Creating new ecologies through constructed assets

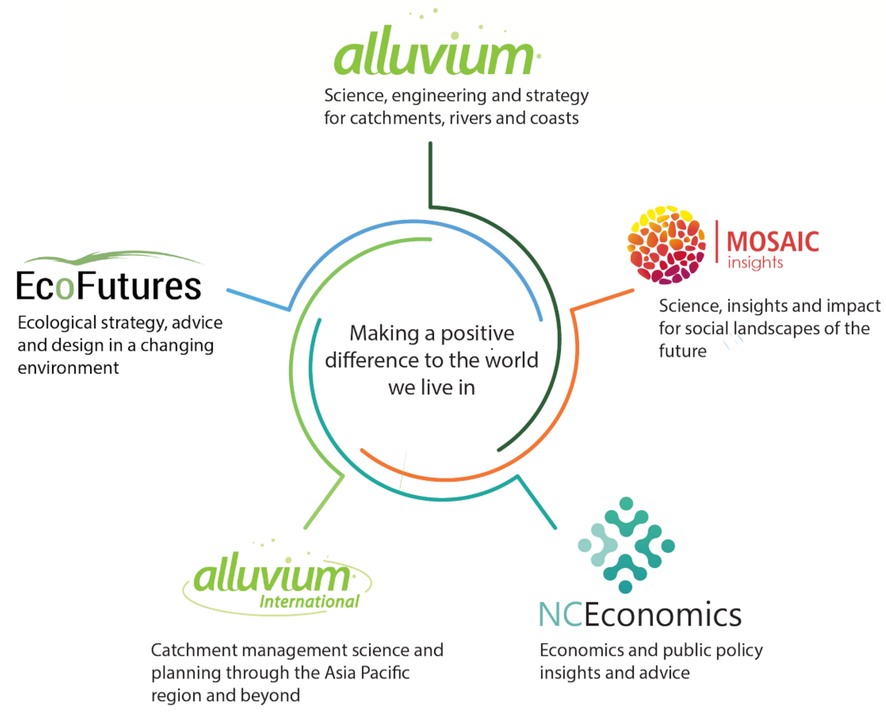
Introduction

Across urban catchments ecological values that were once present are now likely to be irrevocably changed, degraded or lost. According to Victoria's Department of Energy, Environment, and Climate Action (DEECA), *"between one quarter and one third of Victoria's terrestrial plants, birds, reptiles, amphibians and mammals, and many invertebrates and ecological communities, are at risk of extinction."* DEECA lists a number of threats to urban biodiversity including:

- Habitat loss and fragmentation – that is often associated with intensive land clearing undertaken to accommodate our growing urban centres.
- Changes to riverflows, wetlands and floodplains – that is often a result of urbanised catchments.

This has led to the intended and unintended evolution of urban habitat as flora and fauna accommodate suitable niches. Hobbs (2006) coined the term 'novel ecosystems' to describe the value of intended modification to urban environments. These novel ecosystems have evolved through intended interventions or modifications as a result of 'human agency'. In doing so he proposed that these environments provide intrinsic benefits within urban environments.

Water Sensitive Urban Design (WSUD) assets have been constructed across many Australian cities with the aim of improving stormwater quality and reducing volumes entering receiving waterways. Additional benefits include greening, connection to natural spaces, and the cooling of our suburbs. In addition, a new generation of constructed urban waterways, swamps and wetlands are being designed to restore ecological values where they had looked to be lost. These assets perform their primary design function (e.g. stormwater treatment) while incorporating design elements that accommodate local species that may be rare or endangered.



The fragmentation of habitat is evident across residential growth corridors. By adopting an ecological restoration approach to constructed assets, habitat refuges can be integrated into growth area planning. Over time, enough of these assets can provide habitat connectivity across residential growth corridors. This approach will deliver long term benefits as climate change dries the urban landscape and constructed assets are increasingly relied upon as habitat refuges.

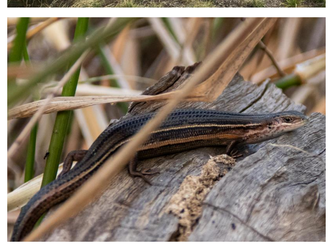
Case study: Merri Edgars Wetland, Coburg North, Victoria

The Moreland (now Merri-bek) Open Space Strategy (2012-2022) identified the need for a wetland to
- provide habitat and assist in the reintroduction of a range of locally native flora and fauna. Providing habitat for the endangered Tussock Skink was a key design objective, while
- improving the quality of water entering the Merri and Edgars Creek.

Alluvium and landscape architects TBLD designed a wetland - from concept to detailed design and documentation - to be located in a nearby area of open space.

Prior to European settlement ephemeral wetland environments like this would have been commonplace along waterways like the Merri Creek, providing habitat for the Tussock Skink and other species.

Constructed in 2016, the wetland design recreates habitat while complementing the natural landscape of the Merri and Edgars Creeks that is visited by many in the local community. The wetland achieves a net increase in biodiversity and improves water quality. Happily, the Tussock Skink has been identified at the wetland (as per the photo below).



Figures: Left: Nearmap imagery May 2015, Middle: Nearmap imagery April 2023, Right: Tussock Skink habitat created as part of the project

Case study: Designing drainage schemes for the federally protected Seasonal Herbaceous Wetlands

Planning within residential growth areas is guided by studies and assessments that identify factors, like environmental values, that influence catchment and infrastructure planning. There is an opportunity within greenfield areas to transform our approach to urban water cycle planning to protect and enhance identified ecological values. In the northern growth corridor of Melbourne, the challenge was to protect Federally protected Seasonal Herbaceous wetlands from the impacts of catchment urbanisation.

This was achieved through the setting of a clear vision and approach to the use of water to enable a range of benefits associated with unique ecosystems.

- *Ecology* – designing drainage to mimic an appropriate hydrological regime of wetting and drying (including factors of timing, depth and duration), while still allowing for natural variability.
- *Waterway health and water quality* - respond to the stormwater performance objectives including evaporation, infiltration and harvesting of stormwater.
- *Cultural* – Supporting connection to Country by recreating waterway systems that are and were historically important to First Nations people.
- *Amenity / Liveability* - provide a healthy and varied urban landscape and location for recreation and interaction with nature.

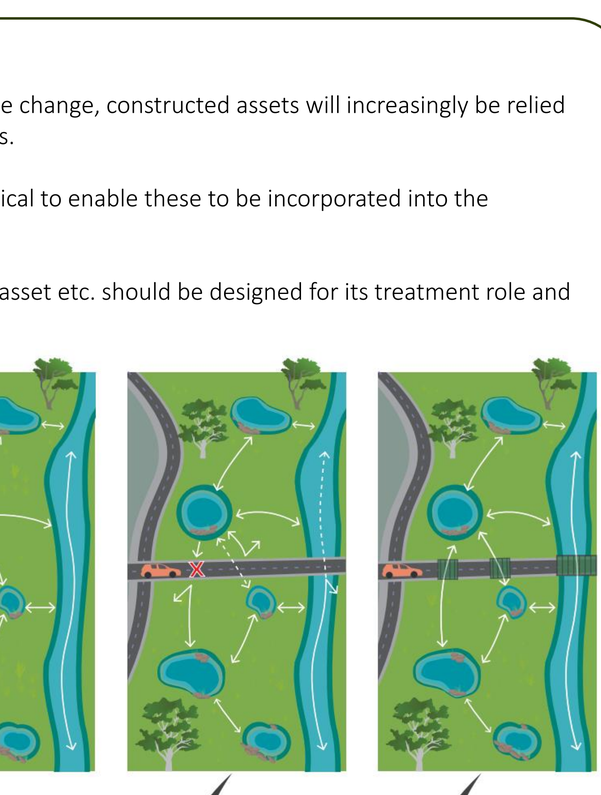


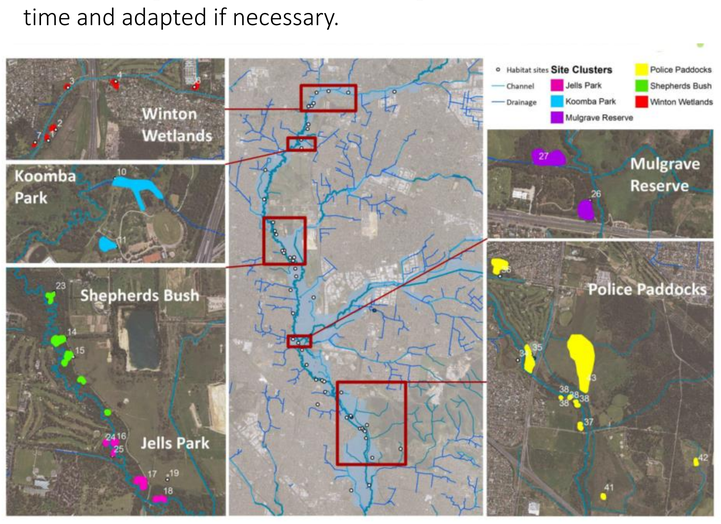
Figure: Example mapping of existing and potential new corridor links in the Wallan (Victoria) growth area

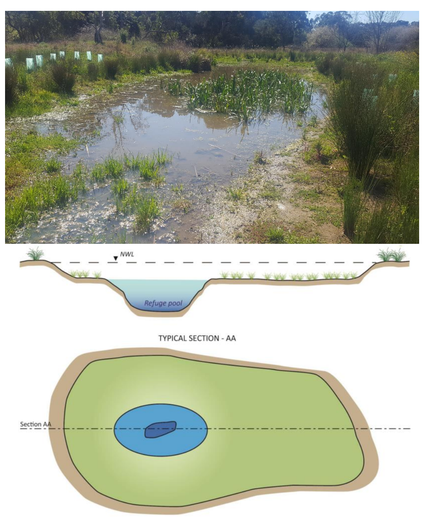
Case study: Dwarf Galaxias drought refuge, Dandenong Creek Valley, Victoria

Dwarf Galaxias (*Galaxiella pusilla*) are native Australian fish that were abundant throughout the Dandenong Valley (Victoria) but are now a Federally protected species. As part of the *Enhancing Our Dandenong Creek (EODC)* program, Melbourne Water is investing in habitat restoration to re-establish the Dwarf Galaxias population. This project created a network of sites to create an ecologically sustainable population through floods and droughts. At a meta-population scale, the aim is to create connectivity between sites.

Alluvium surveyed ~40 potential sites across the Dandenong Creek floodplain. 21 priority sites were assessed to understand the required interventions to ensure the sites held water in drier conditions and provided protection from predator species. Functional designs were developed for the refuges at priority sites.

In recent years, Melbourne Water has constructed 19 of these sites. Once the vegetation is established and the water regime is confirmed, dwarf galaxias are reintroduced to the site. The sites are monitored over time and adapted if necessary.





Figures: Left: mapping of potential sites and clusters; Top right: Example constructed dwarf galaxias refuge; Top right: Example of the drought refuge habitat concept.

Key take-aways

- With the pressures of urbanisation and climate change, constructed assets will increasingly be relied upon to provide habitat and ecological refuges.
- Early identification of values and drivers is critical to enable these to be incorporated into the planning process.
- Every constructed waterway, wetland, WSUD asset etc. should be designed for its treatment role and to provide habitat and habitat connectivity.
- The aim should be the creation of new ecological landscapes that support target species, rather than recreating predevelopment ecological conditions.
- Designers and ecologists should identify the target species and any pockets of habitat that could be linked to create habitat corridors. Earthworks, hydrology and plant species will respond to these conditions.
- Implementation challenges are likely. Ensuring early integration into the planning process and alignment with strategic drivers is critical to success.

Figure: Example of incorporating Growling Grass Frog habitat in growth areas (Source: DEECA, 2017. Growling Grass Frog Crossing Design Standards)

Authors: Jenny Butcher, Stuart Cleven, Dan O'Halloran
Alluvium Consulting Australia
Contact: Jenny.butcher@alluvium.com.au