

# Ecology 101:

## Ecosystem Services in the Credit River Watershed

Health and well-being of people living and working in the Credit River Watershed is linked to health of the watershed's forests, wetlands, soils, plants and animals. Nature provides multiple goods and services that sustain our life, including food, materials (such as timber and fish), clean air, drinking water, and also offers opportunities for recreational, cultural and spiritual enjoyment. All these are examples of *Ecosystem Services* – benefits provided to people by the watershed's ecosystems.

Recently the Millennium Ecosystem Assessment (MEA), the most comprehensive international ecological assessment ever carried out, was initiated by the United Nations to improve our understanding of the links between ecosystems and human well-being. According to MEA, all services provided by healthy ecosystems can be divided into four types:

ECOSYSTEM SERVICES	
<p><b>SUPPORTING SERVICES:</b></p> <p>Services needed for production of all other services</p> <ul style="list-style-type: none"> <li>• Primary production</li> <li>• Provision of habitat</li> <li>• Nutrient cycling</li> <li>• Soil formation</li> <li>• Oxygen production</li> <li>• Water cycling</li> </ul>	<p><b>PROVISIONING SERVICES:</b></p> <p>Goods provided by ecosystems</p> <ul style="list-style-type: none"> <li>• Fresh water</li> <li>• Food and fuel</li> <li>• Genetic resources</li> </ul>
	<p><b>CULTURAL SERVICES:</b></p> <p>Non-material benefits provided by ecosystems</p> <ul style="list-style-type: none"> <li>• Spiritual and religious values</li> <li>• Education and inspiration</li> <li>• Recreation and aesthetic values</li> </ul>
	<p><b>REGULATING SERVICES:</b></p> <p>Benefits obtained from regulation of ecosystem processes</p> <ul style="list-style-type: none"> <li>• Pollination</li> <li>• Climate regulation</li> <li>• Disease regulation</li> <li>• Natural hazard protection</li> <li>• Erosion regulation</li> <li>• Water purification</li> </ul>



HUMAN WELL-BEING
<ul style="list-style-type: none"> <li>• Basic materials</li> <li>• Health</li> <li>• Security</li> <li>• Good social relations</li> <li>• Freedom of choice and action</li> </ul>

Ecosystems in the Credit River Watershed, such as forests, wetlands, streams and meadows, have a positive contribution to the quality of life of the watershed's residents and visitors.



**Provisioning Services: food, timber and fuel**

Forests not only provide us with building materials, fire wood and food, but they also produce the oxygen we breath and help to reduce greenhouse gases which are affecting our climate.



**Cultural Services: Recreation**

People enjoy recreational activities such as kayaking or fishing on the Credit River.



**Regulating Services: Pollination**

Many field crops in the watershed depend on pollination services provided by wild bees and other insects



**Supporting and Regulating services**

Wetlands provide important benefits to society, including maintaining water quality; flood and erosion control; as well as recreational fishing and hunting.

## Ecological Economics 101:

### Value of Ecological Services in the Credit River Watershed



Ecosystems in the Credit River Watershed, such as forests, wetlands, streams and meadows, have a positive impact on the well-being of the watershed's residents, visitors and the broader community.

Credit Valley Conservation (CVC) recognizes the importance of protecting and restoring these valuable ecosystems. Several years ago, CVC started a long-term initiative to estimate the value of natural benefits in the Credit River Watershed. The purpose of this project is to bring awareness to the importance of natural features for human wellbeing and assist in making informed policy and land-use decisions in the watershed.

Natural ecosystems in the watershed provide life-sustaining goods and services to people who live and work in the watershed, and to those who come to the Credit River for recreational opportunities. These ecosystems, however, are threatened by a variety of local and global factors such as urban development and climate change.



Ecosystems in the Credit River Watershed provide a wide range of benefits, also known as Ecological Goods and Services, to local residents and visitors.



Forests in the Credit River Watershed hold approximately 6.52 million tonnes of carbon<sup>1</sup>. The climate regulation value represented by this carbon storage has been estimated at \$11.4 million annually<sup>2</sup>.



The value of the Credit River recreational fishery is estimated at least at \$1.2 million per year<sup>4</sup>. The benefits of other (non-angling) river-based recreation in the watershed are estimated at \$6.9 million per year<sup>2</sup>. These benefits are only a portion of the total value of recreational opportunities provided by the watershed's ecosystems to its residents and visitors.



The annual value of agricultural crops in the watershed is estimated at \$8.4 million. Most of these crops would not exist without the pollination services of insects that are estimated to be almost \$4 million per year<sup>2</sup>.



Natural benefits from wetlands in the Credit River Watershed are worth at least \$187 million per year<sup>2</sup>. Residents in the watershed are willing to pay significant amount for wetland restoration programs (\$229 to \$259 annually per household over the next 5 years)<sup>9</sup>.

## Ecological Economics 101:

### Value of Ecological Services in the Credit River Watershed

Although it is often assumed that nature will continue supplying unlimited resources in perpetuity, ecosystem degradation can reach a critical tipping point beyond which quality or quantity of the services the ecosystem can provide is radically reduced. Once these benefits are gone, we will have to find alternative ways to provide similar goods and services. Sourcing human-made infrastructure to replace ecosystem services is very costly if not impossible. For example, a recent CVC study<sup>2</sup> estimated that if we were to degrade local groundwater supplies in the watershed, it would cost more than \$100 million per year to pump water from Lake Ontario. Some benefits, such as nature's ability to provide clean air or regulate our climate, cannot be replaced with any technology.

Unlike commonly traded goods and services, most ecological services do not have explicit prices in the marketplace. *Economic valuation* - assigning a value to key ecosystem

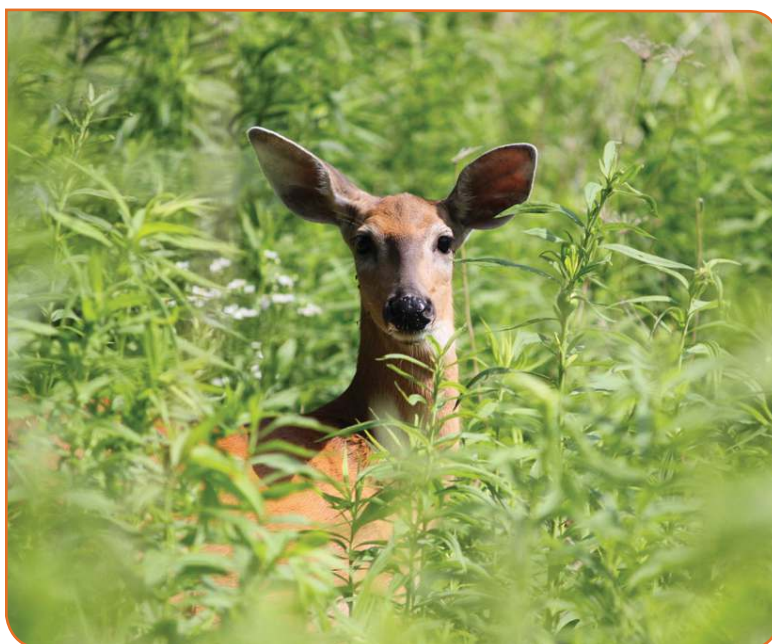
services using a variety of valuation methods - is a tool that helps policymakers and citizens take proper care of the watershed's *natural capital* to ensure benefits flow for generations to come.

What are nature's goods and services worth? One can say that their value is infinite. People would not survive without fertile soil; clean drinking water and air; and an amenable climate. But "infinite" has often been interpreted as an over-abundance of resource, leading to a valuation of "zero" in the past. This led to suboptimal land use and policy decisions.

Valuation of ecosystem services helps to acknowledge the *total economic value* (TEV) of critical ecosystem services and their important contribution to our well-being. It also helps policy makers to better account for the true benefits and costs of our land use decisions.

#### Key terms and definitions:

1. **Ecological Economics:** a field of academic research that aims to address the interdependence of human economies and natural ecosystems. It is distinguished from mainstream economic analysis of the environment by its treatment of the economy as a subsystem of the ecosystem and its emphasis on preserving natural capital.
2. **Ecosystem Services (Ecological Services, Environmental Services):** the flow of benefits to society from healthy, functioning ecosystems ensuring continuous human health and well-being. Normally, distinction is made between Ecosystem Goods and Ecosystem Services.
3. **Ecosystem Goods:** consumable products provided by ecosystems, such as food, fuel or building materials. Most ecosystem goods are traded in the marketplace and have explicit prices. **Ecosystem Services**, on the other hand, are non-material benefits provided to humans by nature's ecosystems, such as replenishing and protecting water supplies or providing recreational opportunities. Most ecosystem services do not have markets to be traded in and, therefore, do not have explicit prices assigned to them.
4. **Economic Valuation:** a technique for measuring and comparing various benefits provided by nature which can improve use and management of natural resources.
5. **Ecosystem:** complex system consisting of living organisms (plants, animals, and microorganisms) interacting with their associated non-living environment.
6. **Natural Capital:** stock of natural resources, including the flows of ecosystem goods and services, that exists in a region at a given point of time.
7. **Total Economic Value (TEV):** sum of all values derived from the use or existence of an ecosystem service.
8. **Watershed:** an area of land that drains into a stream, lake, river or ocean.

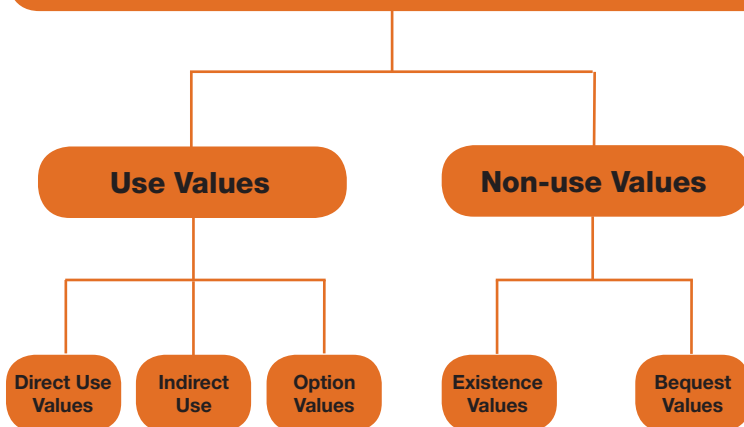


## Ecological Economics 101:

### Value of Ecological Services in the Credit River Watershed



#### Natural Resource / Environment Total Economic Value



#### Total economic value

Total economic value (TEV) is the concept used in valuation of natural capital and ecosystem services. It suggests that economic value is the sum of use values and non-use values. Use values reflect the value derived by humans from consumption (directly or indirectly) of the services, or the value of having the option of consuming them in the future. There are three types of use values:

- **Direct use value:** value derived from direct use of the ecosystem or resource, such as the value of drinking water.
- **Indirect use value:** value derived from indirect use of the ecosystem or resource, such as the value of a wetland for flood control.
- **Option value:** value derived from preserving a use value of water or forest today so that it may be available in the future.

Non-use values, in contrast, are derived without consumption taking place.

There are two types of non-use values:

- **Bequest value:** satisfaction that individuals derive from knowledge that ecosystem services will exist for future generations, for example knowledge that natural areas will be protected for children and grandchildren.
- **Existence value:** satisfaction of knowing that certain plants or animals exist in the watershed. For instance, some people may value the fact that the bald eagle exists in the Credit River area, even though they may never see one.

CVC's natural capital and ecosystem valuation reports:

<sup>1</sup> "An Analysis of Present and Future Carbon Storage in the Forests of the Credit Valley Watershed" (2010)  
<http://www.creditvalleyca.ca/bulletin/downloads/CVC-CarbonStudyFinal.pdf>

<sup>2</sup> "Natural Credit: Estimating the Value of Natural Capital in the Credit River Watershed" (2009)  
<http://www.creditvalleyca.ca/bulletin/downloads/CVC-NaturalCreditReport.pdf>

<sup>3</sup> "The Credit River Watershed: Property Value Appreciation: Impacts of Natural Features" (2009)  
[http://www.creditvalleyca.ca/bulletin/downloads/CVC-NatFeatRpt-Mar31\\_09.pdf](http://www.creditvalleyca.ca/bulletin/downloads/CVC-NatFeatRpt-Mar31_09.pdf)

<sup>4</sup> "The Credit River Watershed: Valuation of Angling" (2008)  
<http://www.creditvalleyca.ca/bulletin/downloads/cvc-anglingRpt-Jan29.pdf>

<sup>5</sup> "Valuing Wetlands in the Southern Ontario's Credit River Watershed, Phase 1: Wetland Ecosystem Services Characterization" (2009)  
<http://www.creditvalleyca.ca/bulletin/downloads/ValuingWetlandsPhase1-final.pdf>

<sup>6</sup> "Valuing Wetlands in the Southern Ontario's Credit River Watershed, Phase 2: A Contingent Valuation Analysis" (2010)  
<http://www.creditvalleyca.ca/bulletin/downloads/ValuingWetlandsPhase2-final.pdf>