Case Study

City of Edmonton Urban Forest Asset Management Plan

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Company represented: City of Edmonton, Alberta, Canada

Roles: municipal service provider and consultant

Sector: municipal green infrastructure

Asset owner: City of Edmonton, Alberta, Canada

Introduction

The City of Edmonton developed an Urban Forest Asset Management Plan in 2020-21 with the assistance of WSP's Asset Management Advisory Team. The City is justifiably proud of its urban forest. The North Saskatchewan River Valley is one of the largest urban parks in North America, and a centrepiece in Edmonton's urban landscape. In recent years, the City has actively promoted conservation of natural areas in the adjacent uplands (the Tablelands), through various policies (Natural Areas Management Policy and Corporate Tree Management Policy). Edmonton's 2020 City Plan sets the strategic direction for the way the City grows including continuing to develop a healthy city while also paying attention to "*one of the great challenges of our future: protecting and enhancing our land, air, water and biodiversity*." The City Plan includes a target of planting 2 million new urban trees.

The asset management plan built on an inventory of asset data and a 10-year Urban Forest Management strategic plan developed in 2012. Innovative features of the asset management plan included:

- A hierarchy for Edmonton's portfolio of natural, enhanced, and maintained urban forest assets. The hierarchy included enhanced assets being managed to evolve from landscaped areas back to areas with native species of grass, shrubs, and trees.
- Valuing green assets such as naturally wooded forests, enhanced areas at various stages of their evolution back to native species and maintained trees on city properties and along roadways.
- Identifying stakeholders for the urban forest, and relevant performance measures for accessibility, quality, safety, and sustainability.
- Forecasting costs over a 50-year planning horizon to achieve level of service targets for canopy cover, planting new trees, and increasing the areas of native species.
- Forecasting costs to manage climate change risks from invasive species and drought.
- Applying an optimization model to identify lifecycle strategies and forecast asset outcomes for various budget scenarios.

Benefits of taking an asset management approach for the urban forest include:

- Identifying a strategy for achieving the City's goals with the least asset lifecycle costs.

- Using the modelling of costs and risks to justify the operational costs of tree maintenance and ways to enhance the Urban Forest
- Using the scenario results to build a case for additional capital funding to properly maintain the Urban Forest based on best practices to manage hazards and reach corporate climate mitigation goals
- Successfully acquiring over $100 million in additional funding to plant trees over the next 8 years. This additional planting equates to a net reduction of over 3.2 million metric tons of CO2 equivalent into the environment.

Description of assets in study

Edmonton's Urban Forest Asset Management Plan covered three categories of assets - maintained trees, naturalization areas, and naturally wooded areas:

1. Maintained trees
    a. Hardscape trees
    b. Boulevard trees
    c. Open space trees
2. Naturalization areas
    a. Grass naturalization
    b. Planted naturalization
    c. Other Naturalization
3. Naturally wooded areas
    a. Tableland
    b. River Valley and Ravine

When was the activity carried out?

The plan was prepared over a 20-month period from February 2020 to September 2021.

Why was the activity carried out?

- To clearly establish strategic targets for the Urban Forest, and performance measures for tracking progress towards achieving them.
- To review best practices in urban forest management by similar jurisdictions.
- To forecast costs over 50 years based on best practices to achieve the performance targets and objectives of Urban Forest Management Plan and City Plan.
- To ensure the long-term sustainability of green assets to continue providing valuable services including climate change mitigation and improved public health.
- To provide training on asset management to Edmonton's Urban Forest team.

Description of activity

The plan followed Edmonton's standard template for asset management plans for the City's built assets. Plan content consists of:

- State of the infrastructure
- Levels of service and performance tracking

- Growth and future demand
- Asset management strategies
- Risk-based decision making
- Financial plan
- Improvement plan

Innovative Methodologies

- Valuing trees and forests. The values of individual maintained trees were estimated using the trunk formula technique. The values of natural stands including naturalization areas and naturally wooded areas represent the cost to replace the canopy of the wooded area with mature trees.
- Using GIS models of growth scenarios from the City Plan to estimate future quantities of natural areas and naturally wooded sites.
- Estimating future area of tree canopy based on average values of canopy cover for areas with different types of vegetation.
- Developing optional scenarios over different planning horizons to achieve Edmonton's strategic goals for the Urban Forest.
- Using an optimization model to identify the best strategy for achieving target levels of service under various funding scenarios.

References

City of Edmonton (2020). City Plan. The City Plan | City of Edmonton

City of Edmonton (2025). Naturalization process website. https://www.edmonton.ca/city_government/environmental_stewardship/naturalization

City of Edmonton (2024). Guidelines for the Evaluation of Trees. https://www.edmonton.ca/public-files/assets/document?path=PDF/Guidelines_Evaluation_Trees_August2020.pdf

City of Edmonton (2023). Natural Stand Valuation Guidelines. https://www.edmonton.ca/public-files/assets/document?path=PDF/DRAFT_NaturalStandValuationGuidelines.pdf

IPWEA 2020. International Infrastructure Management Manual 6TH Edition. Institute of Public Works Engineering Australia.

Risk types

Risks considered as high priority to the City were identified in the asset management plan under the following categories:

- Climate change risks to maintained trees such as insects, disease, and drought
- Human activity risks to maintained trees from constructing and maintaining other infrastructure
- Economic risks leading to inadequate budgets for all types of Urban Forest assets
- Climate change risks to naturalization areas and naturally wooded areas such as wildfire and flooding
- Human activity risks to naturalization areas and naturally wooded areas such as illegal trail building and encampments.

Risk management process

Lifecycle activities currently being completed by the City to mitigate risks were identified and included in the forecasted costs. A risk scenario was also developed to forecast the costs of mitigating droughts, a disease infestation, and an insect infestation in addition to the current lifecycle management activities for managing the forest. The City of Edmonton also has a wildfire strategy.

The risk assessment was not related to the corporate risk register.

Tools used

- Remsoft Woodstock optimization model for determining optimal lifecycle strategies for the urban forest under various funding scenarios.
- ESRI GIS for estimating key performance measures such as tree canopy and quantities of naturalization and naturally wooded areas

Costing

- Renewal costs for maintained trees were estimated using unit replacement costs and forecasting the quantity of asset renewals over the 50 year planning horizon.
- Naturally wooded areas and naturalization areas were assumed to be self-regenerating. Costs for naturalization were only estimated in canopy growth projections required to create new naturalization tree assets.
- Operating and maintenance costs were estimated using the Remsoft model and input data on the different types of operational and maintenance activities, their unit costs, the timing in the asset lifecycle when they can be applied, and their impact on the asset condition or lifespan

. People

- City of Edmonton
    - Operations Supervisor
    - Natural Areas Coordinator
    - Supervisor of City's Natural Areas
    - Urban Foresters, City Operations
    - General Supervisor, Open Space Operations
    - Supervisor, Operations Program Delivery and Partnerships
    - Team Lead, Naturalization Program
- WSP
    - Asset Management Advisory Team including specialists in data analysis, optimization modelling, risk analysis, and financial forecasts
    - Environmental Management Expert
    - Environmental Conservation Specialist
    - Registered Professional Forester
    - Arborist

Evaluation

What was the main output of the activity?

A long-term plan for managing the City of Edmonton's Urban Forest incorporating:

- Best practices by similar jurisdictions.
- Clear strategic targets for managing the Urban Forest and performance measures for tracking progress towards achieving them.
- Forecasted costs for achieving the targets and managing risks.
- Optimal strategies for various levels of funding.
- Secured funding for planting new trees
- Recommendations for improving the City's asset management system for the Urban Forest.

Validation

Forecasting model inputs and outputs prepared by the consulting team were reviewed by the City of Edmonton's team before using them to develop the management scenarios.

Outcome

The Urban Forest Asset Management Plan was a success for the City of Edmonton leading to an additional $8 million in funding to plant additional renewal trees and to fund other lifecycle activities for tree renewal. The canopy cover growth projections with clear costing and quantities of different asset types to show how Edmonton plans to reach 20% canopy cover by 2071 helped secure nearly $100 million in funding for growth planting over eight years.

Figure 1: Edmonton Natural Area (Image courtesy of City of Edmonton, https://www.edmonton.ca/residential_neighbourhoods/gardens_lawns_trees/trees-urban-forestry).