

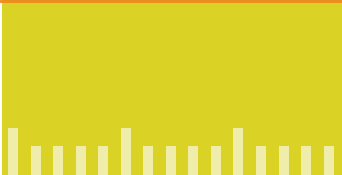


Toward natural asset management in the City of Orillia Ontario



Summary of inventory results and recommendations September 2021

This document features interactive elements! Clicking on a heading or sub-heading in the Table of Contents (ToC) will take you directly to that page. Also, clicking on page numbers in the footer will bring you back to the ToC.



Municipal Natural Assets Initiative





Invest in Nature

The Municipal Natural Assets Initiative (MNAI) is a Canadian not-for-profit that is changing the way municipalities deliver everyday services - increasing the quality and resilience of infrastructure at lower costs and reduced risk. The MNAI 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.

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1 Purpose

This document summarizes the results of a project to develop a natural asset inventory in the City of Orillia and documents steps the local government can take to proceed to a full natural asset management initiative.

2 Introduction

What are municipal natural assets

The term *municipal natural assets* refers to the stock of natural resources or ecosystems that a municipality, regional district, or other form of local government could rely upon or manage for the sustainable provision of one or more local government services¹.

Why manage natural assets

A growing number of local governments recognize that it is as important to understand, measure, manage and account for natural assets as it is for engineered ones. Doing so can enable local governments to provide *core* services such as stormwater management, water filtration, and protection from flooding and erosion, as well as *additional* services such as those related to recreation, health and culture. Outcomes of what is becoming known as *municipal natural asset management* can include cost-effective and reliable delivery of services, support for climate change adaptation and mitigation, and enhanced biodiversity.

How to manage natural assets

There are numerous ways for local governments to manage natural assets. The Municipal Natural Assets Initiative (MNAI) uses methodologies and tools rooted in standard asset management and provides a range of advisory services to help local governments implement them. MNAI has developed the methods and tools with significant investments, piloting, refinement, peer review, and documentation of lessons in multiple Canadian provinces. MNAI's mission is to make natural asset management a mainstream practice across Canada, and in support of this, for local governments to accept and use the methodologies and tools in standard ways across the country.

¹ mnai.ca/media/2018/02/finaldesignedsept18mnai.pdf

What is a natural asset inventory?

Natural asset inventories provide details on the types of natural assets a local government relies upon², their condition, and the risks they face. As depicted in Figure 1 and explained in detail in the Annex, a natural asset inventory is the first component of the Assessment phase. The Assessment phase, in turn, is the first of three phases of a full natural asset management project. By itself, an inventory will not give a sense of asset value but is an essential first step in the full natural asset management project.

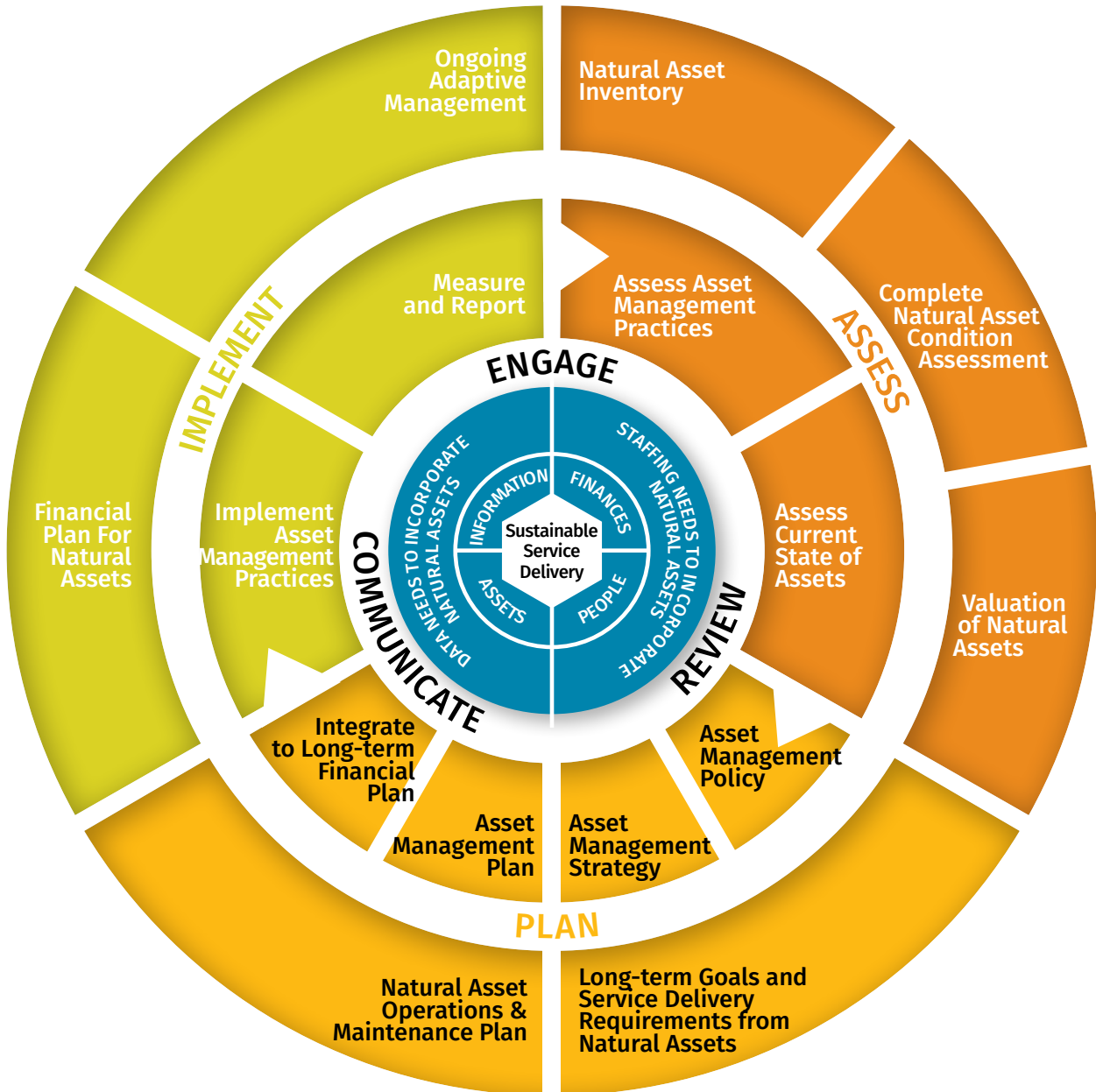


Figure 1: The Asset Management Process. MNAI has adapted this for use with natural assets.

² Note that many local governments rely on services from natural assets they do not own.

3 Local government context

3.1. General



Figure 2: The City of Orillia³.

The City of Orillia (population ~ 31,000) is in Ontario between Lake Couchiching and Lake Simcoe. Also known as the Sunshine City, it places great importance on its natural assets.

The City of Orillia's Official Plan emphasizes "design policies for greening" in development proposals.⁴ The policy for strategic asset management indicates that the City of Orillia "recognizes the importance of Green Infrastructure Assets and will include these in its inventories and Asset Management practices."

High priority services from natural assets include climate change resilience, stormwater and flood control, habitat diversity, and providing aesthetic, recreation, and public health benefits. Urban forests, woodlots, and street trees are its current priority classes of natural assets.

The City of Orillia's natural asset management objectives are to better understand the services that natural assets provide and on which they rely, and how to manage those natural assets effectively. This, together with resulting enhanced public and political awareness, can inform capital project decision-making and a planning policy that includes natural assets.

Specifically, the City of Orillia wants to expand its understanding of parks and green spaces in stormwater management, and of street trees in the context of developing a woodlot management strategy for which it is currently undertaking a Woodlot Management and Emerald Ash Borer Action Plan.

³ Wikipedia. Retrieved April, 2021 from en.wikipedia.org/wiki/Orillia

⁴ Orillia Official Plan. www.orillia.ca/en/city-hall/resources/OfficialPlanText.pdf Retrieved May 2021.

3.2. Asset management readiness assessment

As part of inventory development, MNAI helps local governments determine their overall state of asset management maturity. To do this, MNAI has adapted the Federation of Canadian Municipalities (FCM)'s asset management readiness assessment tool⁵ to help local governments measure their progress on both asset management and natural asset management in four competency areas, with each area describing outcomes based on five levels of progress or maturity.

The completed readiness assessment helps local governments prioritize actions that increase their effectiveness in managing all assets, including natural ones.

The City of Orillia's asset management readiness assessment indicates it is generally at an early stage of formally adopting asset management. Natural asset management activities are undertaken but limited to the Parks department and there is no formal asset management plan guiding natural asset management activities. This MNAI inventory project is the City of Orillia's first step in formalizing natural asset management.

The City of Orillia has an asset management policy that references the role of green infrastructure in service delivery, and the organization has recognized the benefits it would like natural assets to deliver to meet organizational objectives. It is currently developing an asset management strategy and an asset management plan that focuses on engineered assets and does not yet integrate natural asset considerations. The City of Orillia is also committed to meeting the requirements of O. Reg. 588/17, which requires it to include natural assets in its asset management plans by 2024.

In the people and leadership competency area of the readiness assessment, the City of Orillia has an asset management team, but no team member yet with skills and responsibilities related to incorporating natural asset management considerations.

The City of Orillia has a central data repository of core engineered assets that includes some information on asset condition and performance of critical assets collected from a variety of sources. As the City of Orillia's first step in developing a formal natural assets inventory, the MNAI project is building on some of the mapping and data that City staff has already collected. The City of Orillia does have basic condition and performance information for trees in parks, trails and natural areas but has not done a valuation of services from urban forests, nor has it developed levels of service for them. The City of Orillia has discussed doing an inventory of its tree canopy cover although actions have yet to commence.

⁵ See [fcm.ca/sites/default/files/documents/resources/tool/asset-management-readiness-scale-mamp.pdf](https://www.fcm.ca/sites/default/files/documents/resources/tool/asset-management-readiness-scale-mamp.pdf) for details

In relation to financial data, the City of Orillia is at a relatively early stage of asset management. It is working towards linking its asset financial information for core engineered assets and has not done any valuation of natural assets. Similarly, the City of Orillia is at an early stage in terms of developing a structured approach to asset investment planning and each department approaches asset management differently. An asset management plan for core engineered assets is currently under development. While the City of Orillia does have a management plan for a large natural area within city limits and is developing management plans for woodlots, these plans are not yet integrated into an organization-wide approach and do not consider the full range of services natural assets provide, such as stormwater management. It actively manages trees but has not assigned a service value to them.

The City of Orillia is at an intermediate stage for asset management budgeting and financial planning. It is moving away from reactive budgeting for immediate needs to more proactive planning to manage the lifecycle of core engineered assets. It has a 10-year plan for capital projects related to core engineered assets, and financial staff are involved in developing the projections for the plan. The City of Orillia also has an annual capital budget allocation for some natural assets and a 10-year capital plan across parks and recreation. However, these activities are currently isolated from services that should include natural asset considerations such as stormwater management.

4 Natural asset inventory

4.1. Inventory overview

MNAI's natural asset inventories have two main components to express natural asset information: an asset registry (which is a tabular representation of the data) and an online dashboard. MNAI provided the registry to the City of Orillia in an Excel file and the dashboard as a website address. Information on the condition of the assets is a subset of the inventory and is depicted in both the registry and dashboard.

4.2. Inventory data

To establish the inventory, MNAI obtained data from the City of Orillia, Ontario GeoHub and Statistics Canada. MNAI combined the spatial data layers to establish a comprehensive depiction of natural assets. Table 1 describes the data sources used to develop the inventory and condition assessment.

TABLE 1: SUMMARY OF DATA USED

DATASET NAME	SOURCE	PURPOSE
Orillia_Boundary	City of Orillia	Used to delineate study area
Southern Ontario Land Resource Information System (SOLRIS) 3.0	Ontario GeoHub	Used as base landcover dataset for creating initial natural asset inventory
Orillia_Local_Wetlands	City of Orillia	Used to supplement SOLRIS data in creating a more comprehensive landcover dataset
Orillia_SWM_Ponds	City of Orillia	Used to supplement SOLRIS data in creating a more comprehensive landcover dataset
Orillia_Waterbodies	City of Orillia	Used to supplement SOLRIS data in creating a more comprehensive landcover dataset
Orillia_Parkland	City of Orillia	Used to supplement SOLRIS data in creating a more comprehensive landcover dataset, and to summarize area of natural assets in park land
Orillia_Subwatersheds	City of Orillia	Used to summarize natural assets by sub-watersheds
National Road Network - NRN	Statistics Canada	Used to perform road density condition assessment
Orillia_Contours	City of Orillia	Contours were converted to raster dataset and used to determine mean elevation of natural assets
Orillia_EP_Lands	City of Orillia	Used to indicate natural assets within EP lands and summarize by area of natural assets within EP lands
Orillia_ESGRA	City of Orillia	Used to indicate natural assets within ESGRA and summarize by area of natural assets within ESGRA
Orillia_Evaluated_Wetlands	City of Orillia	Used to indicate wetlands considered provincially significant
Orillia_Land_Use	City of Orillia	Used to indicate land use category of where the natural asset resides
Orillia_Park_Trees_2020	City of Orillia	Used to determine count of trees within natural assets
Orillia_Parkland	City of Orillia	Used to determine area of natural assets within park lands
Orillia_Permanent_Streams	City of Orillia	Used to summarize length of streams within natural assets
Orillia_SGRA	City of Orillia	Used to indicate which assets reside in the SGRA and summarize natural asset area within SGRA
Orillia_Trails	City of Orillia	Used to summarize length of trails within natural assets

TABLE 1: SUMMARY OF DATA USED

DATASET NAME	SOURCE	PURPOSE
Orillia_Wooded_Areas	City of Orillia	Used to indicate which assets reside in wooded areas and summarize natural assets within wooded areas
Orillia_Zoning	City of Orillia	Used to assign majority and minority zoning code to natural assets
Soil Survey Complex	Ontario GeoHub	Used to assign various soil attributes to natural assets, such as soil drainage and name
Orillia_City_Owned_Lands	City of Orillia	Used to determine area of natural assets considered city-owned and to add ability to filter the inventory dashboard by assets overlapping with city-owned land

The inventory project defined a total of 579 individual assets, covering 935 hectares (ha), as noted in Table 2. The majority of this area was forest, followed by built-up pervious and then wetlands.

TABLE 2: SUMMARY OF NATURAL ASSETS BY TYPE

NATURAL ASSET TYPE	NUMBER OF ASSETS	TOTAL AREA (HA)
Agriculture	30	113
Built-up pervious	168	217
Forest	211	336
Grasslands	3	6
Hedge rows	41	20
Water	15	17
Wetlands	111	228
Total	579	935

Figure 3 shows the spatial distribution of the natural assets.

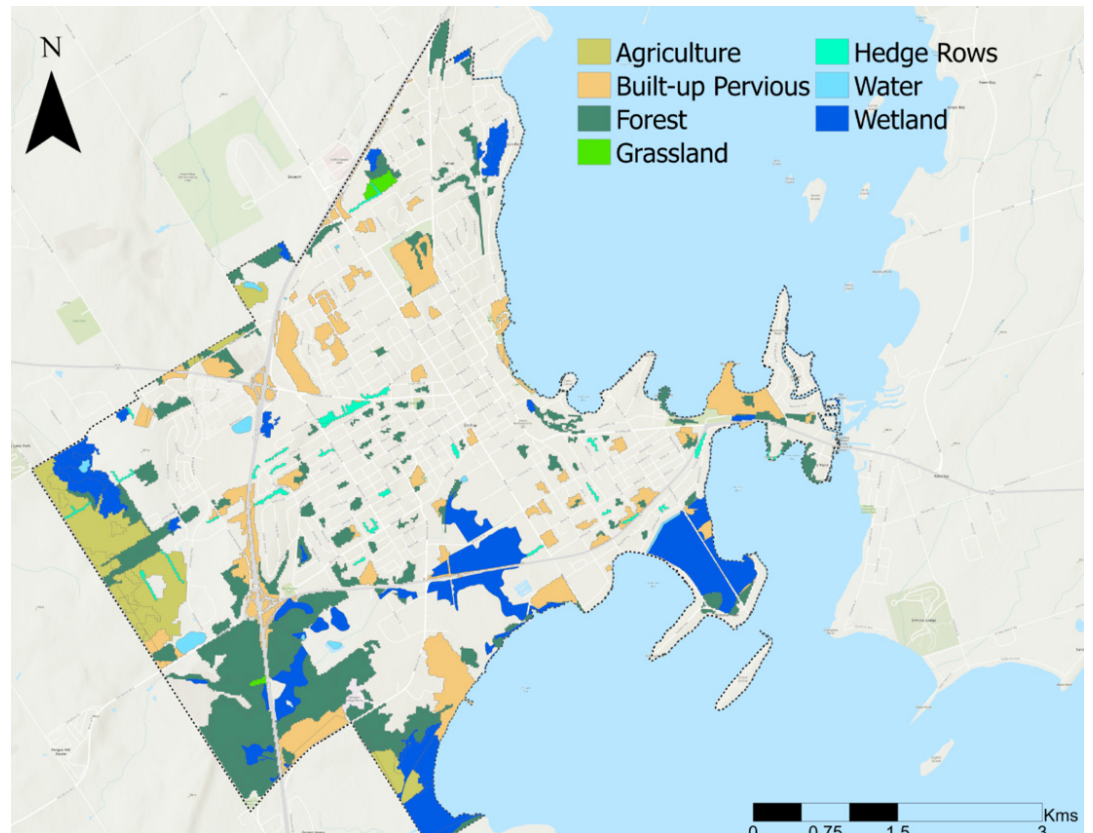


Figure 3: Spatial distribution of natural assets.

4.3. Asset registry

Each asset within the inventory has a unique identification number that allows individual assets to be selected, analyzed, and the corresponding data manipulated as required. For example, changes in condition can be noted for individual assets. Information on each asset is housed in an asset registry. Table 3 is an excerpt from the City of Orillia's registry showing natural asset characteristics and details.

TABLE 3: EXCERPT FROM THE REGISTRY

Natural Asset Registry																				
Asset ID	Sub-Asset ID	Asset Area (ha)	Asset Area (ha) in Subwatershed	Subwatershed	Source	ESGRA Area (ha)	Parkland Area (ha)	Park Name	Park Tree Count	Stream Length (km)	Trail Length (km)	Majority Land Use	Majority Soil	City Owned Land (ha)	Interior Forest %	Adjacent Land Use Score	Permeability Score	Relative Size Score	Road Density Score	Total Score
AGR10	AGR10-1	1.08	1.08	N-25	SOLRIS	0	0.00		0	0.00	0.00	Residential	Vasey Sandy Loam	0.00	0	6	5	1	1	13
AGR11	AGR11-1	0.00	0.00	N-25	SOLRIS	0	0.00		0	0.00	0.00		Vasey Sandy Loam	0.00	0	6	5	1	1	13
AGR12	AGR12-1	9.52	9.52	N-25	SOLRIS	0	0.00		0	0.05	0.38	Residential	Vasey Sandy Loam	0.00	0	6	5	5	1	17
AGR13	AGR13-1	1.35	1.35	N-25	SOLRIS	0	0.00		0	0.00	0.00	Residential	Tioga Loamy Sand	0.00	0	6	5	1	10	22
AGR18	AGR18-1	26.43	26.10	N-25	SOLRIS	0	0.65		0	0.46	1.40	Residential	Vasey Sandy Loam	0.33	0	7	5	10	5	27
AGR18	AGR18-2	26.43	0.33	N-27	SOLRIS	0	0.00		0	0.00	0.03	Residential	Otonabee Loam	0.01	0	7	5	1	10	23
AGR2	AGR2-1	5.48	5.48	N-27	SOLRIS	0	0.00		0	0.02	0.00	Vacant Land	Tioga Sandy Loam	5.10	0	6	5	5	5	21
AGR20	AGR20-1	0.83	0.83	N-25	SOLRIS	0	0.00		0	0.00	0.00	Residential	Otonabee Loam	0.00	0	8	5	1	10	24
AGR21	AGR21-1	2.97	2.97	N-25	SOLRIS	0	0.00		0	0.14	0.16	Residential	Tioga Loamy Sand	0.00	0	6	5	5	1	17
AGR23	AGR23-1	1.64	1.64	N-25	SOLRIS	0	0.00		0	0.00	0.00	Residential	Tioga Loamy Sand	0.00	0	7	5	1	1	14
AGR24	AGR24-1	1.08	1.08	N-29	SOLRIS	0	0.00		0	0.00	0.00	Residential	Otonabee Loam	0.00	0	7	5	1	10	23
AGR25	AGR25-1	1.37	1.37	N-29	SOLRIS	0	0.00		0	0.00	0.16	Residential	Otonabee Loam	0.00	0	7	5	1	10	23
AGR26	AGR26-1	1.93	1.33	S-27	SOLRIS	1	0.00		0	0.00	0.00	Institutional	Otonabee Loam	0.00	0	6	5	1	1	13
AGR26	AGR26-2	1.93	0.61	N-29	SOLRIS	0	0.00		0	0.00	0.00	Institutional	Tioga Loamy Sand	0.00	0	6	5	1	1	13
AGR27	AGR27-1	0.00	0.00	S-27	SOLRIS	0	0.00		0	0.00	0.00		Otonabee Loam	0.00	0	6	5	1	1	13
AGR3	AGR3-1	2.75	2.75	N-27	SOLRIS	0	0.00		0	0.00	0.00	Industrial	Sargent Gravelly Sandy Loam	0.00	0	8	5	1	5	19
AGR30	AGR30-1	10.57	3.68	S-27	SOLRIS	0	0.00		0	0.00	0.08	Institutional	Tioga Loamy Sand	0.02	0	6	5	5	1	17

4.4. Online dashboard

Inventories may provide more insights when characterized visually in a dashboard, which enables users to explore different aspects of the data. For instance, natural asset information can be summarized by watershed area, or, if users want to dive into the specifics of forest assets, they can quickly filter the data to focus on that particular asset. Figure 4 is a screenshot from the dashboard that MNAI provided to the City of Orillia. The full version can be accessed at go.greenanalytics.ca/Orillia.

Orillia Natural Asset Inventory

Summary

Natural Asset Map

Asset Registry

Condition

Decomposition

This asset inventory summarizes natural assets within Orillia, ON, by sub-watershed, and asset type. A range of local/provincial datasets, and condition variables were incorporated into this inventory to further characterize the natural assets. [Click an area of interest on the map below to filter natural assets by sub-watershed.](#)

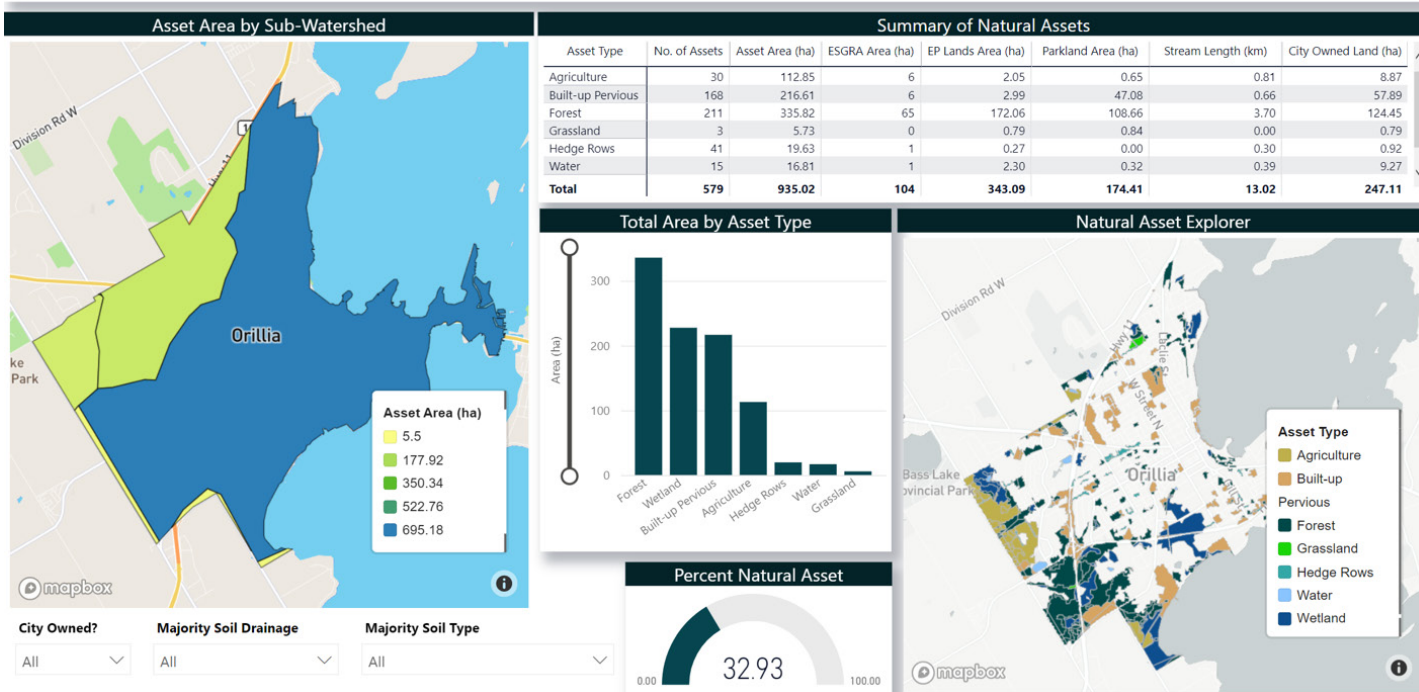


Figure 4: Screenshot of main inventory summary

4.5. Condition of natural assets

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 health of natural assets, and the ability of natural assets 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.

MNAI 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 the City of Orillia. Table 4 summarizes the condition assessment steps and indicators.

TABLE 4: CONDITION ASSESSMENT APPROACH AND INDICATORS

Indicator	Description & Methods for Quantification	Data used to Quantify Indicator
Relative asset size	For each natural and semi-natural asset type, total area is calculated, and a rank is assigned to the assets within each class based on its percentile score. Natural assets within the top third of the ranking (e.g., the largest assets within a class) received a 3, those within the middle third of the ranking received a 2, and those within the bottom third of the ranking received a 1.	Natural asset inventory
Road density	Measures the density of the roads in and around the assets according to high density (assets with more than 2km of roads per km squared), medium density (assets with between 1km and 2km of roads per km squared) and low density (assets with less than 1km of road per km squared).	Natural asset inventory plus spatial representations of roads
Surface permeability	<p>The permeability of surfaces is ranked on a scale of nil to high depending on the type of landcover present.</p> <p>Urban areas, roads and industrial areas are ranked as nil. Assets within impervious surfaces are assigned as low permeability.</p> <p>Agriculture and shrublands are ranked as medium.</p> <p>Wetlands, waterbodies and forests are ranked as high.</p>	<p>Natural asset inventory, spatial representations of land uses and roads, as well as the Global Man-made Impervious Surfaces Dataset from NASA</p> <p>data.nasa.gov/dataset/Global-Man-made-Impervious-Surface-GMIS-Dataset-Fr/dkf4-4bi3</p>
Adjacent land use	Considers the distance to, and the nature of, the area surrounding natural assets. Intense land uses (e.g., shopping malls) in close proximity to natural assets result in a poor rating, while distant land uses that are less intense (e.g., agriculture) result in a good rating. If there are no human land uses within 100 m of the assets, the assets are scored 10. If there are intensive land uses within 100 m of the assets, the score is 0.	Natural asset inventory plus spatial representation of land use as well as intensity rankings of land uses

Once conditions were allocated to each asset, an overall score was derived for the project area. The maximum possible score for an asset was 40, based on a possible 10 points for each of 4 categories:

- Road density as low (10), medium (5) or high (1).
- Surface permeability rated as high (10), medium (5), low (1), or nil (0).
- Adjacent intensive land use (0 for intense land uses, otherwise 10).
- Relative asset size where the largest 3rd areas receive 10, 5 for middle 3rd, and 1 point for the lowest 3rd.

The total condition score was then converted into a rating scale:

- **Good** - assets with a score of 30 or higher
- **Fair** - assets with a score between 20 to 29
- **Poor** - assets with a score between 10 to 19
- **Very Poor** - assets with a score lower than 10
- **No Rating**

Figure 5 summarizes the natural asset condition assessment results as per the online dashboard.

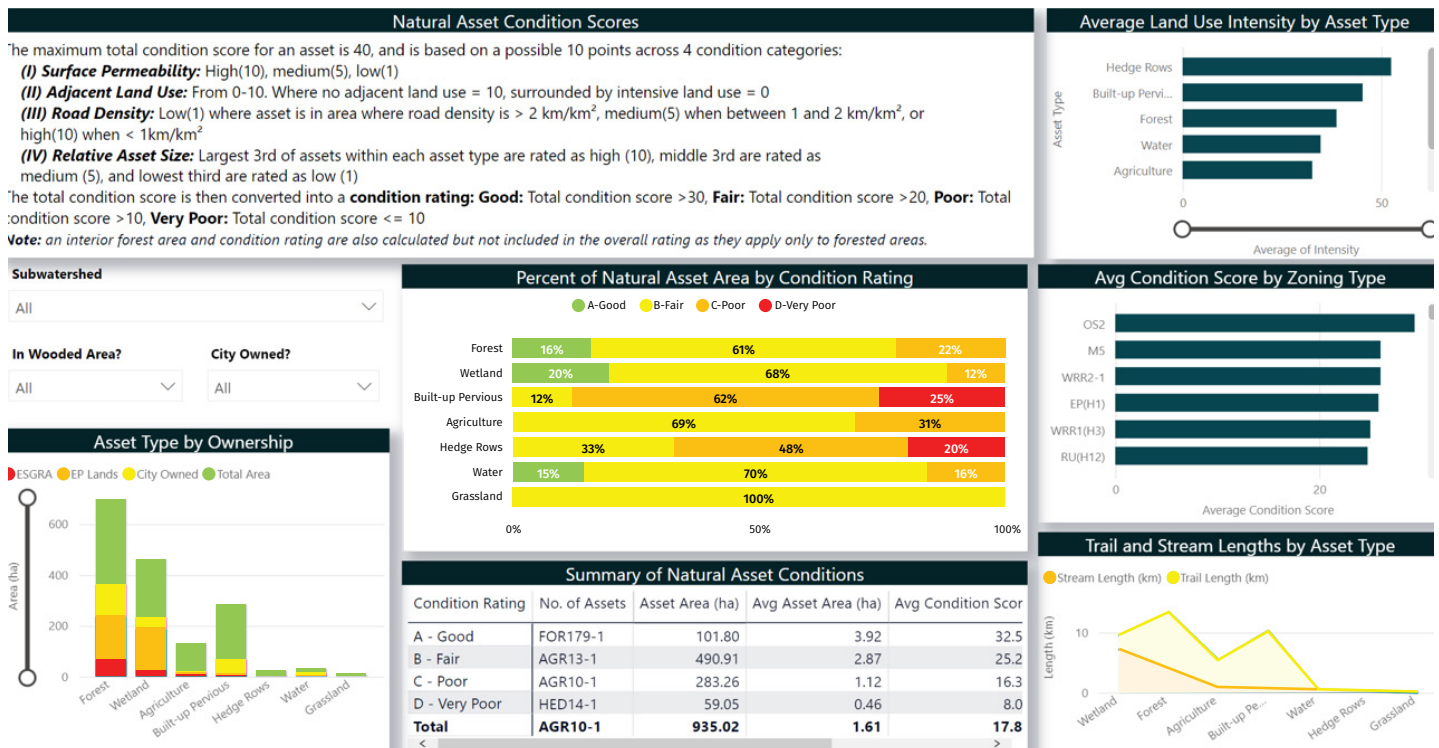


Figure 5: Screenshot of condition assessment details

Overall, about 102 ha (or 18 per cent) of natural assets were assessed in good condition and 491 ha (or 53 per cent) were assessed in fair condition. Forests, wetlands, grasslands and water all largely ranked good or fair.

Table 5 summarizes condition ratings and Figure 6 summarizes condition by natural asset type.

TABLE 5: SUMMARY OF NATURAL ASSET CONDITION RATINGS
MNAI desktop approach

Condition Rating	Number of Assets	Total Area (ha)	Average Condition Score
Good	26	102	33
Fair	171	491	25
Poor	253	283	16
Very poor	129	59	8
Total	579	935	18

Percent of Natural Asset Area by Condition Rating

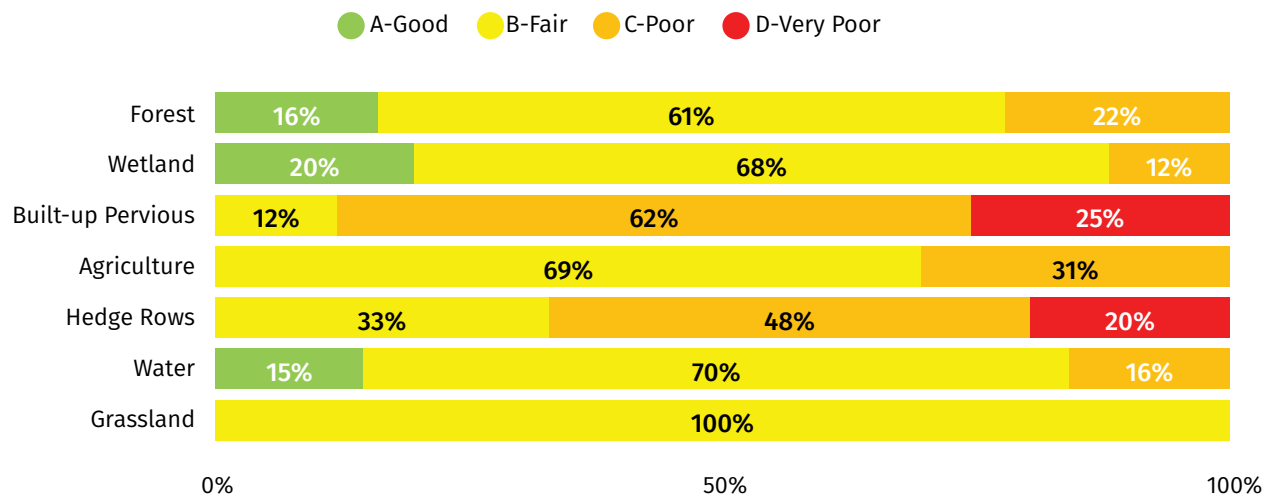


Figure 6: Summary of condition rating by natural asset type (MNAI desktop approach)

4.6. Maintaining the inventory

Inventories are not static. Both the registry and the dashboard can be expanded as new information becomes available. For example, asset condition might improve as a result of restoration efforts, or new studies may add insights on the condition of the assets. The area and geographic distribution of assets may also change over time as development and other land use changes take place (e.g., agriculture areas may be replaced by built assets as development takes place). New data can be reflected in the asset registry and subsequently in the online dashboard as it becomes available. Furthermore, the level of desired detail may evolve as asset management readiness increases or as areas of natural management focus emerge. However, inventories should grow in detail and sophistication only insofar as they remain aligned with the capacity of the communities to maintain them and the uses to which they will be put. Their evolution and development should be a function of the monitoring, reporting and lessons of the asset management cycle and be driven by the imperative of ensuring sustainable, cost-effective delivery of services to the community, which is the core of asset management.

5 Risk identification

5.1. Risk identification tool overview

Identifying risks facing natural assets can help local governments prioritize their management of natural assets. To this end, MNAI provides local governments with a tool entitled *Risk Identification Process in the Development of Natural Asset Inventories* and guidance in self-administering it.

Risk management is a four-stage process that includes risk identification, analysis of probability and consequence, development of risk mitigation strategies, and control and documentation. The use of the risk identification tool informs the first and second stages of risk management through the identification of top risks to natural assets and their associated services, and a high-level analysis of impacts and consequences.

Risk types relevant to natural asset management typically include:

- **Service risk:** the risk of an asset failure that directly affects service delivery.
- **Strategic risk:** the risk of an event occurring that impacts the ability to achieve organizational goals.
- **Operations and maintenance risk:** risks related to poor asset controls and oversight, which can lead to poor record-keeping and poor monitoring of asset.
- **Financial risk:** risks related to the financial capacity of the City of Orillia to maintain municipal services.
- **Political risk:** risks related to the nature of municipal politics.

5.2. Using the risk identification tool

Using the risk tool, the City of Orillia considered possible risks that the loss of natural asset functions could pose to built infrastructure, personal health and safety, and private property, including:

- Overuse of trails/dumping
- Flooding (current and future)
- Forest fire
- Invasive species
- Development pressure
- Pollutant loading from urban, agricultural, or industrial sources
- Drought (current and future)
- Erosion/ Ice jams
- Extreme weather events
- Extreme heat

Each risk was then ranked low, medium or high according to the probability of an impact occurring, and the relative magnitude of its negative consequences. To assess impact and consequence, the City of Orillia considered four questions:

- 1/ what impact is likely to happen?
- 2/ what is the consequence of that impact happening?
- 3/ what can be done to mitigate the probability of impact and/or consequence?
- 4/ what cues will signal the need for mitigation?

5.3. Results of the risk identification process

The risk identification process revealed:

- 4 high-level risks (invasive species, pollutant loading, erosion/ice jams, and extreme weather events)
- 1 medium-high level risk (drought)
- 1 medium-level risk (extreme heat)
- 1 low-medium level risk (flooding)
- 3 low-level risks (overuse of trails/dumping, forest fire, and development pressure)

In terms of scope, the identified risks affect natural assets across the City of Orillia, particularly watercourses, shorelines, Lake Couchiching, and Lake Simcoe. The risks also have the potential to negatively impact engineered assets, property, and the personal health and safety of residents.

Risk Matrix

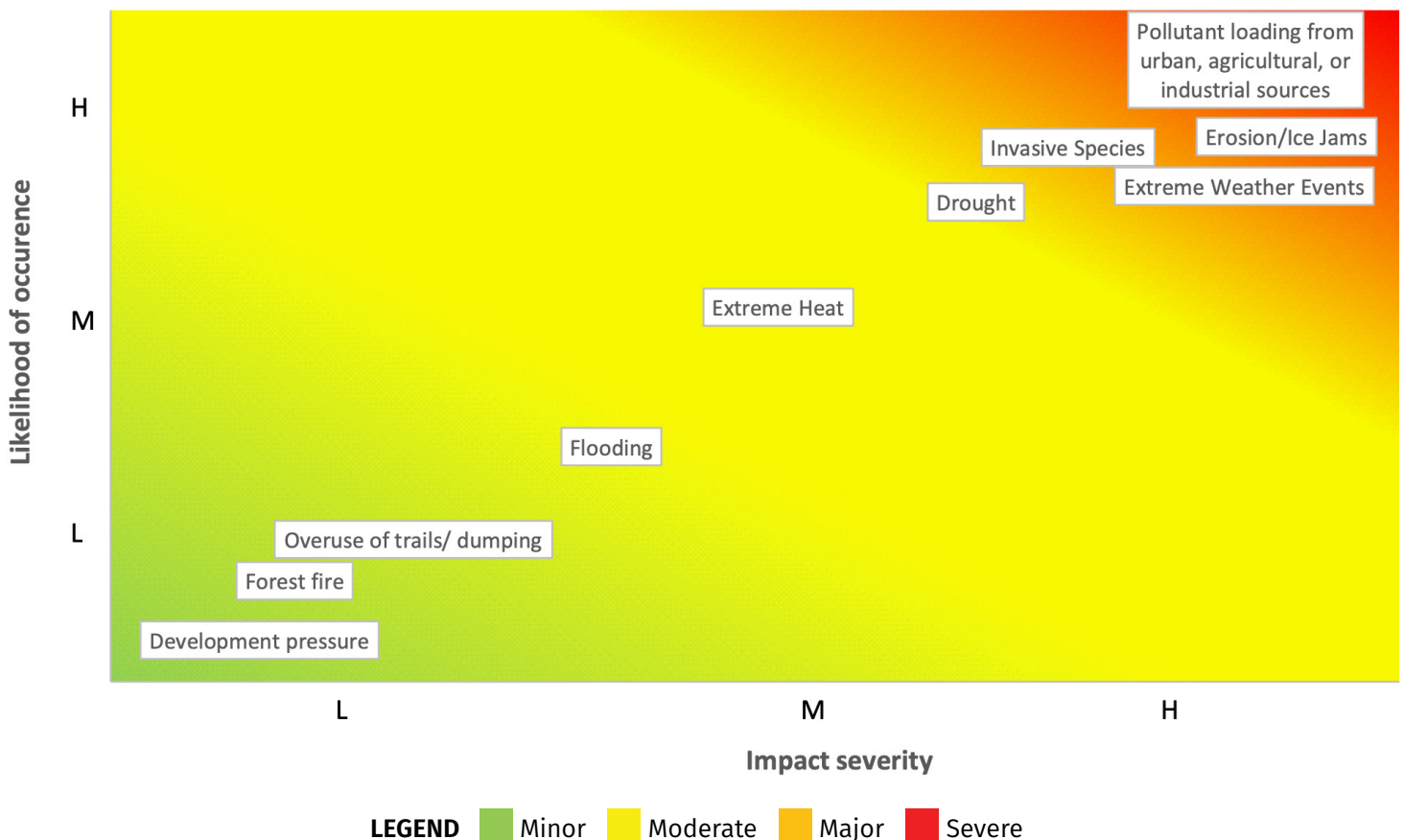


Figure 7: Results of risk management process

6 Recommendations

This section provides insights that can be gained from considering both the inventory - including the condition and risk assessments - and the asset management readiness assessment. It is divided into (a) potential priorities for the local government, (b) possible actions for the further development of the inventory, and (c) steps the City of Orillia can consider to advance to a full natural asset management initiative.

6.1. Potential priorities for the City of Orillia

Combining the results of the condition assessment with the outcomes of the risk identification highlights potential priorities on which the City of Orillia could focus natural asset management efforts. These are:

- **Pollutant loading:** Pollutant loading from road salt, road sand, and phosphorus poses a high risk to natural assets, particularly water (both surface and groundwater), boulevards, wetlands, and grasslands. Locations of particular importance include municipal wells and the water intake at Lake Couchiching and Lake Simcoe and its associated canals. Historical industrial use has impacted groundwater, which the City of Orillia has identified as an area of concern. Aquifers used for drinking water already have sentinel wells, a groundwater-monitoring well located between a known area of groundwater contamination and drinking-water supply wells. Additional actions to address pollutant loading include protecting natural assets such as wetlands and riparian buffers that help control run-off, and ecological restoration and retrofit activities to clean and restore degraded surface water bodies.
- **Invasive species:** Invasive species are a high-level risk to woodlots, permeable built-up areas, wetlands, and watercourses across the City of Orillia. Phragmites have invaded Mill Creek, Ben's Ditch, the Champlain Storm Pond, and the natural area behind the new Recreation Centre, and Emerald Ash Borer is present in woodlots and parks. Invasive species can reduce resiliency, increase climate-related risks, negatively impact biodiversity, impair terrestrial and aquatic ecological services, lower property values, and increase municipal costs to maintain, control and eradicate target species. They can also impact engineered assets such as roads. The City of Orillia provides educational materials and is working with Lakehead University to address phragmites⁶.
- **Erosion/Ice jams:** Erosion and ice jams are a high-level risk to waterbodies and watercourses, particularly those near Ben's Ditch, the shoreline of Lake Couchiching, and the shoreline of Lake Simcoe, where erosion can reduce the buffer capacity for natural leachate treatment at the City of Orillia's Waste Diversion Site (landfill). The City of Orillia has implemented mitigation measures such as an environmental monitoring

6 Hawke, D., 2021.

program to assess the impacts of leachate, constructed some shoreline erosion control measures on the Lake Simcoe shoreline at the Waste Diversion Site, and Engineering Design Criteria that includes remedial and preventative measures for watercourse erosion and bank instability. In addition, a Shoreline Buffer Overlay Zone⁷ is part of the Zoning By-law, which requires a Shoreline Development Agreement for the development or significant redevelopment of properties on the shorelines of Lakes Couchiching and Simcoe. This is intended to prevent erosion and control the quality of runoff water entering the lakes. Additional measures to address erosion include restoring and maintaining riparian buffers on watercourses and shoreline vegetation.

- **Extreme weather events:** Extreme weather events impact all natural assets across the City of Orillia. High winds and significant rainfall causing damage are of particular concern for woodlots, wetlands, and watercourses. A Climate Change Action Plan is being completed. The Plan would benefit from considering the role of natural assets in disaster mitigation. Maintaining the land’s absorptive capacity through retention of forest cover and restoration of floodplains and wetlands will help mitigate the impacts of extreme weather, reducing property and infrastructure damage, lost work time, injury, and loss of life.
- **Drought:** Drought was identified as an uncontrollable medium-high level risk to woodlots, parks, wetlands and grasslands across the City of Orillia. Significant droughts were experienced in 2016 and 2021. The City of Orillia has a Water Conservation and Efficiency Plan⁸ which can be complemented by drought response plans that consider the role of natural assets.

TABLE 6: RISK MITIGATION STRATEGIES

Accept	Risk may be acceptable if probability and consequences are small
Minimize	Risk under local government’s control that warrants exposure reduction
Share	Partners in a project permit the sharing of larger risks to reduce it for each
Transfer	Insurance, fixed price contracts, and other risk transfer tools

Table 6 lists and provides brief descriptions of risk mitigation strategies.

⁷ City of Orillia, n.d.

⁸ City of Orillia, 2014.

Opportunities to strengthen natural asset management at an organization-wide level

The City of Orillia is at a relatively early stage of adopting asset management from a governance perspective. While it does have an asset management policy that includes green infrastructure, it does not yet have an asset management strategy or roadmap to guide asset management investments and activities. A short-term opportunity for the City of Orillia is to include natural asset management objectives based on the findings from this inventory project.

Natural asset management objectives could relate to strengthening data and information about natural assets identified as high risk, developing a monitoring plan or maintenance plans, and/or supporting active management and protection. Staff expects that once the MNAI natural assets inventory is complete they will be able to identify gaps in their natural asset data and address them through future projects.

Staff also wants to find synergies between natural asset management and municipal service areas such as stormwater management. As the City of Orillia updates its asset management plan, natural asset considerations need to be integrated into all service areas to achieve this. A short-term action to support integration would be to ensure that a member of the asset management team is responsible for incorporating natural asset management considerations; the readiness assessment identified this as a gap.

6.2. Possible actions for the further development of the inventory

Based on the inventory, the City of Orillia could consider the following, regardless of whether or not it pursues a full natural asset management process. These are mostly incremental measures.

- Expand the risk identification to include field verification of results.
- Determine acceptable levels of risk to the City of Orillia's risk mitigation strategies (see Table 6).
- Explore the role of natural assets in risk mitigation strategies.
- Further develop the condition assessment and risk assessment using local climate projections, land use modelling, and other data already at their disposal.
- Identify linkages between services and assets and assess the condition of, and risks to, the assets from the perspective of their ability to deliver services. From a water management perspective, the wetlands and forested areas in the watersheds will be key.
- Share the inventory with adjacent local governments to stimulate collaboration within the watershed.

- Initiate or enhance monitoring - for example, using gauges, water level sensors, and loggers to improve understanding of trends, feed into condition ratings of assets, and gather information for modelling.
- Schedule regular updates (e.g., every 3-5 years) of the inventory, condition assessment and risk identification to understand trends.
- Maintain interest and momentum in natural asset management to move towards a full natural asset management project.

6.3. Steps to a full natural asset management project

If the City of Orillia wishes to proceed with a full natural asset management project, including implementation, it will need to consider the following steps:

- 1/ **Confirm scope, roles and responsibilities.** Undertake a meeting or workshop to confirm (a) assumptions [for example, that water management is primary services of concern] (b) roles, responsibilities, and capacities (c) community capacity to undertake a larger project.
- 2/ **Fill essential knowledge gaps.** If discussions on scope and certainty and related data needs for modelling indicate the need for additional data, these gaps could be filled.
- 3/ **Modelling.** Modelling levels of service that natural assets currently provide, and provide under different potential management, local climate change projections, and rehabilitation or restoration scenarios, is central to natural asset management as it gives communities the ability to explore how different actions will affect the health and corresponding performance of natural assets.
- 4/ **Economic assessment.** The economic assessment component provides a market-based indication of (a) the current value of the services from natural assets if they had to be provided by an engineered means, and (b) the costs and values of different interventions in terms of service delivery.
- 5/ **Planning.** This step allows local governments to explore different scenarios such as “what happens to the services provided by the wetland if there is significant building upstream?” or “what happens to the services if the forest is restored?” Using modelling, changes in service levels can be understood and quantified. Corresponding values can also be determined through continued economic assessment. Based on the foregoing, local governments can consider and prioritize actions ranging from status quo to planning, regulatory, financial operations, maintenance, acquisition, and monitoring interventions. The analysis can be used to support the development of a natural asset management strategy or to include strategic objectives around natural assets in an overarching asset management strategy.

- 6/ Implementation.** MNAI can provide ongoing advice / guidance on policy pieces and integration of the above information for 12-18 months. After that, the local government, together with local partners and service providers, would ideally have the capacity to continue these efforts on their own.
- 7/ Ongoing monitoring.** It is essential to continue monitoring the project to learn whether interventions are working and to share lessons and learnings with other communities undertaking natural asset management. MNAI would typically stay involved with the community for three years through a monitoring arrangement to be established with the communities.

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Annex: Results of the City of Orillia's risk identification

This Annex contains the results of the City of Orillia's use of MNAI's risk identification tool, which they self-administered with guidance from MNAI. Table 1 was the main product that personnel developed from the exercise.

Step 1: Identification of risks

Common Risks to Natural Assets:

- Overuse of trails/dumping
- Flooding (current and future)
- Forest fire
- Invasive species
- Development pressure
- Pollutant loading from urban, agricultural, or industrial sources (e.g., overuse of salt on roads)
- Drought (current and future)
- Erosion
- Ice jams
- Storm surge
- Lack of flood hazard mapping
- Lack of land management plans
- Lack of monitoring reports
- Construction activity
- Political policy change

Step 2: Complete survey

TABLE 7: SIMPLIFIED RISK IDENTIFICATION SURVEY

Risk	Ranking	Assets Affected	Location	Notes
1. Overuse of trails/ dumping	Low	Permeable Built-Up Areas, Woodlots	City-wide	<ul style="list-style-type: none"> Community groups clean up trails regularly. Garbage receptacles at parks are used for dumping of household waste but are cleared quickly by City staff.
2. Flooding	Low/ Medium	All natural assets in flood hazard overlay (see map)	Within areas identified as flood hazard on OP	<ul style="list-style-type: none"> Flood risk is higher for man-made assets; natural assets are more resilient to flooding.
3. Forest fire	Low	Woodlots and Permeable Built-Up Areas	Scout Valley	<ul style="list-style-type: none"> Several incidents of arson in Scout Valley in the last year, no significant damage.
4. Invasive species	High	Woodlots, Permeable Built-Up Areas, Wetlands, Watercourses	City-wide	<ul style="list-style-type: none"> Phragmites invasion in Mill Creek, Ben's Ditch, Champlain Storm Pond, natural area behind new Recreation Centre. Emerald Ash Borer in Woodlots, Parks
5. Development pressure	Low	Agriculture, Watercourses	Watercourses in Trailside Subdivision in West Orillia	<ul style="list-style-type: none"> The City's Planning application review process protects natural assets to a large degree. The only major Agricultural area in the City is currently subject to a development application for residential development.

TABLE 7: SIMPLIFIED RISK IDENTIFICATION SURVEY

Risk	Ranking	Assets Affected	Location	Notes
6. Pollutant loading from urban, agricultural, or industrial sources	High	Water, Wetlands, Grassland	Municipal wells and water intake in Lake Couchiching; Stormwater discharges into Lakes Couchiching and Simcoe and associated canals	<ul style="list-style-type: none"> ■ Road salt, road sand and phosphorus impact on grassland/wetlands, boulevards, water. ■ The City has a sentinel well system for drinking water aquifer. ■ The City has known areas of contaminated groundwater due to Orillia’s industrial history.
7. Drought	Medium/ High	Woodlots, Parks, Wetlands, Grassland	City-wide	<ul style="list-style-type: none"> ■ The City experienced significant droughts in 2016 & 2021. ■ Causes die-off of vegetation. ■ Not controllable.
8. Erosion/Ice jams	High	Waterbodies, Watercourses	Shorelines of Lakes Couchiching and Simcoe, Waste Diversion Site and Ben’s Ditch	<ul style="list-style-type: none"> ■ Erosion at Lake Simcoe shoreline reduces buffer capacity for natural leachate treatment at Waste Diversion Site. Some mitigation measures have been implemented.
9. Extreme weather events	High	All natural assets and particularly Woodlots, Wetlands and Watercourses	City-wide	<ul style="list-style-type: none"> ■ City is currently completing a Climate Change Action Plan. ■ High winds, significant rainfall causing damage.
10. Extreme heat	Medium	Watercourses, Wetlands	Areas located near Stormwater outlets	<ul style="list-style-type: none"> ■ Heated stormwater is impacting habitat in areas of SW outlet. Certain species are negatively impacted by changes in water temperature.

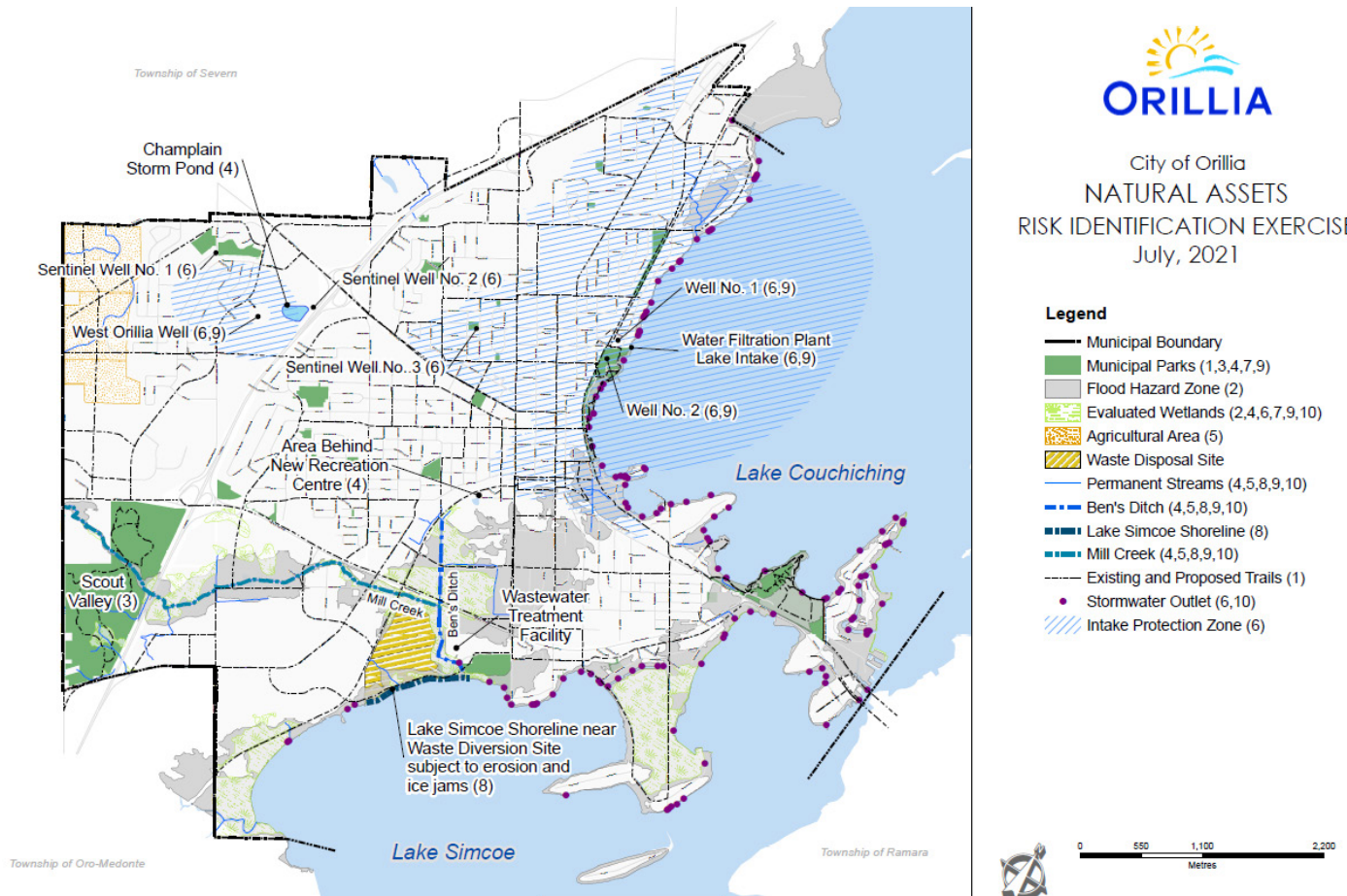


Figure 8: Map numbers relate to those in risk exercise.

Municipal Natural Assets Initiative

