The Pelham Greenbelt

Natural Asset Management Project

Summary Report

November 2024

Invest in Nature

The Natural Assets Initiative (NAI) is a Canadian not-for-profit that is changing the way local governments, watershed agencies, and others deliver everyday services — increasing the quality and resilience of infrastructure at lower costs and reduced risk. The NAI team provides scientific, economic, and municipal expertise to support and guide local governments in identifying, valuing, and accounting for natural assets in their financial planning and asset management programs, and developing leading-edge, sustainable, and climate-resilient infrastructure.

Town of Pelham Land Acknowledgement

The Town of Pelham acknowledges the land on which we gather is the traditional territory of the Haudenosaunee and Anishinaabe peoples, many of whom continue to live and work here today. This territory is covered by the Upper Canada Treaties and is within the land protected by the Dish With One Spoon Wampum agreement. Today this gathering place is home to many First Nations, Métis, and Inuit peoples and acknowledging reminds us that our great standard of living is directly related to the resources and friendship of Indigenous people.

Acknowledgement

This project was generously supported by the Greenbelt Foundation.

Possibility grows here.

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Key Messages

I/ The Pelham Greenbelt Project identified natural assets in both the Town of Pelham, home to significant environmental features and agricultural lands, as well as lands that intersect with Ontario's Greenbelt. At 2 million acres, the Greenbelt is an ecologically rich protected area that supports key habitats and ecosystem services for millions of Canadians in the Golden Horseshoe region.

Maintaining natural assets and ecological connectivity in these areas is important for economic and environmental prosperity in the larger region, especially with respect to addressing climate change and development pressures.

II/ The inventory assessment defined a total of 4,428 individual natural assets across 10,458 hectares, the majority being agriculture followed by swamp and forest. Overall, about 26% of the assets were in *very good* condition, and about 12% were assessed in *good* condition.

III/ Natural assets provide $585,859,327 in stormwater management services, based on the capital costs to replace similar services with built infrastructure (specifically stormwater management ponds and low-impact development units).

IV/ Natural assets also support several co-benefits — taken together the combined ecosystem service value for carbon sequestration, recreation, freshwater supply, and habitat provision ranges from $22.1 M to $24.7 M per year.

V/ The Project includes recommendations and a planning framework to guide the Town of Pelham's continued improvement in natural asset management, manage current risks facing natural assets, and support effective, climate-resilient asset management and land-use decision making.

1.0 Introduction

Canadian local governments, conservation authorities, Indigenous Nations, and other entities face infrastructure and asset management challenges. Many services these organizations provide, including water and wastewater, transportation, flood attenuation, and erosion control, depend on ageing engineered infrastructure assets that need renewal, and face additional pressures from climate change.

Effective stewardship of natural assets[1] helps these entities deliver more resilient services in a changing climate, reduce associated costs, and provides an alternative to "building their way out" of infrastructure challenges. Natural assets can provide both critical infrastructure services and numerous co-benefits that make a community worth living in. This practice has become known as a natural asset management (NAM), a subset of the broader field of nature-based solutions (NbS). NAM enables nature to be conceptualized, accounted for, and managed as a vital asset to ensure its long-term viability.

Within this context, the Town of Pelham, Ontario, with support from the Greenbelt Foundation, partnered with the Natural Assets Initiative (NAI) on the Pelham Greenbelt Natural Asset Management Project to **identify**, **measure**, **value**, and ultimately **manage** Pelham's natural assets — with specific focus to those that overlap with Ontario's Greenbelt — to ensure a reliable flow of core services and diverse co-benefits.

The urgency to accelerate NAM is particularly acute in urban and peri urban areas; approximately 80% of Canadians live in the interface between natural and urban areas where nature is extremely important, but also highly vulnerable.[2] The Pelham Greenbelt Natural Asset Management Project [hereafter, the Project] addresses this need, and is designed to integrate nature and its services into Pelham's financial planning and asset management programs.

This report provides a summary of project results to date; full details on the Project's methodology, sources, and approach are provided in the Technical Report.[3]

The Town of Pelham maintains a public website to share updates related to its Municipal Natural Asset Management Plan Project at *engagingpelham.ca/mnamp*.

1 The term 'natural assets' refer to the stock of natural resources or ecosystems that a municipality, regional district, or other watershed rightsholders or stakeholders could rely on or manage for the sustainable provision of one or more services (MNAI 2017).

2 Brown et al. (2021)

3 Available at naturalassetsinitiative.ca

2.0 Project Goal & Objectives

The Project's goal is to ensure that the natural assets within the Town of Pelham, and particularly those that overlap Pelham and the Greenbelt, are understood, measured, valued, and ultimately managed to protect their integrity, and thus ensure their reliable flow of core infrastructure services and diverse co-benefits.

Three objectives support this goal:

1/ Understand the current roles of natural assets in the project area in providing stormwater management and flood mitigation services to the residents of Pelham

2/ Quantify the value of natural assets in the project area in terms of service provision, including determining costs and benefits relative to engineered alternatives

3/ Develop strategies for long-term management of natural assets based on this understanding

2.1 Natural Asset Management Methodology

The methodology for the Pelham Greenbelt Natural Asset Management Project is based on standard asset management practices that Canadian local governments are increasingly required to adopt, and which are articulated by organizations such as Asset Management BC, based on global norms (see Figure 1). NAI has adapted methodologies to ensure that natural assets — which are complex in their role in service delivery, are context-specific, and present novel considerations — can be effectively integrated and considered in asset management.

Figure 1: Natural Asset Management Wheel

Source: NAI, 2017; Adapted from Asset BC, 2014

Why use an asset management-based methodology to understand the relationship between local governments and nature?

- Asset management is becoming ubiquitous among Canadian local governments, offering scope to make NAM a broadly based, scalable and comparable practice.
- Ontario is the first province in Canada to regulate asset management planning at the municipal level and to require consideration of both human-made and natural assets as part of this process.
- Asset management provides a useful and practical approach for conceptualizing nature not simply in narrow aesthetic terms, but as something upon which communities rely for a multiplicity of important services.
- Asset management is proving to be a mechanism that helps integrate nature-related considerations into core local government decision-making, thus broadening its relevance beyond departments that focus on environmental matters.

3.0 Local context

The Town of Pelham (population ~18,192 as of 2021) is in the centre of the Niagara Region in the province of Ontario. Pelham is located within the Ontario Greenbelt — the world's largest greenbelt at over 2 million acres (> 80,000 ha), the Greenbelt is a protected area of greenspace, farmland, forests, and wetlands that surrounds much of Ontario's Golden Horseshoe region.

3.1 Geography

The Project required two study areas. The primary modelling focus for the Project are Pelham lands that intersect with the Greenbelt, specifically the ecological boundary of the Upper Twelve Mile Creek (UTMC) subwatershed. Where possible, results were provided for the entire Town of Pelham to accommodate Pelham's desire to complete natural asset management within its jurisdiction (see Figure 2)

The Upper Twelve Mile Creek is a natural ecosystem largely untouched by human activity and provides a diverse landscape and unique ecosystem. The stewardship of this watershed is crucial for maintaining high-quality groundwater for the Town of Pelham while preventing erosion and providing flood control for the lower and middle Twelve Mile Creek.

The Town of Pelham is the second, larger scope for the project (see Figure 3). It is one of twelve municipalities of the Niagara Region. This broader scope was identified for natural asset management, which is completed at a jurisdictional scale.

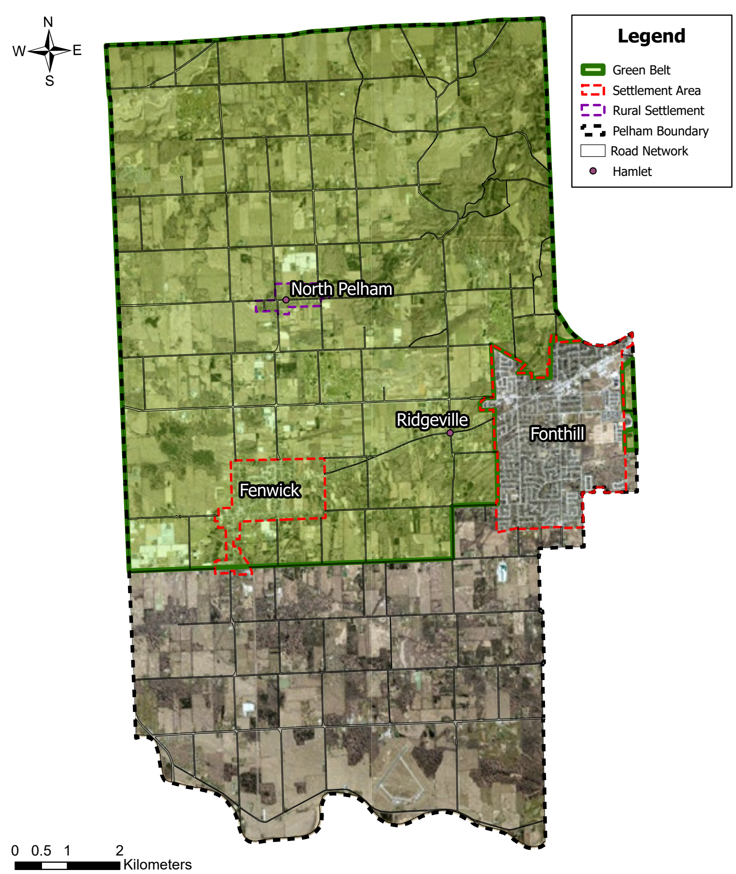
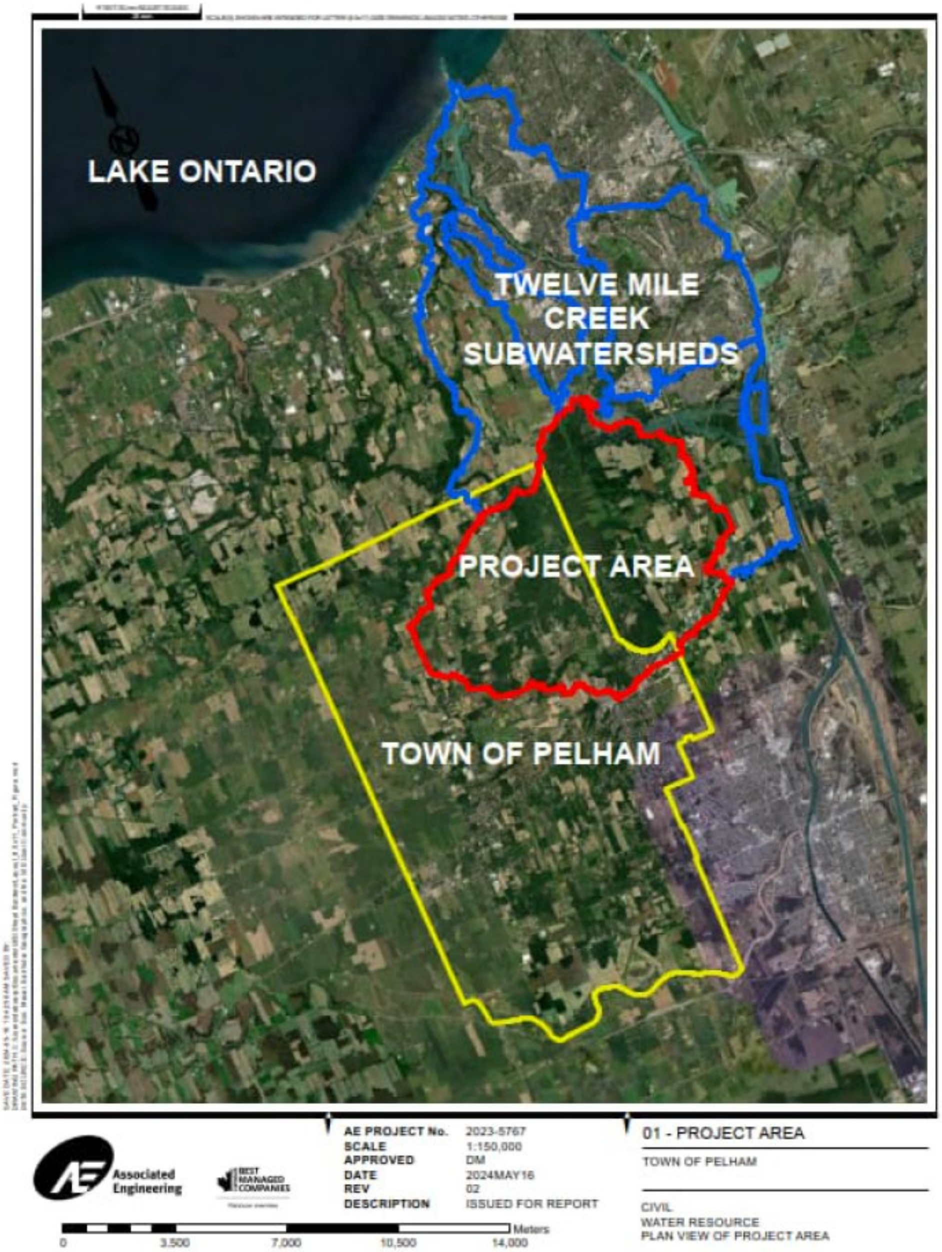


Figure 2: Project Area

Figure 3: Study Area 1 - Upper Twelve Mile Creek Subwatershed Boundary



3.2 Indigenous Peoples

The project area is located on the traditional territory of the Haudenosaunee and Anishinaabe peoples. The territory is covered by the Upper Canada Treaties and protected by the Dish With One Spoon Wampum agreement. Today, the project area is home to several First Nations, Métis, and Inuit people. The Project and related work respect their Rights and Title.

The Project has several limitations with respect to Indigenous Peoples. Indigenous Traditional Knowledge and practices are based in a holistic and inherent understanding of nature, the benefits it provides, and the connections between all living things. All NAM initiatives, including the Pelham Greenbelt Natural Asset Management Project, will achieve better outcomes when they include Indigenous worldviews, knowledge, and perspectives.

This requires sustained, meaningful collaboration with Indigenous Nations. The Project provides an opportunity to learn from those who have lived in the region for millennia and determine ways in which their knowledge and perspectives can inform and be included in all resultant project programming.

3.3 Land Use

The land us in the UTMC subwatershed is a mix of rural and urban communities with natural areas, including mixed forests. 'Rural' is the dominant land class and are primarily agricultural lands (hosting greenhouses, nurseries, orchards, cash crops, and some livestock), but include estates and rural residents, a LaFarge quarry operation, and a few golf courses. The UTMC includes geological features such as the Niagara Escarpment and Fonthill Kame. Natural features include the last spring-fed cold-water stream in Niagara Region and several conservation areas.

The total built or impervious area is estimated at over 20%[4] of the total subwatershed area. If the total impervious area continues to increase, services provided by the subwatershed (water quality, erosion control) will degrade and the unique characteristics of the subwatershed will be at risk.

3.4 Governance, Policy and Structures

As in many communities, natural assets in the Town of Pelham are within a multi-owner, multi-jurisdiction, and multiuse area. Many entities including local governments, the Niagara Peninsula Conservation Authority (NPCA), the Niagara Escarpment Commission (NEC), and the Province of Ontario share governance responsibilities. Most of the land is in private ownership. A small percentage is in public ownership or stewardship (e.g., Nature Conservancy of Canada lands, Niagara Region public lands, Pelham public lands, NPCA lands and Short Hills Provincial Park.).

4 Baker, J. L. (2021).

4.0 Current State of Natural Assets

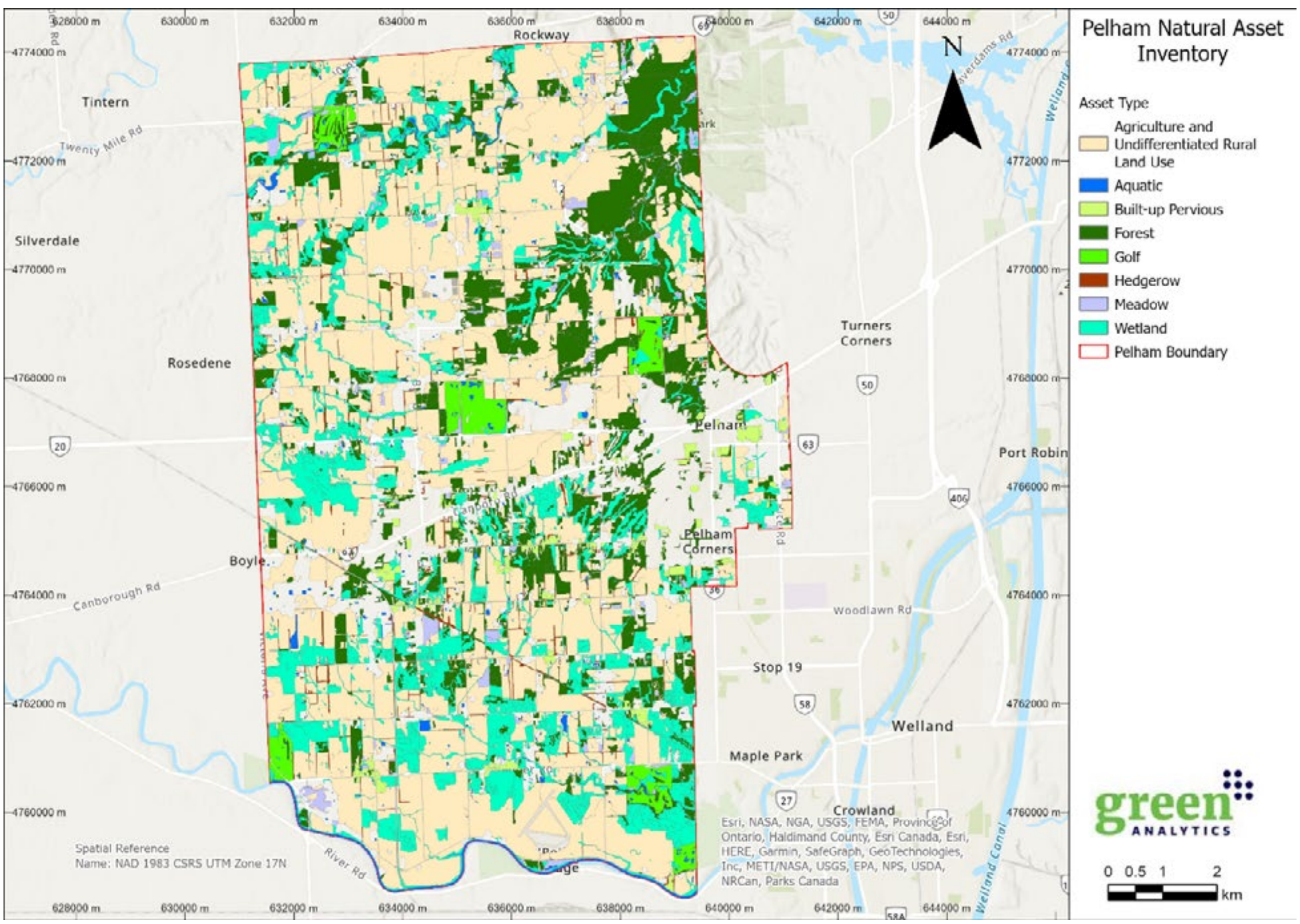
The first step of natural asset management (see Figure 1) is assessment, which involves inventorying existing natural assets, the current services they provide and that service value, their condition, and options to continue improving understanding.

4.1 Identification of Natural Assets

NAI employed data from multiple sources to establish the natural asset inventory — the inventory includes an asset registry (which is a tabular representation of the data) and an online dashboard, which is available at *go.greenanalytics.ca/pelham*. The dashboard provides a helpful visual representation of the inventory in the mapped project area and allows viewers to filter data based on specific asset types or condition.

The inventory assessment defined a total of 4,428 individual assets, covering 10,458 hectares (ha).[5] The majority of natural assets in Pelham are agriculture, followed by swamp and forest. Figure 4 shows the distribution of natural assets in the Town of Pelham.

Figure 4: Spatial Distribution of Natural Assets



5 An **asset** is defined as a continuous area of the same land cover type. For example, an intact forested area would be defined as one asset, but a forested area that is bisected by a road would constitute two assets.

4.2 Natural Asset Condition Assessment

Documenting the condition of natural assets is a key aspect of natural asset inventories. A natural asset condition assessment provides an understanding of both the ecological integrity of natural assets, and their ability to provide services. This information, in turn, can support the effective management of natural assets, be reflected in the registry and the dashboard, and updated over time.

NAI completed a desktop-based condition assessment and built it into the inventory to provide an initial understanding of the status of the natural assets for Pelham. The framework and process used for the condition assessment in this project aligns with the recently released Canada-wide standards and specifications for natural asset inventories, CSA W218:23.

CONDITION INDICATORS

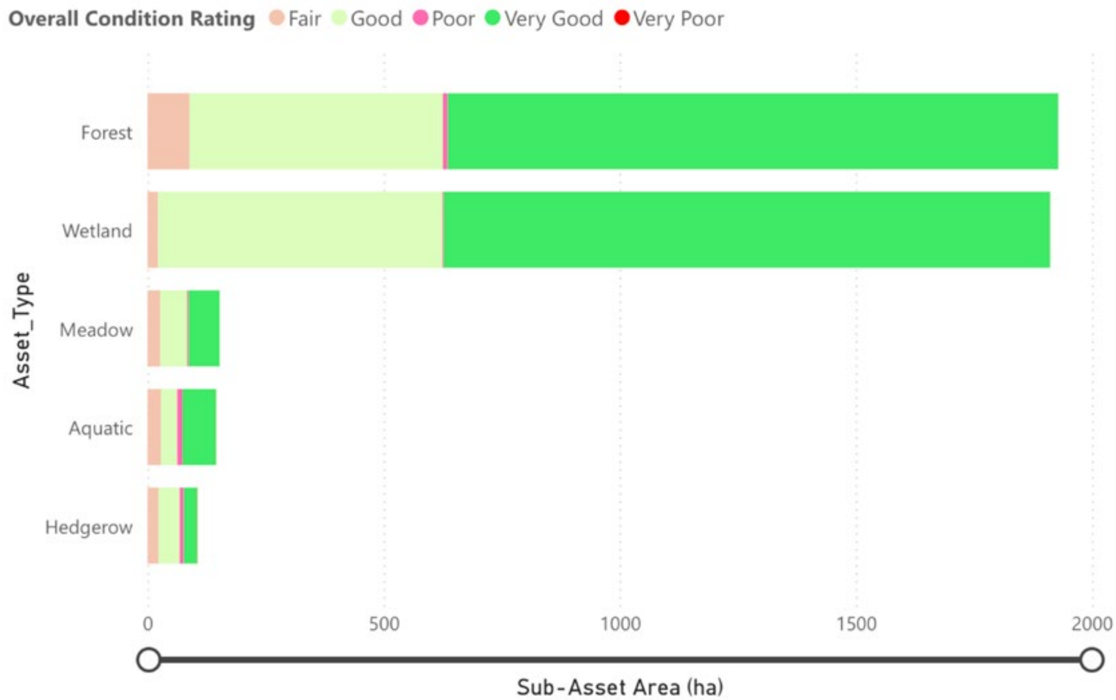
The indicators employed in the desktop assessment are proxy metrics for broader ecological condition considerations. The underlying assumption for natural asset condition assessments is that an asset that is assessed as being in a “good” condition from an ecological perspective is anticipated to be able to provide a “good” level of ecological services.

CONDITION RESULTS

Overall, about 2,744 ha (or 26%) of natural assets were assessed in very good condition and 1,275 ha (or 12%) were assessed in good condition. Forest and wetland assets largely ranked good and very good, while meadow, aquatic and hedgerow assets ranked across the full range of condition scores, from poor to very good.

Figure 5 shows the results of the condition assessment by asset type. **These results signal the strong role of natural assets to provide or supplement services over the long term, as well as their role in addressing risks such as climate change and development pressure resulting from population growth**.

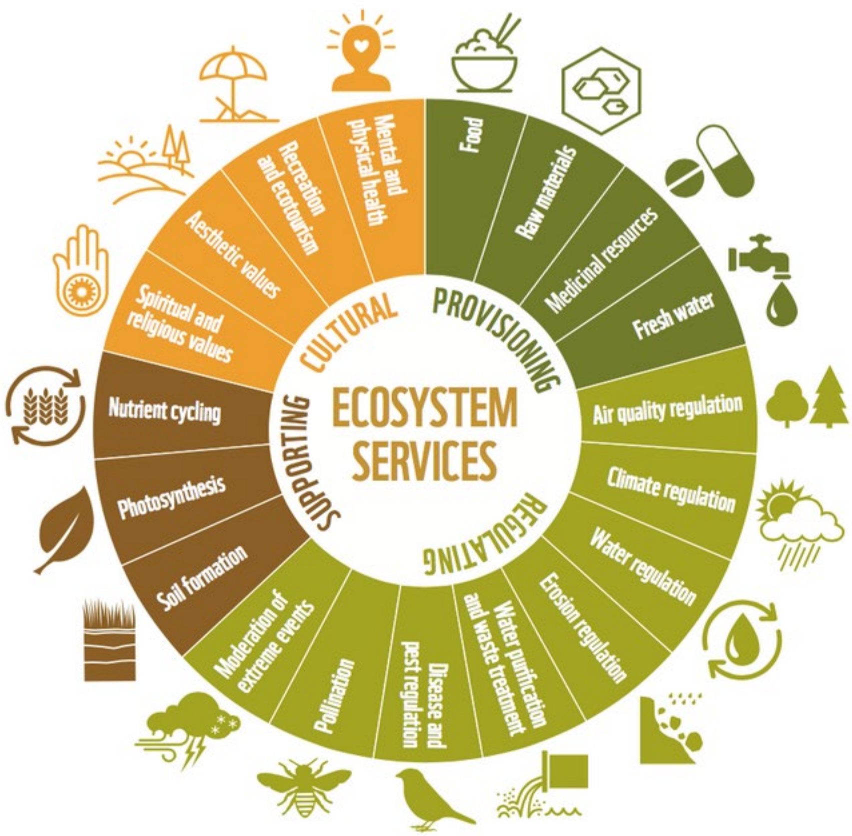
Figure 5: Summary Of Condition Rating by Natural Asset Type



5.0 Value of Natural Asset Stormwater Services and Co-Benefits

NAM is about far more than assigning a financial value to services provided by nature. Individual service values only represent a small subset of what nature provides and should never be construed as a "value" of nature itself. Nevertheless, valuations can be helpful tools to build awareness and inform decision-making when they are situated within a broader understanding of the importance and irreplaceability of nature. Figure 5 provides an overview of potential benefits.

Figure 6: Ecosystem Services Diagram from WWF's Living Planet Report (2016)



5.1 Assessing Natural Asset Stormwater Services

Stormwater management (SWM) was the core service considered for the Pelham Greenbelt project, and the only service modelled to develop an in-depth understanding of the role of natural assets in managing stormwater.

Associated Engineering Ltd. (Associated) was retained by the Town of Pelham as part of a multidisciplinary team lead by NAI to prepare SWM hydrologic modelling and costing analysis of the UTMC subwatershed. The analysis evaluates the SWM services provided by the natural areas in the subwatershed and allow for a comparison of the estimated costs of replacing these ecosystem services with engineered stormwater management facilities.

This valuation is the first of its kind for Pelham and lays the foundation for further asset valuation studies, which are expected to enhance its asset management program and allow for more informed decision-making regarding protection and management of Pelham's natural assets. There have been very few studies of this kind completed, particularly in Ontario and of this scale. This study can serve as an example for other municipalities as they work to integrate natural assets into their asset management programs.

STORMWATER SCENARIO MODELLING

PCSWMM (Personal Computer Storm Water Management Model) was selected as the hydrologic model because it can accurately simulate rainfall/runoff processes using the SWM Model (SWMM) engine.

The model is run with a synthetic rainfall distribution to determine worst-case scenario results in each scenario. The 100-year return period storm for the 12-hour AES (Atmospheric Environment Service) distribution was used as the synthetic rainfall distribution.

Regarding SWM services, the purpose of the model is to provide data on changes to peak flow and runoff depth between the different scenarios.

Peak flow	Runoff depth
Peak flow is the maximum rate of discharge during the 12-hour 100-year AES storm event, often resulting in erosive forces and water level increases, such as flooding, scouring, and erosion of riverine and/or local drainage systems. Stormwater quantity controls are typically designed to limit a development's peak runoff rate to prevent downstream impacts (i.e., flooding, erosion) due to the increased runoff rate and volumes resulting from development.	**Runoff depth** (mm) is part of the water balance process and represents the excess water leaving a subcatchment after a rainfall event occurs. The water balance process includes inputs such as: ▪ Precipitation ▪ Run-on from other subcatchments ▪ Hydrological processes that occur on the subcatchment, like infiltration and evaporation A high runoff depth may indicate a degraded ecosystem and may cause erosion, flooding, and stress to the groundwater system.

Three scenarios were modelled:

Scenario 1 represents the existing (i.e., baseline) conditions of the UTCM subwatershed, with natural assets distinguished separately into forest and wetland subcatchments.

Scenario 2 is defined by the replacement of the natural asset subcatchments from Scenario 1 with subcatchments that represent a 'natural area catastrophic loss' land-use (i.e., bare earth).

Scenario 3 adds built stormwater infrastructure to Scenario 2 to match the infiltration and peak flow reduction achieved by the natural asset subcatchments in Scenario 1. This includes stormwater ponds and low impact development (LID) units.

SCENARIO RESULTS

Detailed modelling results are available in the Technical Report.

Comparing Scenario 2 to Scenario 1, the runoff depth appears to increase across the watershed (by approximately 25 mm). The removal of natural assets and reduction of infiltration potential of the soil increased the amount of runoff leaving each catchment, creating higher peak flows in Twelve Mile Creek.

Scenario 3 reveals that LID units did not have a significant impact on reducing peak flow, as the headwater streams of Twelve Mile Creek continued to experience an elevated peak flow caused by the removal of natural assets. Stormwater ponds employed in this scenario had a larger impact in reducing peak flow.

In sum, the scenario modelling results reveal that removal of the natural assets led to an increase in peak flows—up to six times the flow rate in certain areas, as well as an increased runoff depth. The scenario analysis further demonstrated that built infrastructure has mixed effectiveness in reducing flow rate, with stormwater management ponds being more effective that LID units. Built infrastructure was able to reduce runoff depth, but this solution comes with larger construction and maintenance costs, in addition to a loss of co-benefits provided by natural assets

5.2 Stormwater Service Valuation Results

To determine the value of stormwater services provided by natural assets, the Project team calculated the estimated costs of replacing these services with engineered stormwater management facilities (specifically SWM pond and LID units). The approximate costs of engineered infrastructure to manage stormwater were determined using recent construction tender prices for building stormwater ponds and LID units local to Southwestern Ontario.

The following preliminary conclusions from the valuation are based on results of modelling completed to date:

- Value of stormwater services is $585,859,327, which is the capital cost to manage a similar capacity of stormwater with built infrastructure.
- Removal of the natural assets resulted in significant projected increase to peak flow and a significant projected increase to runoff depth.
- The SWM infrastructure in Scenario 3 was able to replicate the peak flow and runoff depth results from Scenario 1.

While this study provides a quantifiable monetary value to a subset of natural asset services, this value should not be used as a method of replacing these natural assets. Natural assets also provide many other benefits that cannot be replicated by engineered stormwater infrastructure. A selection of co-benefits and their values are explored in the following section.

5.3 Co-Benefit Valuation Results

Several services were selected for valuation for the Town of Pelham. These include **climate regulation**, **fresh water**, **recreation services**, and **habitat provision** to support biodiversity.

This analysis estimated the value of several ecosystem services provided by the natural assets within the Town of Pelham. Taken together, the combined annual value of recreation, carbon sequestration, freshwater and habitat was estimated to range from $22.1 M to $24.7 M per year (see Figure 7).[6]

Figure 7: Annual Ecosystem Service Values within the Town of Pelham

6 While these are annual figures, the replacement estimate is not annual, as built infrastructure will have a lifespan longer than one year. However, built infrastructure will also require maintenance and eventual replacement.

6.0 Planning Phase of Natural Asset Management

"Most natural assets in an urban setting can be sustained for many decades, and longer, with the correct biophysical conditions and the adoption of appropriate management actions"

Credit Valley Conservation, 2020

6.1 Level of Service Framework

Levels of Service (LOS) are objectives and performance measures that define the expected performance of assets and related services and are an essential pillar of asset management. Defining LOS enables municipalities to link strategic organizational objectives with technical and operational requirements of infrastructure and is a way to guide a local government towards optimizing investments in infrastructure and service delivery.

One of the objectives of this Project is to recommend a level of service framework for natural assets for the Town of Pelham to guide decision-making related to natural asset management.

The framework is based on defining levels of service for the following priority services of interest identified by the Town of Pelham, including:

- Stormwater (incl. flood management)
- Water (for drinking and irrigation)
- Biodiversity (incl. habitat for species at risk)
- Nature-based recreation
- Climate mitigation and adaptation

STRATEGIC DRIVERS OF NAM FOR THE TOWN OF PELHAM

Several of the Town of Pelham's guiding documents include goals, objectives or policy considerations for the protection and proactive management of natural assets, described below. These constitute Pelham's current drivers of NAM, and the LOS framework was developed to be aligned with them.

Proposed LOS objectives are provided in the Technical Report.

6.2 Operations and Maintenance Activity Costing

Like engineered assets, natural assets need to be managed proactively to avoid deterioration of the services they provide. Operations and Maintenance (O&M) plans are an essential component of asset management and, in the case of natural asset management, may include monitoring, maintenance, acquisition, and restoration.

O&M costs for natural assets are often lower than engineered infrastructure since ecological functioning occurs independent of human assistance. With proper monitoring, maintenance, and rehabilitation today, natural assets can provide services for a period longer than that for engineered infrastructure, minimize service disruptions, provide a wide range of co-benefits, and promote long-term resilience.

For the natural assets on public-owned land identified in the Pelham Greenbelt project, which include wetlands (both natural and constructed), forests (both urban and street trees) and watercourses, common O&M activities were estimated over a 10-year period for those assets on public lands.

The estimates provide ideal O&M costing to maintain natural assets in a high condition but will vary by ecosystem location and health. Estimate O&M costs range from about $811,000 to $1.7 M a year. Annual estimates for each asset class are provided in Section 5.2 of the Technical Report.

7.0 Conclusions and Recommendations

The Project provides the Town of Pelham with insight into the state of natural infrastructure in its jurisdiction, with specific emphasis on lands within the Greenbelt. It has also estimated the value of stormwater services and other co-benefits the natural assets provide.

Natural asset management is an iterative process that requires continual improvement—in other words, ongoing, adaptive management. To this end, NAI provided 11 recommended next steps for Pelham to better protect and proactively manage natural assets, with consideration to the project results and the NAM roadmap that Pelham completed in 2023.

Each recommendation is listed in detail in the Technical report; for the purposes of this summary, the suggested steps are summarized by their underlying themes.

A/ Protect what you can

It is much easier (and more cost effective) to protect existing natural spaces than it is to rehabilitate or restore ecosystems once they are lost. Suggested actions for the Town of Pelham are to:

- **Review policies and governance** to ensure the large tracts of intact natural assets in the Greenbelt are proactively managed where possible. For example, Pelham could develop a specific natural areas policy, create bylaws to support ecosystem service protections, or strengthen commitments to natural asset management in official plans.
- **Identify priority areas for naturalization**. In this case, priority areas could be determined by local climate projections, which may reveal growing vulnerability in certain areas that could be addressed through naturalization.
- **Continue to secure or protect forests and wetlands** to ensure ecosystem services will be sustained long-term. Pelham has already secured some land through Environmental Protection designations and should explore mechanisms such as conservation easements, tax credits, and partnerships (e.g., with NPCA) where public land securement is not possible.

B/ Use evidence-based decision making to manage natural assets

Insights gained from this project, along with existing data, should be employed by Pelham to advance natural asset management, meet planning objectives, and make informed decisions about the infrastructure on which the community relies. Pelham should pursue ongoing improvement and increase capacity where possible; next steps can be to:

- **Proactively monitor and manage erosion sites**, beginning with a high-level risk identification to understand the extent of risk facing natural assets or other public infrastructure. While Pelham have secured assessment funding for 2024, it should also seek ongoing budget support to establish a management plan and conduct ongoing monitoring of erosion sites.
- **Formalize invasive species management**, which is currently conducted on an ad-hoc basis. As invasive species are considered a high risk to natural assets in the Niagara Region, its recommended that Pelham make use of existing studies and regional monitoring programs, progressing to formal, proactive invasive species management over time.
- **Review opportunities to proactively manage riparian areas along watercourses** for source water quality and quantity protection. For example, Pelham can proactively designate certain watercourses as municipal drains through Ontario's Municipal Drainage Act (1990). Twelve Mile Creek is not currently considered a municipal drain, but doing so would allow Pelham to gain access privileges to maintain watercourses in areas that are experience drainage issues.
- **Strengthen assessment of natural assets and related services**. Now equipped with a natural asset inventory, the Town of Pelham could improve its understanding of natural asset condition and risks to better inform investments. If additional resources are secured, Pelham would benefit from ground truthing the initial condition assessment, expand stormwater modelling to include a climate change scenario, and pursuing a monitoring framework with NPCA.
- **Include a costed lifecycle management strategy for natural assets** in updates to Pelham's Asset Management Plan, which would align with Ontario's asset management regulations for municipalities (O. Reg 588/17), and specifically green infrastructure requirements.

C/ Build awareness and partnerships

Many of the natural assets that provide ecosystem services to the community in the Town of Pelham are not owned by Pelham, and it does not have direct control over their management. To be effective, natural asset management requires a whole of community effort. To this end, Pelham should:

- **Support collaborative partnerships to advance natural asset management**, as many natural assets that deliver services are not owned or managed by Pelham. Different rightsholders and stakeholders can support various activities including data collection and stewardship. These include universities, First Nations, neighbouring municipalities, regulatory agencies, and private landowners.
- **Develop a communications plan to build awareness of the value of natural asset management in the watershed**. These natural assets provide benefits not just to Pelham, but also to communities downstream; it will be important for Pelham to communicate ongoing results of NAM activities to the public and wider region in order to build support for and collaborate on future initiatives.
- **Build staff and council awareness and support of natural asset management** as knowledge within the organization is currently limited. In the short term, Pelham can strengthen staff and Council awareness through dissemination of this report and related communications, as well as allocate resource for professional development and peer learning opportunities in both asset management and NAM.

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Natural Assets Initiative

MAKING NATURE COUNT