Geomorphic change & disturbance thresholds for the protection or recovery of stream form in urban catchments

Channel Prediction
Project A3

This project will develop physical form predictive tools to inform land development policy and planning, support delivery of HWS objectives and an understanding of the Levels of Service that could be supported by streams draining urban catchments.

Project Team:
University of Melbourne
Kathy Russell
Geoff Vietz
Tim Fletcher
Jasper Kunapo
Matt Burns
PhD student

Melbourne Water
Rhys Coleman
Penny Rogers
Leigh Smith
Shaun Corrigan
Marion Urrutiaguer
Michael Godfrey
Sharyn RossRakesh
Trish Grant
Birgit Jordan

Catchment urbanisation has profound effects on the physical form and function of stream channels, with far reaching economic, ecological and social implications for our cities and suburbs. The two main drivers of this change are flow and sediment inputs. Recent studies have greatly improved our understanding of these relationships.

However, there is currently no accepted model for the expected extent and severity of channel change relative to catchment or corridor characteristics, nor do we have an ability to predict channel physical form recovery in the event that flow regime management reduces input stressors. This hampers our potential to plan for geomorphic change, and limits our ability to demonstrate the benefits of moving away from business-as-usual.

The understanding from this project will be used to develop catchment-scale models that inform a predictive tool for the **management of river physical habitat** (MoRPH).

Methodology

The study design relies on regional spatial datasets describing catchment condition (e.g. climate, geology, imperviousness, vegetation) and LiDAR-based channel metrics (e.g. bankfull width) to develop statistical models for channel morphology relative to urban development.

It will use the model to predict how waterways will change into the future given changes in catchment stressors such as imperviousness. The project team proposes to focus on the following tasks in the 2020-21 research year:

- Extend models to the prediction of variability metrics.
- Incorporate updated and improved environmental variables.
- Undertake targeted desktop and field validation of data and predictions.
- Investigate the benefits of re-extracting and updating channel dimension data using new LiDAR data.
- Investigate relevant measures of geomorphic floodplain function.

The project methods are based on spatial and statistical analysis of region-wide stream and catchment data to understand the impact of urbanization on physical form. We also aim to develop conceptual channel evolution models which describe the trajectory of stream physical form over time.

Expected outcomes

- Robust desktop assessment techniques developed for physical form condition data collection across Melbourne.
- Physical form metrics for representative stream reaches across the Melbourne Water region.
- Suitable environmental predictors available for use in the physical form model.
- Understanding of the level of intervention required to retain physical form of streams post-development.
- A planning to identify the extent of impacts of development scenarios on physical from and requirements for stormwater controls and/or floodplain space.