Ontario’s Good Fortune: Appreciating the Greenbelt’s Natural Capital

Understanding the Framework, Data Sources, and Methods

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Agenda

- Understanding the Concepts
- Overview of the analytical process
- Framework
- Data needs
- How values are determined
  - Extractive Uses
  - Recreation
  - Human property protection (flood protection)
- Tips for how to get started
Understanding the Concepts
Pathway from Ecosystem Structure and Processes to Human Wellbeing

Management/Restoration → Institutions & Human Judgments
  Determining (the use of) services → Feedback between value perception and use of ecosystem services

ECOSYSTEMS & BIODIVERSITY
- Biophysical Structure or Process (e.g., vegetation cover of Net Primary Productivity)
- Function (e.g., slow water passage, biomass)
- Service (e.g., flood-protection, products)

HUMAN WELLBEING (Socio-Cultural context)
- Benefits (e.g., contribution to health, safety, etc.)
- (Economic) Value (e.g., WTP for protection of products)

Understanding Final Ecosystem Services

“... components of nature, directly enjoyed, consumed, or used to yield human wellbeing.”
– Boyd and Banzhaf (2007)

“... aspects of ecosystems utilized (actively or passively) to produce human wellbeing.”
– Fisher et al. (2009)
Understanding Final Services

Overview of the Analytical Process
Overview of Analytical Steps

1. Establish and codify final ecosystem service accounts
2. Identify and gather relevant data
3. Determine which accounts can be quantified with available data
4. Quantify natural capital
Quantification Steps

1. Assessing beneficiaries (end users of the ecosystem service flows) by considering the following questions:
   – Who are the beneficiaries?
   – Where they are located?
   – How many beneficiaries are there?

2. Determining the quantity of services being utilized by the beneficiaries, for example:
   – days of recreation
   – reduction in air pollution
   – volume of water used

3. Determine the value of final ecosystem service flows
Framework
<table>
<thead>
<tr>
<th>Account</th>
<th>Environmental subclass</th>
<th>End-products</th>
<th>End-products subclass</th>
<th>Use / Non-use</th>
<th>Use / Non-use subclass</th>
<th>Detailed Use / Non-use</th>
<th>Beneficiary</th>
<th>Beneficiary subclass</th>
<th>Market / Non-market</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>Forest</td>
<td>Flora</td>
<td>Wood fibre</td>
<td>Extractive use</td>
<td>Raw material for transformation</td>
<td>Timber</td>
<td>Industry</td>
<td>Forestry and logging</td>
<td>Market</td>
</tr>
<tr>
<td>T2</td>
<td>Forest</td>
<td>Flora</td>
<td>Wood fibre</td>
<td>Extractive use</td>
<td>Energy</td>
<td>Fire wood</td>
<td>Household</td>
<td>Homes using wood based heating</td>
<td>Market</td>
</tr>
<tr>
<td>T3</td>
<td>Forest</td>
<td>Flora</td>
<td>Mushrooms / wild berries / nuts</td>
<td>Extractive use</td>
<td>Other extractive use</td>
<td></td>
<td>Household</td>
<td>People who care</td>
<td>Non-market</td>
</tr>
<tr>
<td>T4</td>
<td>Forest</td>
<td>Flora</td>
<td>Sugar maple trees</td>
<td>Extractive use</td>
<td>Raw material for transformation</td>
<td>Maple sap</td>
<td>Industry</td>
<td>Food manufacturing</td>
<td>Market</td>
</tr>
<tr>
<td>T5</td>
<td>Forest</td>
<td>Fauna</td>
<td>Mammals</td>
<td>Non-use</td>
<td>Existence and bequest</td>
<td></td>
<td>Household</td>
<td>People who care</td>
<td>Non-market</td>
</tr>
<tr>
<td>T6</td>
<td>Forest</td>
<td>Fauna</td>
<td>Mammals</td>
<td>Extractive use</td>
<td>Recreation / tourism</td>
<td>Hunting</td>
<td>Household</td>
<td>Hunters</td>
<td>Non-market</td>
</tr>
<tr>
<td>T7</td>
<td>Forest</td>
<td>Fauna</td>
<td>Birds</td>
<td>Non-use</td>
<td>Recreation / tourism</td>
<td>Bird watching</td>
<td>Household</td>
<td>Birdwatchers</td>
<td>Non-market</td>
</tr>
<tr>
<td>T8</td>
<td>Forest</td>
<td>Fauna</td>
<td>Birds</td>
<td>Non-use</td>
<td>Existence and bequest</td>
<td></td>
<td>Household</td>
<td>People who care</td>
<td>Non-market</td>
</tr>
<tr>
<td>T9</td>
<td>Forest</td>
<td>Composite end-products</td>
<td>Forest landscape</td>
<td>In-situ use</td>
<td>Recreation / tourism</td>
<td>Fall colour viewing</td>
<td>Industry</td>
<td>Tourism operators</td>
<td>Non-market</td>
</tr>
<tr>
<td>T10</td>
<td>Forest</td>
<td>Composite end-products</td>
<td>Forest landscape</td>
<td>In-situ use</td>
<td>Aesthetic appreciation</td>
<td>Scenic views</td>
<td>Household</td>
<td>Hunters</td>
<td>Non-market</td>
</tr>
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<td>Forest</td>
<td>Composite end-products</td>
<td>Forest landscape</td>
<td>In-situ use</td>
<td>Recreation / tourism</td>
<td>Hiking</td>
<td>Household</td>
<td>Hikers</td>
<td>Non-market</td>
</tr>
</tbody>
</table>
Data Needs / Sources
General Data Needs and Possible Sources

• Data needs and sources will vary depending on:
  – What accounts you want to capture
  – What your accounting objectives are

• Some key data sources:
  – Land cover / land use data
    • SOLRIS V2.0
    • AAFC annual crop inventory
  – Population data
    • Census of population
General Data Needs and Possible Sources

• Other valuable data sources:
  – 2012 Canadian Nature Survey
  – EVRI value transfer database
  – Agricultural census data
  – Water permit data
  – National Forest Inventory (NFI) data
  – Wetlands spatial data
Discussion Break

• Consider the issues, policy questions, or other problems you face in your day to day work.
  – Do you see value in a framework like this to help you structure, organize, and present data?
  – What specific issues, questions, or problems could this type of framework help address?
  – How important would you say quantifying benefits in dollar terms is to address those issues?
  • In other words, what if we just started quantifying beneficiaries (where and how many)?
Valuation Examples
Extractive Uses – Analytical Challenges

• Spatial alignment of data sources with area of interest (i.e. Greenbelt)
• Permit to take water data doesn’t include actual water use
  – only maximum daily withdrawal permitted
Extractive Uses – Data Sources Used

- **Agricultural Census Data for the Greenbelt**
  - Custom geographic tabulation provided by Statistics Canada, commissioned by Friends of the Greenbelt
    - Amount of irrigation reported
    - Number of maple taps

- **Spatially referenced water permit data**
  - Land Information Ontario
Extractive Uses – Valuation Measures

• Production function imputed water values:

• Market values for non-timber forest products
Recreation – Analytical Challenges

• We don’t know the population of people who actually recreate in the Greenbelt
  – But we know the percent of the population that recreated within 20km from home

• Recreation data doesn’t align with detailed disaggregated accounts
  – E.G. Hiking in forest areas vs hiking in grassland areas
Recreation – Data Sources Used

• Census
  – To establish relevant population

• 2012 Canadian Nature Survey
  – Ontario results:
    • Percent of population engaging in different recreational activities
    • Percent of population that recreate within 20km of home
    • Average number of days spent engaging in recreational activities
    • Reported expenditures for recreational activities
Recreation – Valuation Measures

• Used a travel cost based approach as a proxy for the value of recreation
  – Value is based on reported expenditures for specific recreational activities
  – We excluded expenditures on transportation, accommodation and food to capture activities near home
Human Property Protection (e.g. flood control) – Analytical Challenges

• Region was too large to determine the number of properties within flood prone areas
  – New mapping is becoming available that will make this more readily accessible

• Hydrologic modelling is needing to fully understand the role wetlands play in mitigating flood risk given specific spatial context
Human Property Protection (e.g. flood control) – Valuation Measure

• Value function transfer:
  – meta-analysis specifically looking at wetland within agricultural landscapes across North America
  – Statistically assessed 66 wetland value estimates
  – Function adjusts wetland value based on:
    • Area of a wetland
    • Abundance of wetlands in the surrounding area (e.g. substitutes sites)
    • Population of surrounding area
    • Amount of economic activity in the surrounding area
  – Surrounding area = 50 km radius from each wetland
Human Property Protection (e.g. flood control) – Data Sources Used

• Wetlands
  – Spatial data from Land Information Ontario

• Census data by CSD to determine relevant population

• Gross Cell Product, as measure of Gross Domestic Product spatially referenced to a grid 1 degree latitude by 1 degree longitude
Tips for how to start accounting for natural capital

• Establish a locally relevant list of accounts and use it as guiding framework
• Don’t get hung up on the valuation
  – Identifying who is benefiting and how much “natural capital” is being used is a great first step
• Use this Greenbelt study as a guide, or reference point:
  – If you have better, more relevant data, for your region use it.
Questions / Discussion
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