Linking stream network process models to robust data management systems

How does the growth of cities affect rivers?

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Urban population growth and increasing density comes with a steep environmental cost, in particular with respect to the quantity and quality of water and sediment runoff directed to our rivers. This project will aid in the adaptation and management of risk with the development of online tools that consolidate monitoring and modelling data from different disciplines and sources. Tools will inform decision-making regarding: land use planning; risk assessment due to changes in climate; and stream rehabilitation.

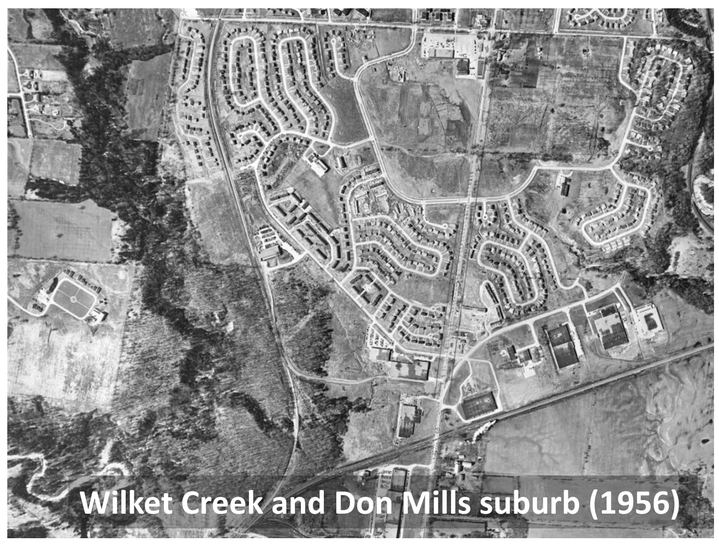
Researchers are working with industry partners to ensure that information is presented in a flexible, interactive, and comprehensible platform that can be use to create maps, tables and tailored report cards.

Interoperability of Monitoring and Modelling Results

› Various approaches to monitoring, reporting and modelling of surface water channels make it difficult to: assimilate different types of data; develop subsequent models using monitoring results; and compare predictive model outputs.

› Interoperability requires more data to be captured as part of reporting including:
  › syntactic (e.g., data structure, format, transformation);
  › semantic (e.g., data meaning & model categories); and
  › conceptual data (e.g., concept associations, assumptions, constraints, scenarios, assessments).

Research will integrate existing results in a single environment where decision makers can analyze and compare available results and scenarios.


Wilket Creek and Don Mills suburb (1956)

Novel Approaches to Modelling & Analysis

› Fundamental questions remain regarding methodological monitoring protocol and analysis of physical and ecological environments to optimize salient details of river response to urbanization.

› Management strategies can lead to new problems. For example, stormwater management may address peak flows but can adversely impact water temperature and sediment continuity).

› This project applies recent research on relationships between hydrology, geomorphology, pollutant flows, aquatic habitat, and management strategies.

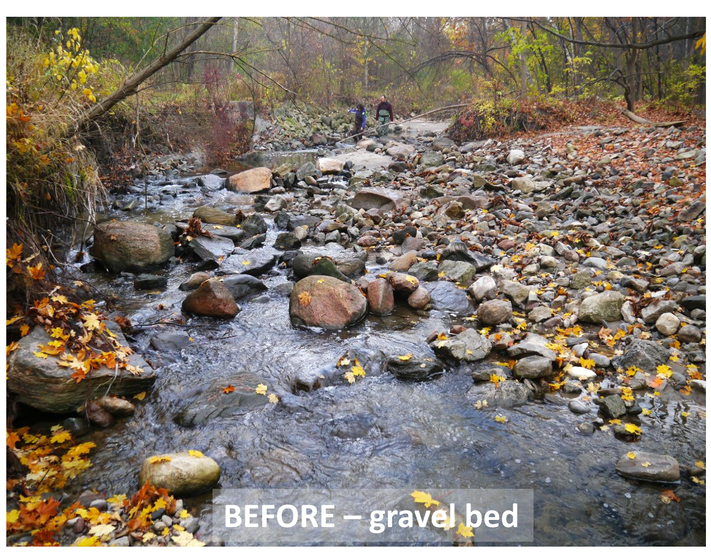
Result: Improved adaptive management of urban watersheds with better modelling, monitoring and analysis. Integration of techniques within the digital environment will improve the user's ability to understand and interact with the results.

Integrated Approaches to Stream Restoration

› Urban river networks are physically, chemically, and ecologically degraded.

› Disconnect between stabilization of physical environment, water quality issues, and ecological restoration is hypothesized to be due to the:
  a) misconception of rivers as static conveyors of water rather than dynamic conveyors of water, sediment, and organic material; and
  b) focus on local rather than network scale processes.

The project's digital environment will allow the user to perceive the bigger picture, and allow realistic application of stream network rehabilitation techniques. Results will consider the integrated issues of: water quantity and quality; morphology, and ecological integrity.


BEFORE – gravel bed


AFTER – exposed till bed

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