

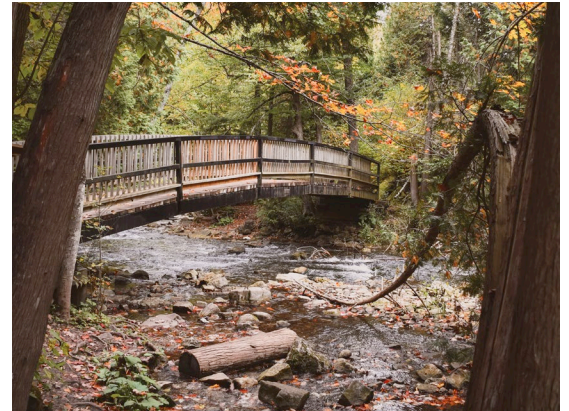
# AGENT-BASED MODELING: LINKING PUBLIC HEALTH AND WELL-BEING TO ECOLOGICAL GOODS AND SERVICES IN THE CREDIT VALLEY WATERSHED

MARTIN BUNCH, YORK UNIVERSITY

*Research conducted 2016-2018, Report published May 2020*

## WHY DID WE DO THIS RESEARCH?

Watershed-level interventions effectively protect and promote human health and well-being in a wide variety of ways, including flood protection and mitigation, cleaning the air, providing green space for public recreation and enhanced mental and physical health, and reducing skin cancer by providing a robust urban canopy. Substantial health benefits are realized from the actions of Ontario's Conservation Authorities, but the dollar value of these benefits is rarely computed or expressed. The linkages between environmental interventions and public health benefits are not well-articulated, which means the potential co-benefits of environmental and public health interventions are underrealized.



## WHAT DID WE DO?

This project created a computer model, known as an agent-based model, to simulate and explore some of the critical relationships that exist between ecosystem health and public health and well-being in the Credit Valley Watershed. In this model, for example, tree planting was linked with monetary, health and ecological indicators. The model worked with a key relationship from the literature that links human mortality with exposure to urban green space, using data from a study of 1.3 million adults in 30 Canadian cities that examined the relationship between mortality and measures of greenness within 250 metres of people's homes (Crouse et al., 2017). The mortality ratio is in turn linked to Government of Canada estimates of the value of a statistical life.

Agent-based models are a way to explore and understand the overall effects that result from actions taken at different times and places in a system. "Agents" are actors on the landscape that act independently, but whose actions add up to larger patterns and outcomes. Geosimulation draws on geographic data and geographic information systems to show potential changes to specific spaces such as in a watershed or sub-watershed.

## WHAT DID WE FIND?

The project fills a gap in the current knowledge by integrating the literature related to ecological goods and services and public health and well-being in a way that is locally-relevant, conceptually clear and publicly accessible. The model will ultimately include a range of conservation actions that can be implemented on the landscape, including several low-impact development options. The outcomes are focused on a range of benefits, including changes in public health pathways and outcomes as well as ecological service outcomes.

## WHAT ARE THE IMPLICATIONS OF THIS RESEARCH?

Once a range of conservation actions are included, this tool is intended also to be used by Conservation Authority staff to support high-level planning based on scenarios that target health and well-being benefits for Credit River watershed residents. The model provides managers and decision-makers with innovative ways of valuing ecosystem services at the watershed level to complement monetary valuation. This project approaches such non-monetary dimensions through the development of scenarios that help to answer questions about the potential health and well-being outcomes of different conservation actions at different places and times in the Credit Valley watershed.

Agent-based models like this one can identify new questions and enrich conversations about policy and program structures and potential alternatives by simulating real-world situations. The process of building the model is as important as the tool itself, as it requires a range of stakeholders with different expertise and perspectives to come together to create a meaningful network of social and ecological relationships that can be modelled and tested.

**TO CONTACT THE RESEARCHER, EMAIL [RESEARCHSPOTLIGHT@CWN-RCE.CA](mailto:RESEARCHSPOTLIGHT@CWN-RCE.CA).  
VISIT OUR REPORT LIBRARY AT [CWN-RCE.CA](http://CWN-RCE.CA)**