



Murdoch  
UNIVERSITY

# 2017 RESEARCH FINDINGS

in the School of

**VETERINARY & LIFE  
SCIENCES**

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BULLETIN

5.13

Ecology, People  
& Environment



*This small urban wetland supported many native species of freshwater invertebrates. It has dense cover of submerged, emergent and floating plants as well as native trees at the edge. It has a natural bed of sediment and is close to other wetlands. Photo: Dr Edwin Chester*

## Can human-created wetlands sustain urban freshwater biodiversity?

The Swan Coastal Plain was once covered by wetlands, but fewer than 30% of these natural wetlands remain. Many natural wetlands are seasonal — drying out in summer and autumn. Others are perennial, containing water year round.

Recently, the drying climate and groundwater extraction cause more wetlands to dry out over summer. Few natural wetlands now remain perennial, and in exceptionally dry years, such as the summer of 2010–11, some natural wetlands failed to fill at all. This reduces

habitat for native freshwater animals and plants, especially those that require perennial freshwater.

Wetlands support high biodiversity including: waterbirds, turtles, frogs, water rats, fish, invertebrates and aquatic plants. Invertebrates show the highest biodiversity, including many species found nowhere else in the world. Perth's wetlands contain crayfish (gilgies, koonacs), Carter's freshwater mussel, and 11 dragonfly species found only in south-west WA. Invertebrates also provide food for other wildlife.

Across the globe, humans have created wetlands for aquaculture and farming, water supply, drainage, irrigation and recreation. Interest is increasing about whether these wetlands can support native species. Urban Perth contains many human-created wetlands. Many are perennial, and could provide habitat for freshwater species when other habitats are dry. This research aimed to determine whether Perth's human-created wetlands sustain similar invertebrate freshwater biodiversity to natural wetlands.



*FAR LEFT: Researchers sampling a small created wetland that supported few species of freshwater invertebrates. This wetland had natural bed materials but little vegetation of any kind and was not close to other wetlands or patches of native vegetation. Photo: Dr Edwin Chester*



*LEFT: This urban drain supported very few species of freshwater invertebrates, it has no fringing vegetation and steep sides, although it did contain native floating plants. Photo: Dr Belinda Robson*



The tadpole of the motorbike frog *Litoria moorei* living in an urban water feature.



TOP: This urban drain has a natural sandy bed, some native emergent and fringing vegetation and supported a higher number of species of native invertebrates than the urban stream. Photo: Dr Edwin Chester

ABOVE: *Chelodina* Swamp, a natural perennially-flooded wetland with a very high diversity of native freshwater invertebrates, a natural sandy bed and submerged, emergent and fringing native vegetation. Photo: Dr Edwin Chester

## Methods and results

The waterscape — interspersed wetlands, ponds, streams and drains — within the Perth metropolitan area provided an ideal model system to address a question critical for urban environments globally<sup>1</sup>: can waterbodies created by humans replace lost habitat or enhance survival opportunities for native species?

We sampled > 70 urban waterbodies (both flowing and standing waters) in Perth, assessing habitat qualities and aquatic invertebrate biodiversity. These wetlands vary widely in their habitat types and quality, and freshwater invertebrate biodiversity also varied widely.

In some wetlands biodiversity was similar to that of natural wetlands. Wetlands with higher biodiversity contained freshwater plants, fringing vegetation, shallow-sloping edges, natural bed-materials and had reasonable water quality, they also had other waterbodies and natural terrestrial vegetation nearby.

For other wetlands, biodiversity was lower in human-created wetlands. Factors such as the presence of feral fish (e.g. *Gambusia* spp.), absence of fringing vegetation or freshwater plants, very brief periods of inundation (< 4 weeks) and non-natural bed materials (e.g. concrete) were associated with low biodiversity.

## Conclusions and recommendations

Human-created urban wetlands can support freshwater biodiversity at a level comparable with natural wetlands, if managed appropriately. Management practices that will assist human-created wetlands to sustain native species include: planting native fringing and freshwater plants, creating shallow edge slopes and the use of natural bed materials. The creation of connections to other waterbodies through patches of native vegetation or intermittent surface water connections also supports biodiversity. Revegetation and controlling invasive *Gambusia* spp. will play a key role in enhancing the ability of urban wetlands to sustain freshwater biodiversity. ■

## More information

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## Acknowledgements

Scott Strachan, Gaia Nugent and Kerrylyn Johnston assisted with fieldwork.

## References

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