

CANADIAN CONSULTING ENGINEERING AWARDS 2024

THE CITY OF CALGARY VALUATION OF NATURAL ASSETS

LOCATION: CALGARY, AB
CLIENT/OWNER: THE CITY OF CALGARY
LEAD CONSULTANT: ASSOCIATED ENGINEERING



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PROJECT SUMMARY

The City of Calgary's Natural Assets Valuation reveals the significant value of natural assets, such as forests, riparian areas, and waterbodies, and the services they supply. The study provides The City with the information required to support decision-making and planning for land-use and natural asset management, protecting the environment and mitigating the effects of climate change. This transformational project paves the way for integrating built and natural asset management - a model for other communities.



INNOVATION

Taking a unique and visionary approach to managing its natural infrastructure, The City of Calgary retained Associated Engineering and project partner Green Analytics to determine the value of its natural assets. The City understood the value of its built infrastructure but did not have a valuation of its natural infrastructure and their benefit to Calgarians. The City wished to quantify the value of its natural assets, including forests, trees, grasslands, shrubland, wetlands, riparian areas, watercourses, and agricultural land.

Associated's team inventoried the natural assets; identified priority services that natural assets provide to Calgarians; and conducted a financial valuation of services provided by natural assets, as well as their replacement costs. Working with City staff from across many departments, the following services were prioritized for natural assets: Recreational, Amenity and enjoyment, Habitat, Water retention, Urban heat reduction, and Carbon storage.

Using data sets from The City and Government of Alberta, Associated inventoried natural assets by combining relevant spatial data layers into a Geographic Information System, through a hierarchical process and workflow. The spatial data layers depict the land cover and land use within the area. To facilitate data analysis, Associated developed an online dashboard that allows viewing of various aspects of the inventory by community, land-use class, riparian

management zone, and source watershed vulnerability.

The team developed an innovative method for determining water retention valuation. Natural assets retain water in natural depressions. The team leveraged previous depression mapping that Associated conducted for The City to quantify the volume of surface ponding storage available within natural assets. Typical costs for constructed stormwater storage infrastructure were then compared with water storage capacity in natural depressions. The evaluation identified that Calgary's natural depressions can provide storage of 1,200 m³/hectare, whereas current development and stormwater management design practices provide 600 to 800 m³/hectare, thus diminishing the water storage capacity of the landscape by 30% to 50% from its predevelopment state. The depression volume method determined a water retention value of \$1.2 billion/year, reflecting the role of natural depressions in reducing the need for conventional stormwater ponds.

This study revealed the overall substantial value of The City's natural infrastructure:

- Replacement cost: \$6.9 billion
- Service value: \$2.5 billion/year

This valuation transforms The City's decision-making and planning for land use and natural asset management, protecting the environment, improving climate resilience, and providing a model for other communities.



COMPLEXITY

The project challenge was not only determining the value of The City's natural assets, but also identifying what services the assets provide and placing a value on these services. Associated's team brought together The City's subject matter experts in a participatory process to identify their priority services and the criteria for valuation. Subject matter experts represented many departments, including Parks, Water, Planning, Environmental and Safety Management, Resilience, and Corporate Asset Management.

Until recently, it has been difficult to quantify the benefits of natural assets, until the development of natural asset accounting. Natural assets provide many services, also known as ecosystem services. To identify which ecosystem services should be explored, Associated developed a multi-criteria decision-making approach.

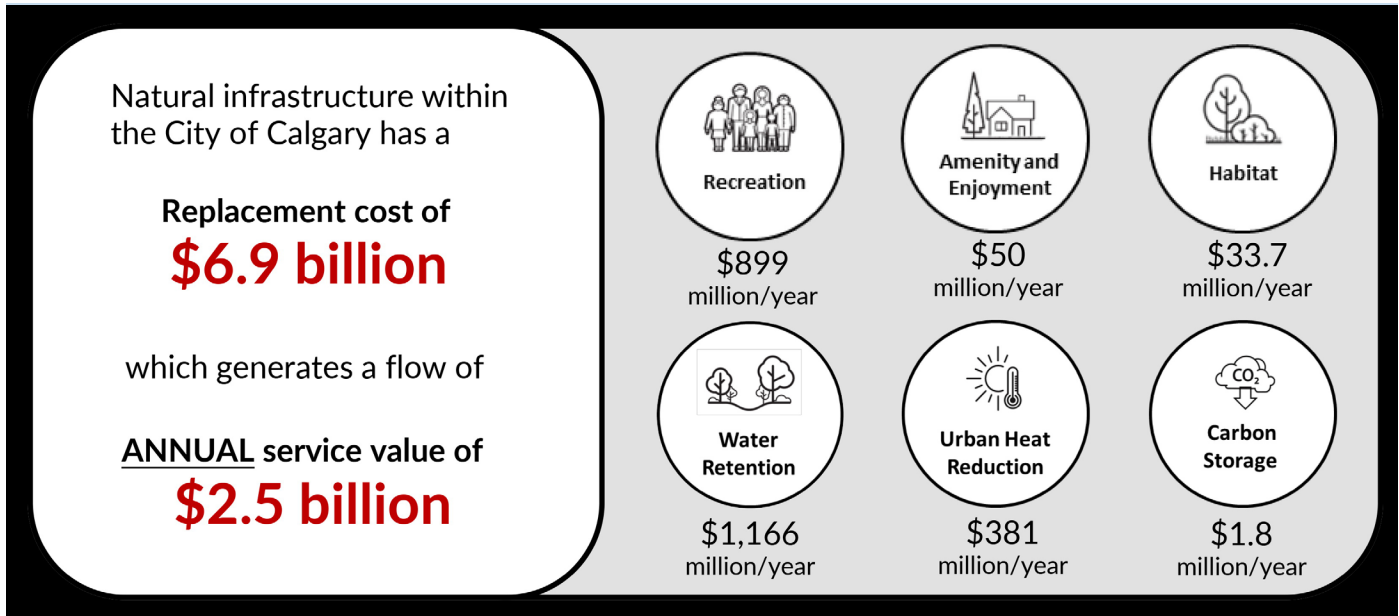
Subject matter experts defined four criteria that natural asset management would accomplish:

- Healthy environment
- Healthy public
- Economic sustainability and
- Improved resilience

Biodiversity, clean water, and clean air were also identified as foundational outcomes of functioning natural infrastructure.

City staff ultimately selected the six priority services for the financial evaluation: Recreation, Amenity and Enjoyment, Habitat, Water Retention, Urban Heat, and Carbon Storage.

Adding to the complexity, natural assets are part of an interconnected system with overlapping services, which made it difficult to segregate the assets for valuation. Also, natural assets can provide multiple services, are renewable resources, their performance increases with age, and maintenance typically decreases with age. To estimate the value of a natural asset, the study considered the "value" derived from the benefits of the services, not the services themselves.



SOCIAL AND/OR ECONOMIC BENEFITS

Associated Engineering used recent developments in natural asset accounting to demonstrate that natural infrastructure in Calgary has a current replacement value of \$6.9 billion and generates an annual service value up to \$2.5 billion. If natural infrastructure was its own service line, it would rank 5th of 19 service lines in The City’s asset management portfolio.

The social benefits comprise \$899 million/year in recreation and \$50 million/year in amenity and enjoyment.

The environmental benefits include \$34 million per year for habitat, including Calgary’s open spaces (forest, wetland, grassland, and shrubland).

Natural assets are currently contributing to the reduction of heat-related deaths. The reduction in surface air temperature due to street trees and natural assets was estimated to result in approximately 18 and 28 avoided heat-related deaths per year, respectively.

Natural assets provide valuable carbon storage and sequestration to mitigate climate change. The study estimated the value of carbon sequestration at \$1.8 to \$7.6 million/year.

The study confirmed that investments in natural infrastructure can have significant economic returns and can reduce a municipality’s reliance on costly built infrastructure, mitigate the effects of climate change, and improve a city’s livability by providing spaces for community connection and recreation.

In addition to these services, the financial valuation also included replacement values for wetlands, riparian, forests, grasslands, and street trees. Analyses showed that there is a greater benefit to conserving and restoring natural assets, since performance of natural assets increase with age and replacement typically does not provide like-for-like value.



ENVIRONMENTAL IMPACT

Natural assets provide multiple environmental benefits and builds sustainability and climate resilience; however, their value and the significance of their services are often overlooked in municipal financial planning and reporting. Natural infrastructure can mitigate climate change by absorbing and storing carbon. Natural assets provide the space where rainfall can pond in low-lying areas to reduce the risk of flooding. Healthy vegetation and root systems, including riparian areas along rivers and lakes, reduce sedimentation and erosion protecting the integrity of riverbanks and improving water quality.

The study identified that natural assets provide multiple services, their performance increases with age, and maintenance typically decreases with age (but can take longer to establish, such as vegetation). Natural assets can self-adapt to a changing climate and are also a renewable resource.

The City of Calgary's Valuation of Natural Assets quantifies the value of its natural infrastructure as follows:

- Habitat: \$34 million/year
- Water retention: \$1.2 billion/year
- Carbon storage: \$381 million/year and
- Urban heat reduction: \$1.8 million/year

By demonstrating the value of the City's natural assets and their service, The City has the supporting information it needs to make a case for funding natural asset management and maintenance in the future and to make decisions on long-term natural asset management that will protect the environment and mitigate climate change, which will ultimately reduce The City's carbon footprint and improve air quality, water systems, and ecosystem services.



MEETING AND EXCEEDING CLIENT'S NEEDS

The City of Calgary's Valuation of Natural Assets project communicates the significant replacement value and annual service value of its natural assets. Like most levels of government across Canada, asset management in Calgary has historically focused on man-made assets that receive large public funding support. By demonstrating the value of natural assets, this project fundamentally changes the conversation about what constitutes an asset. The study provides The City with the supporting information to adequately fund the lifecycle needs of natural assets and informs the City's future decision-making and planning for land use, natural asset management, and operations.

The City is using the study to build awareness and understanding of natural assets within City departments, Council, and external stakeholders. The information will be used to align policy to support the protection and retention of natural assets. The City plans to build a business case for improved protection of valuable land by managing natural assets in a similar manner to other municipal assets to enhance municipal accounting and financial reporting practices.

Associated's valuation study provides The City with the capability to use natural assets accounting on a city-wide basis to inform the value proposition of restoring disturbed areas, and to restore ecological and hydrological functions and services that have been lost due to urbanization.

Reflecting the innovation and leadership of this project, following the project's completion, Calgary's lead for Corporate Asset Management subsequently served as Committee Chair for a new standard on natural asset inventory with the Canadian Standards Association.

