

Ecosystem services for human well-being in the Credit River Watershed: A comparison of monetary valuation, multi-criteria non-monetary valuation and multi-scale integrated analysis of societal and ecosystem metabolism

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Challenge

Human health and well-being is fundamentally dependent on services provided by ecosystems. However, the importance of ecosystem services (ES) to human well-being, and of managing ecosystem and watershed resources to maintain such services, is not commonly understood by the public, and not well-enough articulated by environmental management and governance organizations. Beneficiaries of such services are often unaware of the nature of their dependence upon supporting ecosystems. This is particularly true in urbanized watersheds. Watershed management organizations are aware of such benefits to watershed residents, but they very rarely track and report measures of human well-being to demonstrate the efficacy of their work.

Relationships among environmental determinants of health and well-being are multiple, diffuse and interact in complex non-linear ways that are difficult to parse and isolate. This presents a problem for normal science, which reduces problems to smaller components in attempts to understand them. Without a way to demonstrate and communicate these relationships, the ES that underpin our health and well-being will continue to be ignored and undermined.

Project

The research team will explore innovative ways of valuing ES at the watershed level to complement monetary valuation. The objective is to provide a robust, integrative tool for decision-making support.

Non-monetary approaches to ecosystem service valuation examine the importance, preferences, needs or demands expressed by people towards nature, and articulate plural values through qualitative and quantitative measures other than money (Chan et al., 2012). They can demonstrate the multi-dimensional nature of human well-being with monetary value being just one aspect of importance amongst others e.g. symbolic, cultural, ecological and spiritual (Keleman et al., 2014). Water based ES such as storm water regulation and water filtration will be given priority.

We are currently developing modules for InVEST (Integrating Valuation of Ecosystem Services and Tradeoffs), an open source tool for biophysical assessment of structural ecosystem components and monetary valuation of ES. Data output from these modules will be assessed using two methodologies: a multi-criteria approach to ES, and; multi-scale integrated analysis of societal and ecosystem metabolism (MuSIASEM) (Giampietro, 2003; Giampietro, Aspinall, Ramos-Martín, & Bukkens, 2014; Madrid-López & Giampietro, n.d.).

Building upon past work by our Partner (<http://www.creditvalleyca.ca/egs>), the approaches proposed here will be compared with monetary valuation. While recognizing known weaknesses of different approaches to valuing and assessing ES and their benefits (e.g., ranking in pair-wise comparison), exploring multiple approaches creates a triangulation.

Outputs

Anticipated Outputs include:

- Dissemination of research findings through conference papers, and peer-reviewed journal manuscripts.
- Applied/professional reports and material suitable for distribution to governance and civil society stakeholders in the Credit River Watershed.
- At least one new InVEST module.
- Coupling of web-GIS scenario planning tools to InVEST model.
- Development of web-GIS tools to create data for, and to parameterize InVEST.
- Robust triangulated approach to ecosystem service valuation.
- Exploration of the MuSIASEM approach for use in ecosystem services valuation/scenario assessment.
- Exploration and adaptation of a multi-criteria decision making approach to valuing ecosystem services and well-being benefits.

Outcomes

The project aims to achieve the following outcomes:

- Change in practice and/or adoption into practice through the creation of new InVEST modules with a focus on the biophysical integrity of water bodies as ecosystem structural components and their functional roles in providing flows of ES. New modules will be coupled to the project's web-GIS and used to assess the baseline conditions of ecosystem structure and changes occurring from scenario interventions.

Research Team and Partners:

Research Team:

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Partners:

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