Urban Creeks in SEQ
- can bugs live anywhere?
Role of habitat and hydrology

Fran Sheldon
Stormwater Harvesting and Ecohydrology

Science Forum, 19-20 June 2012
CONCEPTUAL MODEL

Urbanisation

Changed hydrology
(magnitude, frequency & duration)

Habitat Availability & Quality

Water Quality

Invertebrate Diversity & Assemblage Composition
• Spatial analysis
• Temporal analysis – preliminary results
• Where to from now?

Large number of sites over many streams

- Tingalpa Creek (forested)
- Tributary to Blunder Creek (WSUD)
- Stable Swamp Creek (urban)

Increasing %TIA
SPATIAL ANALYSIS: EXPLORING ACROSS THE %TIA GRADIENT

- Sites distributed across the %TIA gradient
- Classified as:
  - Directly Connected (DC) – black triangles
  - Not Directly Connected (NDC) – open diamonds
METHODS

Quantitative collections
• Quantitative samples collected from 16 sites across 12 different streams in May 2010
• Modified suction sampler used to collect samples by placing it over a defined bed area at 3 locations (individual riffles, or runs if riffles were not present) at each site.

Semi-Quantitative collections
• 15 of the same sites as 2010 during baseflow conditions
• both spring and autumn of 2007 & 2008
• 250-μm-mesh dipnet used to collect benthic fauna from a total length of 10 m of habitat along the water’s edge,
• Sampling and sorting followed EHMP protocols
RELATIONSHIPS BETWEEN MACROINVERTEBRATE DIVERSITY AND ENVIRONMENTAL VARIABLES

EPT Taxa

%TIA

Richness

DO (mg/L)

DC directly connected to stormwater drainage

NDC - not directly connected
INFLUENCE OF %TIA ON INDIVIDUAL TAXA

Threshold Indicator Taxa Analysis (TITAN) of macroinvertebrate assemblage response to the %TIA gradient

May 2010

2007-2008
SPATIAL CONCLUSIONS

• In the directly connected streams (DC), richness, relative richness and relative abundance of EPT taxa along with 2 macroinvertebrate sensitivity scores (SIGNAL2 and SPEARpesticides), were low when compared with streams without direct connection (NDC).

• Results suggest urban streams in SEQ show similar responses to urban streams elsewhere – low richness of EPT and other sensitive taxa with increasing % of upstream impervious surfaces.

Leigh, C., Dunlop, J.E. and Sheldon, F. (in press). Generalist assemblages in urban streams lack association with the environmental conditions prevailing in their aquatic habitat during baseflow. Freshwater Science. Accepted May 2012.
WHAT DRIVES LOW DIVERSITY

Urbanisation

Increased rate of rise and fall
Increased magnitude
Increased frequency
Reduced baseflows

Increased siltation in pools
Reduced habitat diversity in riffles (infilling by sand)
Incised channels and lower habitat complexity

Reduced DO under low flow
Increased turbidity
pH and Salinity
Pesticides and Heavy metals
Increased nutrients

Reduced EPT and Sensitive Taxa Diversity
METHODS

• Sites:
  – Tingalpa Creek (reference)
  – Stable Swamp Creek – Sunnybank, Keats Rd (urban)
  – Tributary to Blunder Creek – Daintree Close (WSUD)

• Sampling
  – 3 ‘sites’ within each ‘reach’
  – Replicate samples from specific habitats (riffles, pools, snags, macrophytes)
  – Macroinvertebrates – 250μm sweep 10m of habitat
  – Logged water quality and hydrology
  – Sampled every 6 weeks June 2011 – March 2012
Tributary to Blunder Creek, Daintree Close (WSUD)

Stable Swamp Creek – Sunnybank, Keats Rd (urban)

Tingalpa Creek (reference)
Multidimensional Scaling (MDS) Plot, Pray-Curtis Similarity

ASSEMBLAGE DIFFERENCES:
JUNE 2011
Urban riffles more similar in assemblage composition to forested riffles than urban pools.
IF FLOW IS DRIVING REDUCED DIVERSITY EXPECT SHIFTS IN URBAN RIFFLE ASSEMBLAGES OVER SUMMER
IF HABITAT IS DRIVING REDUCED DIVERSITY EXPECT NO CHANGE IN URBAN RIFFLE ASSEMBLAGES OVER SUMMER
HABITAT MAPPING

Proportion of 1 km reach

Forest Stream Type

Urban Stream Type

WSUD Stream Type

Pool%

Riffle%
• Riffle sites in urban streams more diverse than originally thought
• Pool sites in urban streams extremely low diversity
• If there were fewer riffles present in urban streams, compared with forested, then apparent low diversity could reflect reduced habitat availability
• But, habitat availability appears to be similar
  – Habitat quality may differ
• Next stage of study
  – Complete temporal analysis of assemblage change
  – Relate to water quality and hydrology data
  – Map riffle habitat “quality” across the %TIA gradient
ACKNOWLEDGEMENTS

• Spatial Sampling
  – Jason Dunlop (DERM) – 2007-2008 collections
  – Catherine Leigh (ARI) – 2010 collections

• Temporal Sampling Research Team
  – Michael Newham
  – Wendy Neilan
  – Carolyn Poulson
  – Janine Woods
  – Lars Pelzer
THANK YOU

www.urbanwateralliance.org.au