Platypus distribution and abundance in the upper Wimmera region.

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Confidential Report

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17/01/2013	1.0	Final Report Draft	JG	AW
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Abbreviations

Abbreviations	Description
PIT	passive integrated transponder
TVI	tail volume index
CPUE	captures per unit effort
APC	Australian Platypus Conservancy
PCR	platypus capture rate
DSE	Department of Sustainability and Environment
DPI	Department of Primary Industries

Contents

Executive Summary

Extensive surveys between 1997 and 2004 found platypuses to be relatively widespread in the upper Wimmera Catchment. Platypuses were recorded in the Wimmera River upstream of Glenorchy, Nowhere/Glenpatrick Creek and Mt Cole Creek. The long term drought had severe impacts on aquatic ecosystems in the Wimmera Catchment and only 1-2% surface water was estimated to remain during the driest years. Several surveys since 2004 failed to capture any platypuses in waterways where they were previously known to occur, indicating a rapid and severe decline in abundance.

Since the end of the drought in mid-2010, higher rainfall has resulted in increased surface water and flows and improved conditions for platypuses. As a result, Project Platypus commissioned **cesar** to conduct platypus surveys to investigate the current status of platypus populations in the upper Wimmera region and determine the extent of any post-drought recovery.

Fyke net surveys were conducted at 15 sites in Mt William Creek, upper Wimmera River, and Mt Cole Creek over four nights during October 2012. No platypuses were captured from a total of 38 trap nights, indicating there has been no substantial recovery of platypus populations since the end of the drought. Occasional sightings confirm platypuses do persist in the upper Wimmera region. However, abundance appears to be very low and sparsely distributed. As such, platypuses should be considered locally endangered and their long term survival in the region is in doubt.

The major threats to platypuses in the area are a lack of available surface water and poor riparian vegetation. Low water levels reduce the overall amount of aquatic habitat available, lowers habitat quality, and fragments populations by severing connectivity between and within waterways. As the upper Wimmera waterways are not regulated, water availability will be primarily driven by rainfall but measures to reduce water abstraction through reduced use or improved efficiency will help to improve environmental flows. Widespread clearing of vegetation and unrestricted stock access along waterways has caused severe bank erosion and in-stream sedimentation, resulting in poor habitat quality for macroinvertebrates. Project Platypus has worked closely with landowners to restore riparian habitat in some areas and it is important to continue and expand this work. As well as reducing erosion, intact riparian vegetation confers a variety of benefits to aquatic systems and improves habitat for a range of fauna.

Key findings and recommendations:

- Platypus populations in the upper Wimmera have declined substantially over the past decade. Platypuses should now be considered regionally endangered due to very low abundance and sparse, fragmented distribution.

- Initiate a campaign to gather public sightings to determine the broad distribution of platypuses throughout the Wimmera Catchment, identify hotspots, prioritise conservation efforts, and direct future surveys.
- Encourage and support landowners to implement water conservation strategies to reduce removal of water from the system and improve environmental flows.
- Continue to work with landowners to protect remnant riparian vegetation and restore degraded areas through fencing of riparian zones, weed removal and revegetation with native species.

Nature of work

The platypus is an iconic Australian species that inhabits a variety of aquatic ecosystems throughout eastern Australia (Grant 1992b). The Wimmera Catchment is close to the western limit of the species' distribution. Due to its reliance on freshwater habitats, the platypus is potentially vulnerable to a number of natural and anthropogenic disturbances such as drought and floods, altered water flow regimes, clearing of native riparian vegetation, bank erosion and sedimentation, litter, fishing equipment, and introduced predators. The relative impacts of these threats are poorly understood but are likely to vary between regions and where multiple threats are present, the effects may be synergistic.

Southeastern Australia has recently endured one of the worst droughts in 200 years (Murphy and Timbal 2007). The Wimmera Catchment was severely impacted with many smaller tributaries completely dry and the main waterway, the Wimmera River, reduced to a series of isolated pools for extended periods. Platypus surveys conducted between 1997 and 2004 found platypuses widely distributed throughout the upper Wimmera River and its tributaries, upstream of Glenorchy (Serena and Williams 2007). However, subsequent surveys from 2005 to 2009 failed to capture any platypuses when surface water was estimated to be only 1-2% (Williams and McQualter 2005, Mitrovski 2008, Armistead 2009, Mitrovski 2009). Despite the lack of captures, occasional sightings throughout the area indicated some platypuses continued to persist in refuge areas.

Since the end of the drought in mid-2010, increased rainfall has resulted in greater available surface water, improved flows and hence more suitable conditions for platypuses. **cesar** were engaged by Project Platypus to assess the presence, distribution and relative abundance of platypuses in the region.

Methods

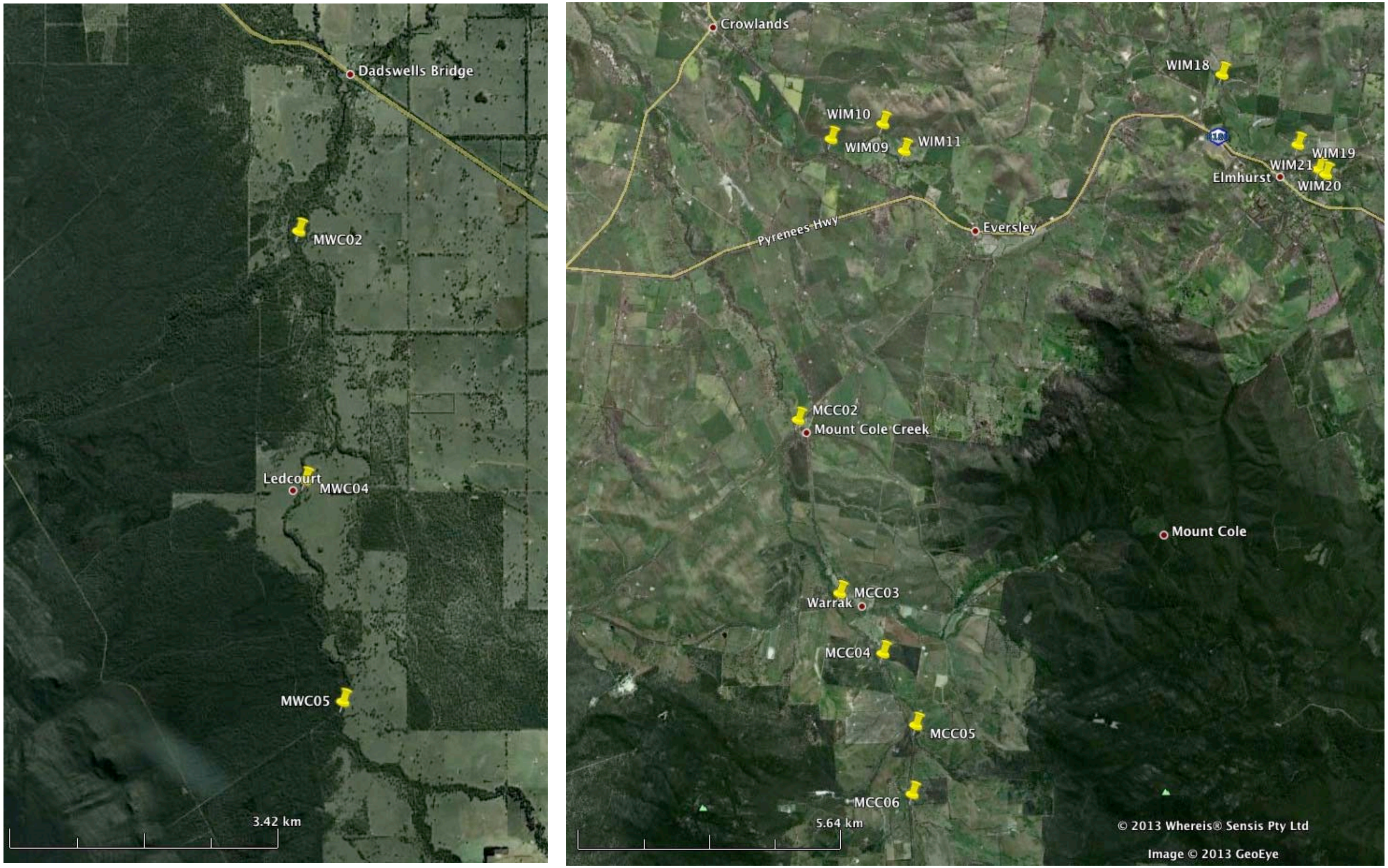
Survey methodology

All platypus surveys during 2012 were conducted using fyke nets (Serena 1994), which consist of a central capture chamber (mesh size 15 x 15 mm) with a series of one-way baffles that detain the animal without entanglement. Mesh wings on either side of the entrance are positioned to block the width of the waterway and guide platypuses into the capture chamber. The distal end of the capture chamber was securely suspended above the water level to allow captured platypuses (and some bycatch) access to air. At each site, a pair of fyke nets was set with one facing upstream and one facing downstream to capture platypuses travelling in either direction. Nets were set during the afternoon and removed at dawn the following day. Nets were checked at regular intervals during the night to remove captured platypuses and bycatch, and to repair holes caused by water rats. In order to maximise the chance of catching platypuses and ensure the safety of captured animals, sites were selected with appropriate water depth (< 1m) and flow, and with suitable edge habitat so that the wings could effectively block the entire channel.

Survey sites

Survey locations were selected to cover a broad area and maximise capture probabilities based on historical captures (Williams and McQualter 2005, Serena and Williams 2007, Mitrovski 2009) and recent public sightings in response to a media campaign initiated by Project Platypus in early spring 2012. Fyke nets were deployed at a total of 15 sites in Mt William Creek, upper Wimmera River and Mt Cole Creek (Figure 1, Appendix 1) over four nights in late October 2012.

Figure 1. Maps of survey sites in the upper Wimmera region. See Appendix 1 for site descriptions.



Measurements and condition of captured platypuses

When captured, platypuses were removed from the net and placed into a calico bag. Each platypus was scanned for the presence of a microchip and if the scan was negative, a microchip (LifeChip or Allflex) was inserted subcutaneously between the scapulae. The sex and age class of each platypus was based on presence/absence and morphology of the calcaneal spurs (Temple-Smith 1973). Three male classes exist including juvenile (≤ 10 months), sub-adult (11-23 months) and adult (≥ 23 months), and two female classes, juvenile (≤ 10 months) and sub-adult or adult (> 10 months). The condition of each animal was qualitatively assessed based on the tail volume index (TVI) described in Grant & Carrick (1978). As platypuses store excess fat in their tail, this index uses the shape and thickness of the tail to broadly indicate the condition of an individual. It classifies individuals according to a 5-point rating system as described below:

Category 1. Excellent condition – tail turgid with the ventral side convex.

Category 2. Good condition – tail able to be folded slightly at lateral edges. Ventral side flat. Rest of tail turgid.

Category 3. Average condition – lateral edges of tail can be easily rolled. Ventral side slightly concave. Rest of tail turgid.

Category 4. Fair condition – tail can be folded along ventral midline. Whole tail soft.

Category 5. Poor condition – vertebrae showing through tissue on ventral side. Whole tail soft.

The mass (nearest 25 g) using 5 kg spring scales (Pesola) was recorded and standard morphometric measurements (bill width, bill length, and total body length to the nearest mm) were taken. Each platypus was assessed visually and manually for litter entanglement, particularly around the neck and front legs, as well as any other signs of injury. All captured platypuses were processed immediately and returned to the waterway at the point of capture as quickly as possible to minimise handling and stress.

Bycatch identification

All non-platypus bycatch were identified to species level (where possible) using Allen et al. (2002) (fish and eels), Cogger (1992) (turtles) and Menkhorst & Knight (2004) (water-rats). Water rats were either observed, captured or their presence was inferred by the occurrence of holes in nets. When captured, water rats frequently chew holes through fyke nets in order to escape (J. Griffiths pers. obs.). Numbers of water rats stated below usually indicate holes observed in nets and therefore are more an indication of activity rather than absolute numbers.

Data analysis

Live-trapping surveys of platypuses are notoriously difficult and labour intensive due to their secretive nature, high mobility, and semi-aquatic, mostly nocturnal lifestyle. Capture rates are typically low and recaptures are uncommon, and as a consequence no robust measure of platypus abundance currently exists (Grant and Temple-Smith 2003). Importantly, there appears to be differential catchability of individuals in the population (Grant 1992a) and individuals may avoid nets after initial capture (Connolly and Obendorf 1998, Bethge 2002, J. Griffiths unpublished data), which violates assumptions of equal catchability through time and compromises estimates of population size by mark-recapture techniques. This hampers researchers' ability to accurately determine platypus abundance and densities and therefore assess the impact of any threatening processes. However, to obtain a simple relative measure of abundance we use a standardised capture index entitled "captures per unit of effort" (CPUE). Capture indices, such as CPUE, assume that the index is proportional to the actual population abundance and the relationship between the index and abundance is constant (Caughley 1977). Therefore, changes in CPUE over time or between survey sites represent proportional changes in abundance (Conroy and Nichols 1996).

To calculate CPUE, the number of individual platypuses captured in a sampling period is divided by the survey effort to standardise capture success and provide an index of relative abundance. Survey effort reflects the total number of nets deployed during a particular survey night. This standardisation allows us to compare relative abundance across surveys sites, waterways, catchments and survey periods. Previously, the Australian Platypus Conservancy (APC) has used platypus capture rate (PCR) as a measure of relative abundance (e.g. Williams and McQualter 2005). The two indices are fundamentally the same except CPUE incorporates all open traps in estimates, as opposed to PCR, which groups two traps set at each site to reflect one trap night. However, slight differences in calculation of the two indices mean care must be taken with direct comparisons. PCR only includes adult and subadult platypuses and is based on number of captures rather than number of unique platypuses. The relative merits of both indices are discussed further in Griffiths and Weeks (2011). In most instances, halving PCR gives a roughly equivalent comparison with CPUE.

Findings

Fyke net surveys were conducted in Mt William Creek (three sites), Wimmera River between Crowlands and Elmhurst (seven sites), and Mt Cole Creek (five sites) over four nights in late October 2012 (Figure 1). No platypuses were captured from a total of 38 trap nights in waterways of the upper Wimmera Catchment.

Five aquatic species were recorded as bycatch during the surveys. Water rats (*Hydromys chrysogaster*), yabbies (*Cherax desructor*) and long-necked turtles (*Chelodina longicollis*) were recorded throughout all three waterways. In addition, carp (*Cyprinus carpio*) were captured in Mt William Creek and a mountain galaxid (*Galaxius olidus*) in the Wimmera River. A summary of all bycatch captured can be found in Appendix 2.

Discussion & recommendations

Platypus abundance has declined substantially in the upper Wimmera region over the past 15 years that surveys have been undertaken. Previous studies between 1997-2004 found overall catch per unit effort (CPUE) of between 0.15 – 0.38 (derived from Figure 1 in Williams and McQualter 2005) in the upper Wimmera River, with CPUE decreasing downstream from Elmhurst to Crowlands, and 0.44 in Mt Cole Creek (in Williams and McQualter 2005). Surveys in the Wimmera River in November 2004 resulted in CPUE of 0.625 and 0.4 near Crowlands and Elmhurst, respectively (Williams and McQualter 2005). However, when these surveys were repeated in March 2005, no platypuses were captured in either section (Williams and McQualter 2005). Since then, widespread surveys throughout the upper Wimmera River in June 2008 (Mitrovski 2008), targeted surveys in potential refuge pools in Mt William Creek in 2008/09 (Armistead 2009, Mitrovski 2009), and the current surveys have not captured any platypuses. Although data from the different studies are not directly comparable due to differences in timing and survey sites, the results indicate a substantial decline in platypus abundance throughout the upper Wimmera region.

Despite the lack of captures during the current surveys, occasional unconfirmed sightings reported to Project Platypus and **cesar** indicate platypuses are still present in the upper Wimmera region. This was confirmed recently (12th December 2012) by a video recording of a platypus swimming in the Wimmera River near Glynwyllyn. However, the results from recent surveys (2008-2012) and the sporadic nature of sightings suggest platypus abundance is currently very low throughout the region. It appears the population has declined substantially in abundance and distribution during the drought with low numbers of animals persisting in isolated refuge areas.

The biggest issue for platypus populations in the region is the lack of available surface water. The extended drought affecting the Wimmera region is undoubtedly the major factor responsible for the decline in platypus numbers over the past 10-15 years, although the effects are likely to have been exacerbated by anthropogenic activities. The major impacts of drought are the reduction of available habitat and loss of connectivity between and along waterways, resulting in fragmentation of populations. In addition, the low water levels and flows will likely alter benthic invertebrate abundance and composition (Lind et al. 2006, Chessman 2009), negatively impact riparian vegetation (Murray-Darling Basin Commission 2003), and increase the impacts of predation. During the worst of the drought, it was estimated only 1-2% surface water was available in the upper Wimmera region with many tributaries completely or partially dry and the Wimmera River reduced to a series of small, isolated pools (Serena and Williams 2007, Mitrovski 2008). The return of above average rainfall over the past two years was expected to improve conditions and platypus populations that had declined significantly during the extended drought would start to recover. Unfortunately, we are yet to see any noticeable recovery of platypus populations although their persistence during the extended and severe drought is encouraging. Climate change models for southern Australia predict

longer and more severe droughts in the future (Commonwealth Scientific and Industrial Research Organisation & Australian Bureau of Meteorology 2007). Another drought in the near future could potentially cause platypuses to become regionally extinct.

Although the current surveys took place in the middle of spring, water levels were very low throughout all waterways (Figure A3.1, A3.2). Some smaller creeks were dry while others were only partially flowing and did not connect to the main channel of the Wimmera River. For example, both Mt William and Mt Cole Creeks contained water in their upper reaches but flows gradually reduced downstream until the creek dried up before reaching the Wimmera River. Some deep pools were present in all surveyed waterways (Figure A3.3, A3.4), but the intervening channel generally contained very low water levels. While these pools potentially provide isolated refuge areas for platypuses during dry periods, their capacity to support platypuses for extended periods is likely to be limited by depletion of available food and the size of the pool. As the pools are reduced, resident platypuses will also become more exposed to terrestrial predators. Available habitat is expected to decrease further over the dry summer months ahead.

The Wimmera Catchment has been highly modified from its natural state, largely due to agricultural practices, with widespread clearing of native vegetation, altered flow regimes, and the introduction of exotic species. As a result, bank erosion and in-stream sedimentation is a problem throughout the area, exacerbated by unrestricted stock access in some areas (Figure A3.2). Sedimentation results in lower primary productivity by reducing penetration of sunlight through the water column while fine sediment substrates are generally unfavourable for macroinvertebrates (Boulton and Brock 1999). This is reflected in platypus activity being positively correlated with coarser substrates (Serena et al. 2001, Grant 2004). A combination of low flow and sedimentation has allowed thick stand of reeds (*Phragmites* and *Typha* spp) to invade the channel in places (Figure A3.5, A3.6), inhibiting movement of aquatic species along the channel and further fragmenting populations. The build-up of sediment deposits can also reduce the depth, and therefore effectiveness, of deep pools acting as refuges during dry periods.

Restoring a buffer zone of native riparian vegetation, comprising mature trees and woody understorey, has multiple benefits for platypuses and general waterway health. Mature trees will stabilise banks and minimise erosion and therefore in-stream sedimentation. Well stabilised banks are preferred locations for platypus burrows (Serena et al. 1998). Organic matter from riparian vegetation is a key component of the aquatic food chain while woody debris provides a more complex in-stream habitat favoured by macroinvertebrates. Overhanging vegetation has been positively correlated with platypus activity (Ellem et al. 1998) and can help to ameliorate high water temperature fluctuations during summer. Riparian vegetation can also act as a natural filter to prevent pollutants (i.e. fertilisers, pesticides, herbicides) entering the water from surrounding agricultural or urban environments

and slow water run-off to moderate flood events. It is encouraging to see collaboration between Project Platypus and a number of private landholders to protect riparian zones and minimise erosion by restricting stock access and implementing revegetation. It is important this work continues and expands. Existing areas of remnant vegetation should first be identified and protected from further degradation, then gradual revegetation of cleared areas should be implemented. Where willows (*Salix* spp) predominate, removal should follow the guidelines in Serena and Williams (2008). Briefly, willows should be poisoned then cut down, leaving the root system intact to stabilise banks while native vegetation establishes. Landholders must be supported and encouraged in conservation efforts through education, funding, and information. Several landholders expressed concern about controlling weeds in fenced riparian zones and providing watering points for stock. These issues need to be adequately addressed to convince more landholders to protect and restore riparian zones and improve habitat for platypuses and other aquatic species.

Due to the current low number of platypuses in the region, any unnecessary deaths can have a major impact on the population. A number of anthropogenic activities can cause the inadvertent death of platypuses in waterways. For instance, platypuses are known to drown in opera-house style traps (Serena and Williams 2010) used to catch yabbies and crayfish (despite being illegal in public Victorian waters). Platypuses can also become entangled in fishing line, hooks, and netting from angling activities. Public education initiatives are likely to be the most effective way to reduce the impact of illegal and irresponsible fishing activities. Other potential threats to platypuses include predation by foxes, dogs and cats. Widespread predator control programs can minimise the impacts of predation, although adequate water and good habitat will generally protect platypuses from predators.

Conclusions

Platypuses in the upper Wimmera Catchment must be considered locally endangered and serious concerns exist over their long-term survival in the region. Populations have declined severely and rapidly since 2004 and their present distribution appears scattered across isolated pockets of refugia. Efforts to conserve platypus populations in the upper Wimmera region will require a collaborative effort between management authorities, community groups and private landholders. As a first step, it is recommended that a campaign be initiated to collect platypus sighting records from the community to identify the extent of their distribution, potentially to inform targeted surveys in the future, and to prioritise conservation efforts. Public sightings are a cost efficient method to obtain distribution data over a large area and have the added benefit of engaging the community on conservation issues. Media, social media, email networks, and public talks may be some of the means used to engage the community and encourage sightings.

The two main issues facing platypus populations in the region are a lack of available water and poor habitat quality. As the upper Wimmera waterways are not

regulated, available water is largely dictated by rainfall. Nevertheless, strategies that reduce water abstraction will ensure better environmental flows and more permanent water availability. In turn, this increases available habitat and improves habitat quality for platypuses and other aquatic fauna. Further habitat improvement work is also required through the protection and enhancement of riparian zones. The key benefit of restoring a riparian buffer zone along waterways is the reduction of bank erosion and subsequent sedimentation but other benefits include providing food and habitat for aquatic macroinvertebrates and native bird species, filtration of agricultural pollutants, controlling salinity, and moderating flood events. A high priority should be given to protecting remnant native riparian vegetation by fencing to exclude stock (in combination with off-stream watering stations) and removal of exotic weeds. Areas where vegetation has been cleared will also require replanting with indigenous species with the aim of establishing a relatively continuous corridor of native riparian vegetation along waterways.

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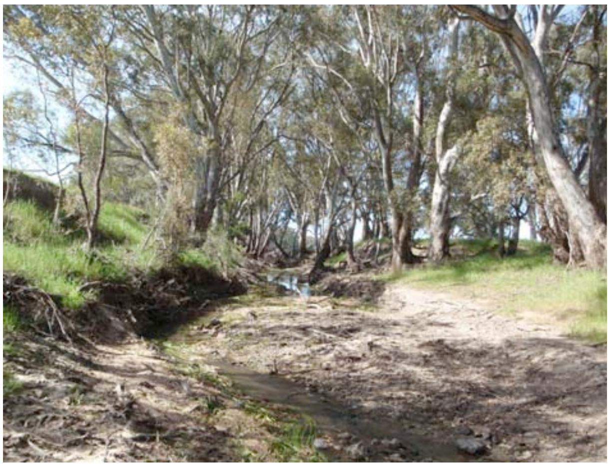
Appendix 1. Location of sites and survey effort

Waterway	Site Code	Latitude	Longitude	Trap nights	Site description
Mt William Creek	MWC02	-36.93847	142.505998	2	Jackman's property south
Mt William Creek	MWC04	-36.968843	142.506956	2	Ledcourt-Briggs Bluff Rd bridge
Mt William Creek	MWC05	-36.995873	142.512759	2	Jackman's property north
Mt Cole Creek	MCC02	-37.227848	143.12999	4	Big Hill Rd bridge
Mt Cole Creek	MCC03	-37.261283	143.14051	4	Warrak Rd bridge
Mt Cole Creek	MCC04	-37.272797	143.151124	2	Buangor-Ben Nevis Rd
Mt Cole Creek	MCC05	-37.286547	143.159283	2	Buangor-Ben Nevis Rd near Rocky Rd
Mt Cole Creek	MCC06	-37.299868	143.158467	2	Buangor-Ben Nevis Rd near Ords Orchard Rd
Wimmera River	WIM09	-37.173555	143.137565	2	50m upstream of Crowlands-Eversley Rd bridge (Darbyshire's property)
Wimmera River	WIM10	-37.170711	143.15034	2	Darbyshire's property
Wimmera River	WIM11	-37.175791	143.155383	2	Darbyshire's property, bridge behind house
Wimmera River	WIM18	-37.160701	143.23247	2	Greene's property
Wimmera River	WIM19	-37.174082	143.251049	4	Elmhurst-Glenpatrick Rd bridge
Wimmera River	WIM20	-37.178807	143.256101	4	Elmhurst Wimmera Rv Reserve
Wimmera River	WIM21	-37.179808	143.257834	2	Elmhurst Wimmera Rv Reserve

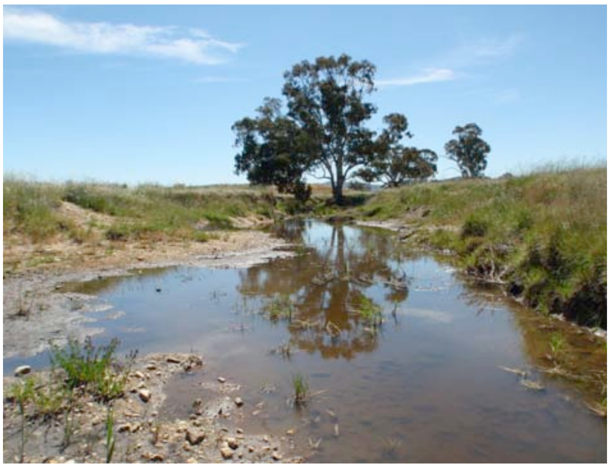
Appendix 2. Summary of bycatch recorded

Waterway	Site Code	Water rat	Mountain galaxid	Carp	Long-necked turtle	Yabby
Mt William Creek	MWC02	1		2	1	2
Mt William Creek	MWC04				2	2
Mt William Creek	MWC05				1	1
Mt Cole Creek	MCC02	3				
Mt Cole Creek	MCC03				1	3
Mt Cole Creek	MCC04					1
Mt Cole Creek	MCC05	1				7
Mt Cole Creek	MCC06					2
Wimmera River	WIM09	1	1		2	
Wimmera River	WIM10				2	1
Wimmera River	WIM11	1			2	
Wimmera River	WIM18	2	1			
Wimmera River	WIM19	4			4	
Wimmera River	WIM20	3			1	2
Wimmera River	WIM21	5				

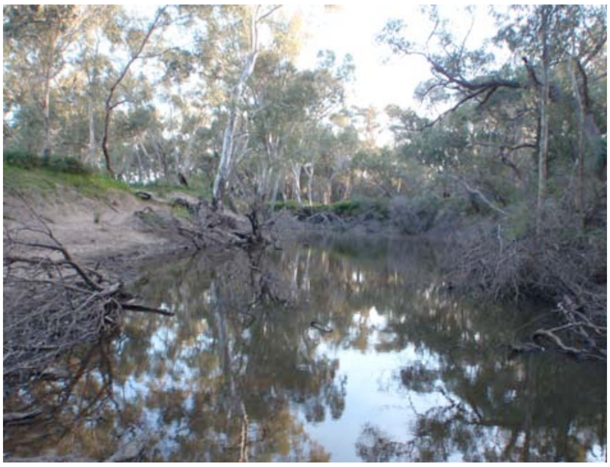
Appendix 3. Photos of selected sites



A3.1: Low water levels in Mt William Ck (MWC04).

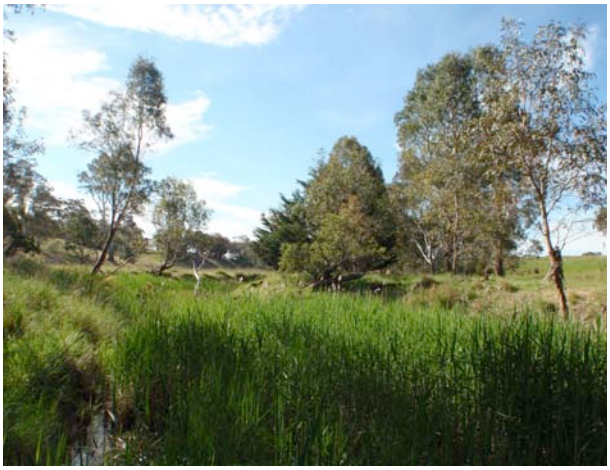


A3.2: Lack of riparian vegetation has resulted in severe bank erosion and in-stream sedimentation in the Wimmera Catchment (WIM19).

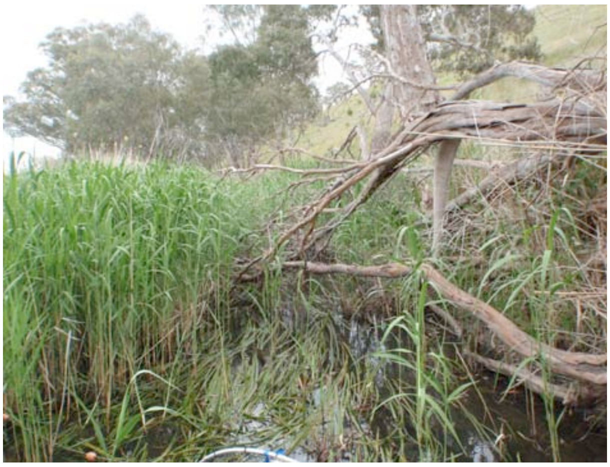


A3.3: Despite low water levels, some deeper pools were present along surveyed waterways (MWC05).

A3.4: Deeper pools probably provided small, isolated refuge areas during the drought (WIM11).



A3.5: Dense stands of reeds congest the waterways in places (MCC03).



A3.6: Reed infestation in the Wimmera River (WIM10).