

Natural Assets Series: Carbon Sequestration Calculation Tools and Approaches

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[Webinar Recording](#)

Municipalities have expressed interest in learning how others are calculating carbon sequestration, with the aim of incorporating carbon sequestration ecosystem services into their greenhouse gas (GHG) inventories. In the first webinar of this series, Lake Simcoe Conservation Authority and Credit Valley Conservation presented on a range of tools available to calculate the carbon sequestration associated with their natural capital, while also considering how decomposition releases a portion of that stored carbon back into the atmosphere, as well rates associated with native ecosystems in southern Ontario, and examples of how this has informed municipal planning.

Presenters

- Owen Royall, Technician, Ecosystem Goods and Services, Credit Valley Conservation
- Sarah Kirilenko, Integrated Watershed Management Technician, Lake Simcoe Region Conservation Authority
- Bill Thompson, Manager of Watershed Plans and Strategies, Lake Simcoe Region Conservation Authority

Presentation Overview

Owen Royall, Ecosystem Goods and Services, Credit Valley Conservation

Carbon Assessments and the Natural Asset Carbon Assessment Guide and Toolbox

- Carbon assessments can help municipalities understand carbon offsets and can be beneficial for ecosystem service valuation to evaluate the value of natural assets.
- Every ecosystem (i.e., forests, wetlands), sequesters carbon at different rates, due to several factors including species type and age, and geographical location.
- The Natural Assets Carbon Assessment Guide and Toolbox was created to address the complexity of carbon sequestration quantification, and was established to standardize carbon assessment methods within Southern and Central Ontario.
- The NACAT provides carbon assessment guidance for novices and experts.
- The NACAT enables users to conduct carbon assessments effectively, and provides background information, a database of carbon sequestration rates and storage data, and information on the appropriate use of tools and methodologies for carbon assessments.
- To help users identify carbon sequestration rates across ecosystems efficiently, the database is organized by land-cover type. There are many types that are understudied, and therefore, the database is a living document that will need to be updated over time.
- Every time a new source is identified, a standardized, unbiased way of identifying confidence in the source has been established. This includes looking at information reliability, source reliability, and relevance.

- Section 3 of the NACAT is a list of other tools, methods, and resources for conducting carbon assessments
- The information provided for each tool includes the asset types (i.e., individual trees, urban forest, wetlands) that it can be applied to, the purpose of the tool, outputs, inputs, methodology, when it can be used, assumptions, limitations, and areas for improvement.
- The two main methods listed in the NACAT are *area-based rates method* and *tools*.
 - Area-based rates method: Quick, easy carbon assessment. Slightly less accurate because you're assuming that an ecosystem that someone else studied is similar enough to the one that you want to do a carbon assessment on.
 - Tools: Can be resource intensive and cost more. The tools typically involve a desktop component delineating your area that you want to do the carbon assessment, and maybe going to the field to take some field measurements that you input into the tool.

Sarah Kirilenko, Integrated Watershed Management Technician, Lake Simcoe Region Conservation Authority

Field work for estimating carbon storage and sequestration rates from natural assets

- LSRCA has been quantifying carbon sequestration rates at 7 different ecosystems. This includes meadow marshes, young coniferous plantations, thickets, woodlands, restored prairies, wetlands, and meadows.
- Prompted by requests for quantification and valuation of ecosystem services, the LSRCA completed a carbon budget within the watershed in 2020, and found that natural forest and wetland ecosystems sequester an estimated 20% of the watershed's emissions annually.
- The three components analyzed when monitoring carbon sequestration are: Annual above ground growth, annual below ground growth, and carbon released through decomposition.
- In 2024, LSRCA expanded their carbon sequestration fieldwork to include sites within other jurisdictions (TRCA).
- Because plants uptake carbon at a relatively standard rate, the methods for estimating carbon storage and sequestration really are simple. The methodology includes the total amount of biomass produced in the growing year within a plot being measured then getting multiplied by a standard carbon factor.
- LSRCA found that there was an average carbon sequestration rate of 2.74 tons of carbon per hectare per year in the meadow marshes sampled. This means that one hectare of meadow marsh offsets emissions from the energy use of 2.4 homes. Due to field logistics, the root tubes for the TRCA sites were deployed later in the spring than those for the other 2 watersheds, and since this had a significant impact on the below ground biomass, the TRCA sites were removed from the sequestration average and it was recalculated, resulting in an increased sequestration rate of 3.03 tons of carbon per hectare per year for the meadow marshes. Demonstrating how study design and methodology can impact results.

**Bill Thompson, Manager of Watershed Plans and Strategies, Lake Simcoe Region
Conservation Authority**

Translating carbon sequestration to municipal use: a case study

- The GTA is experiencing significant growth pressure, but many municipalities within the watershed are concerned with climate change and establishing net-zero targets. Green assets, nature-based solutions, and natural areas are critical tools for helping municipalities achieve net-zero.
- There are questions around data in carbon sequestration and which studies are applicable to Ontario, so the intent of the NACAT is to screen through the literature and highlight studies that are relevant to central Ontario.
- In 2022, ICLEI released a supplemental protocol for accounting for sequestration in trees and forests. It uses very simple data to develop an estimate of sequestration over a study area, whether it's a municipality or a watershed.
- East Gwillimbury was selected as a pilot for applying the carbon sequestration methodology to. The analysis found that the Town's carbon sequestration potential is approximately 100,000 tons of CO₂ equivalent (approximately 23,000 cars). The data sources required were:
 - Watershed land cover map
 - Natural Asset Carbon Assessment Guide and Toolbox
 - Urban forest inventory
 - Municipal Official Plan
- The Official Plan was used to identify areas slated for growth, and it was determined that growth in this scenario would not result in sequestration loss due to municipal policy protections. If the policies remain, the Town won't experience sequestration loss going forward.
- A net increase in carbon sequestration is expected because as residential developments are built, street trees and backyard trees will be introduced.
- Using land cover data, urban forest data, estimates of carbon sequestration rates and applying it to a municipality can
- The case study of East Gwillimbury is a development-as-usual scenario, and demonstrates how simple land cover and urban canopy data lead to practical questions, such as how can we push targets further, and what can be accomplished through transition from grey to green infrastructure? The questions can lead to small but impactful changes and contributions to net-zero targets.

Additional Resources

- [Natural Asset Carbon Assessment Guide and Toolbox](#)

- [GPC Supplemental Guidance for Forests and Trees](#)
- [I-Tree](#)

Contact Information

Please reach out to us at any time with questions, input, or for additional information.

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