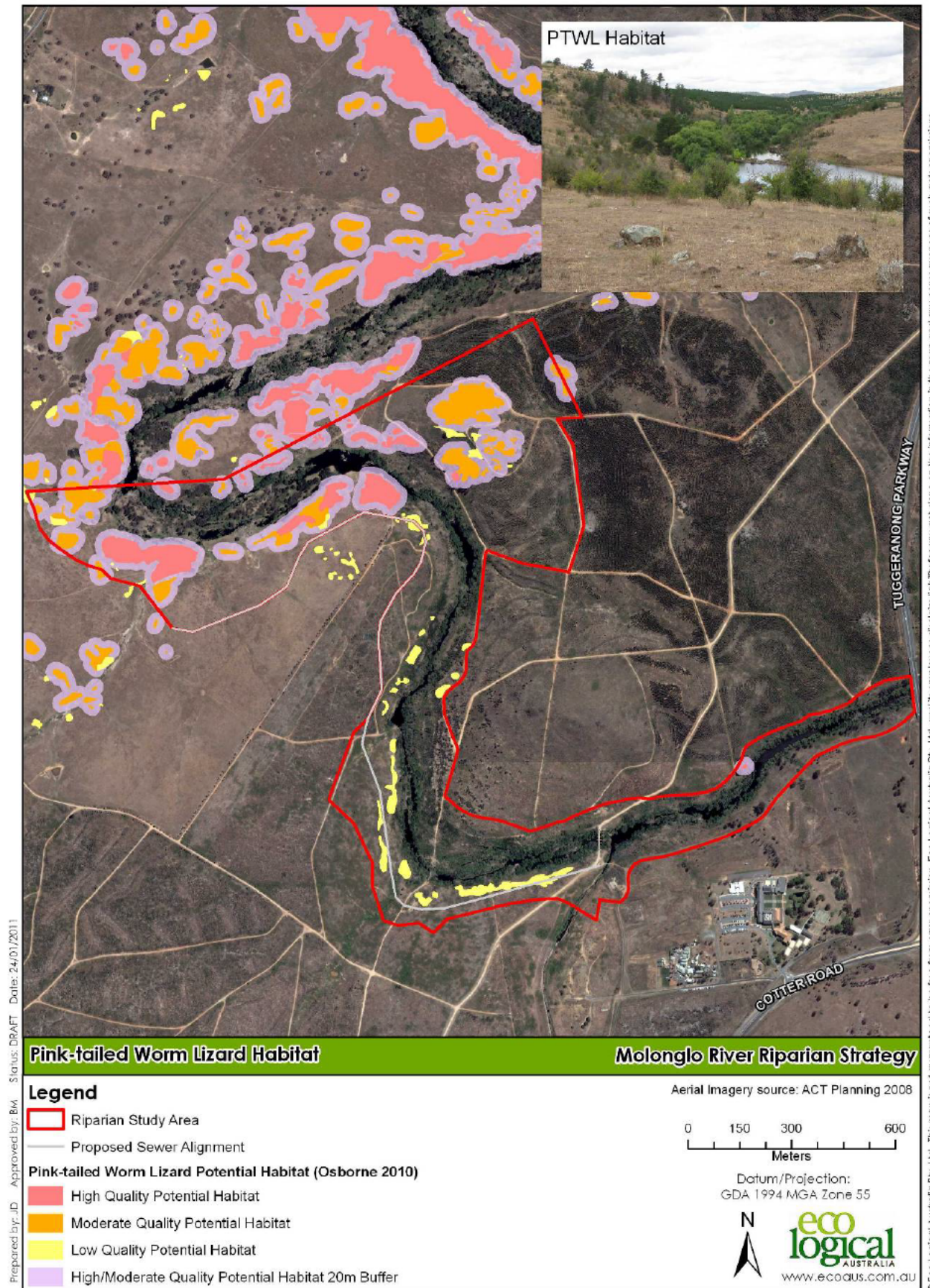


Figure 7: Pink-tailed Worm Lizard habitat

2.3.3 Pest plants and animals

The study area is heavily weed infested because:

- Past land uses have included clearing native vegetation cover for farmland and pine forestry which has resulted in the introduction of pest plants and their establishment in the river corridor
- The 2003 fire destroyed much of the pine forest canopy and encouraged the proliferation of weeds and pine wildlings. Formal forestry practices ceased in the area after the 2003 fires
- Pest plants have become established in reworked streambeds and the main river channel
- River regulation associated with Scrivener Dam has resulted in few high level flows to limit weed establishment
- Riparian areas are usually wetter and more fertile, often allowing exotic species to out-compete native species, especially where there is disturbance. Cultivation and fertiliser application further encourage establishment of weed species
- The watercourse itself is a route by which seeds and other plant material are transported to new locations by the water itself and by animals, particularly birds

There are many weed species growing in the study area. The ACT Pest Plants and Animals (Pest Plants) Declaration 2005 under the *Pest Plants and Animals Act* identifies plants that are major problems in riparian areas and found in this study area. These include:

- African Love Grass (*Eragrostis curvula*)
- Serrated Tussock (*Nassella trichotoma*) – Weed of National Significance
- St John's Wort (*Hypericum perforatum*)
- Blackberry (*Rubus fruticosus* agg.) – Weed of National Significance
- Willows (*Salix* spp.) – Weed of National Significance

Weeds of National Significance (WoNS) have infested large portions of Australia's natural and productive landscape and require action at a national level to reduce their impacts. A national strategy for each WoNS has been endorsed by the Natural Resource Management Ministerial Council and specifies actions to better manage the weed. WoNS recorded in the Molonglo study area are indicated above.

Most of the area adjacent the river corridor (with the exception of the lower reach) is ex-pine plantation land that is covered with Radiata Pine, and further degraded by Blackberry, St John's Wort, and exotic and native grasses. Pine wildlings will be cleared for urban development on the southern side of the river, but ex-plantation areas to the north present a major problem for rehabilitation of ecosystems within the corridor because of the ongoing threat of weed infestation.

Pest animal species that occur in the area include carp, foxes, rabbits and feral cats. Feral animals predate or compete with native species and degrade habitat. Urban development usually increases the impacts associated with domestic pets e.g. dog excrement, kittens being dumped in bushland, and domestic cats preying on birds, reptiles and invertebrates.

2.4 AQUATIC ECOSYSTEMS AND WATER QUALITY

The ACT Water Report 2007-08 summarises results of water quality, stream flow and aquatic ecosystem monitoring in the ACT. The water quality in ACT streams and lakes was assessed against the water quality standards set out in Volume 2 of the Territory Plan, General Code 1.8 'Water Use and Catchment General Codes'. The study found that environmental conditions in urban waterways were more degraded than non-urban waterways. However, it is not possible to know the applicability of

monitoring results to the study area because there were no monitoring sites in the Lower Molonglo River.

The closest water quality monitoring site is at Coppins Crossing, downstream of the study area. Water at this site is monitored by the Wirinjani Waterwatch Group using kits supplied by the Molonglo Catchment Group (refer to **Section 5.3.4** for more details about Waterwatch). Water quality in the Lower Molonglo was rated as good for the period January to June 2009 according to the M-CHIP rating system, which considers pH, turbidity and electrical conductivity (Skinner 2009).

Aquatic habitat in the study area comprises deep and shallow pools with slow moving water, and rocky and muddy bottoms separated by shallow, fast flowing rapids over exposed bedrock. Bridges at Clos and Southwell's Crossings allow fish passage.

The most recent aquatic fauna survey of the Molonglo River was conducted in 2003. The *ACT Aquatic Species and Riparian Zone Conservation Strategy* identifies the need for a fish and platypus survey as a priority action. A Platypus Watch Group has recently established with support from the Molonglo Catchment Group.

There are small pockets of native and exotic reeds along the river, providing in-stream habitat for frogs and fish. There were numerous small fish (species unknown) observed in the river during near Clos and Southwell's Crossings, even though water quality was affected by oily slicks (possibly runoff associated with the nearby water pumping station and tanker) and ferrous material.

Weston Creek enters the river just upstream of Clos Crossing. During dry periods, a pumping station extracts water from a pool at the confluence and the water is taken off site by tanker-truck to water plants at the Arboretum.

2.5 FIRE

The *Strategic Bushfire Management Plan for the ACT* (v2) states that 'the ACT has a history of severe damaging bushfires with large areas burnt in the bushfire seasons of 1919/20, 1925/26, 1938/39, 1951/52, 1978/79, 1982/83, 1984/85, 2000/01 and 2002/03'. A *Bushfire Risk Assessment for the Coombs Estate Development Plan* (ABPP 2010) found that the Molonglo Valley was impacted in the 1951/52 bushfire season, and the 2003 bushfires extended across the entire valley, destroying the forests, infrastructure and dwellings in the adjacent suburbs of Duffy and Holder.

As outlined later in this Strategy, future urban development and rehabilitation of the riparian corridor will require different management approaches, particularly fire regimes, to achieve desired objectives. Issues to consider include:

- The need to protect assets (e.g. homes) through identification and maintenance of asset protection zones (**Section 3**)
- The need to rehabilitate and maintain healthy ecosystems in the riparian corridor through application of ecologically-appropriate fire regimes (**Section 5.1.5**)

Some dead timber and exotic vegetation will need to be removed to reduce bushfire risk prior to urban development. Weed removal is also needed to improve biodiversity. A staged approach to bush regeneration is recommended in this Strategy and should commence prior to construction of dwellings in Coombs to minimise the risk of bushfire associated with excessive dead timber and exotic vegetation in the river corridor and surrounds. Consideration needs to be given to the habitat value of the timber (e.g. used for roosting and nesting) and vegetation to be removed, as well as the risk of soil erosion.