

Understand the role of small headwater streams ('zero-order' streams) in urbanizing catchments for supporting waterway health

Project D1:
Headwater
Streams

This project will increase the understanding of the environmental, social and economic values of headwater streams, to inform land development planning decisions.

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Headwater streams, where catchment runoff first accumulates sufficiently to create overland flow paths, are dominant parts of the riverscape. The smallest streams of catchments are primary sources of streamflow, important sources of organic matter and invertebrates to downstream waters and act as 'hot spots' for retention and transformation of nutrients such as nitrogen and carbon.

Indeed, their contribution to regional aquatic biodiversity is disproportionately large. Headwater streams are also likely to be extremely important for maintaining downstream river and bay health, acting as natural 'stormwater treatment systems'.

Despite the recognition of the potential value of headwater streams, there remains a lack of clear understanding of:

- their ecological structure and function;
- hydrologic and water quality behaviour; and
- management opportunities (e.g. appropriately designed SCMs) to protect them in the face of future urban growth and climate change.

Compounding this, headwater streams are particularly vulnerable to degradation or loss in rapidly urbanizing cities such as Melbourne.

Aim

This research seeks to investigate and quantify the magnitude of the values and services provided by headwater streams and ultimately facilitate their effective management and protection through a clear business case and appropriate policy and design guidelines.

Methodology

Four headwater streams are currently being monitored in the west of Melbourne. The sites have been instrumented with surface- and sub-surface monitoring wells and are being sampled for nutrients and isotopes.

This year, the hydrologic, water quality and ecological data collected to date will be analysed, which will inform the monitoring efforts of an additional six sites. A literature review has already been completed which focused on understanding organic matter decomposition in headwater streams. The review makes a strong argument for the study of organic matter dynamics in headwater streams.

Subsequently, this year the project will complete a pilot study on organic matter dynamics, that will investigate variation in organic matter decomposition rates in both surface and hyporheic zones as well as the physical (e.g. hydrology, water temperature), chemical (e.g. nutrient concentrations), and biological (e.g. microbial diversity and activity) factors driving any variation.

Expected Outcomes

- Improved knowledge of techniques used for monitoring ecosystem values in headwater streams.
- Improved knowledge of ecosystem value and role of headwater streams.
- Greater awareness on the location of headwater streams.

A key **impact** of the project will be greater consideration of headwater streams in planning and policy decisions, resulting in Greater protection and retention of headwater streams in new urban developments.