

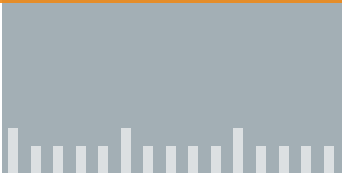


# Toward natural asset management in Dufferin County Ontario



## Summary of inventory results and implications April 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 Dufferin County, Ontario, 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 services<sup>1</sup>.

### 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.

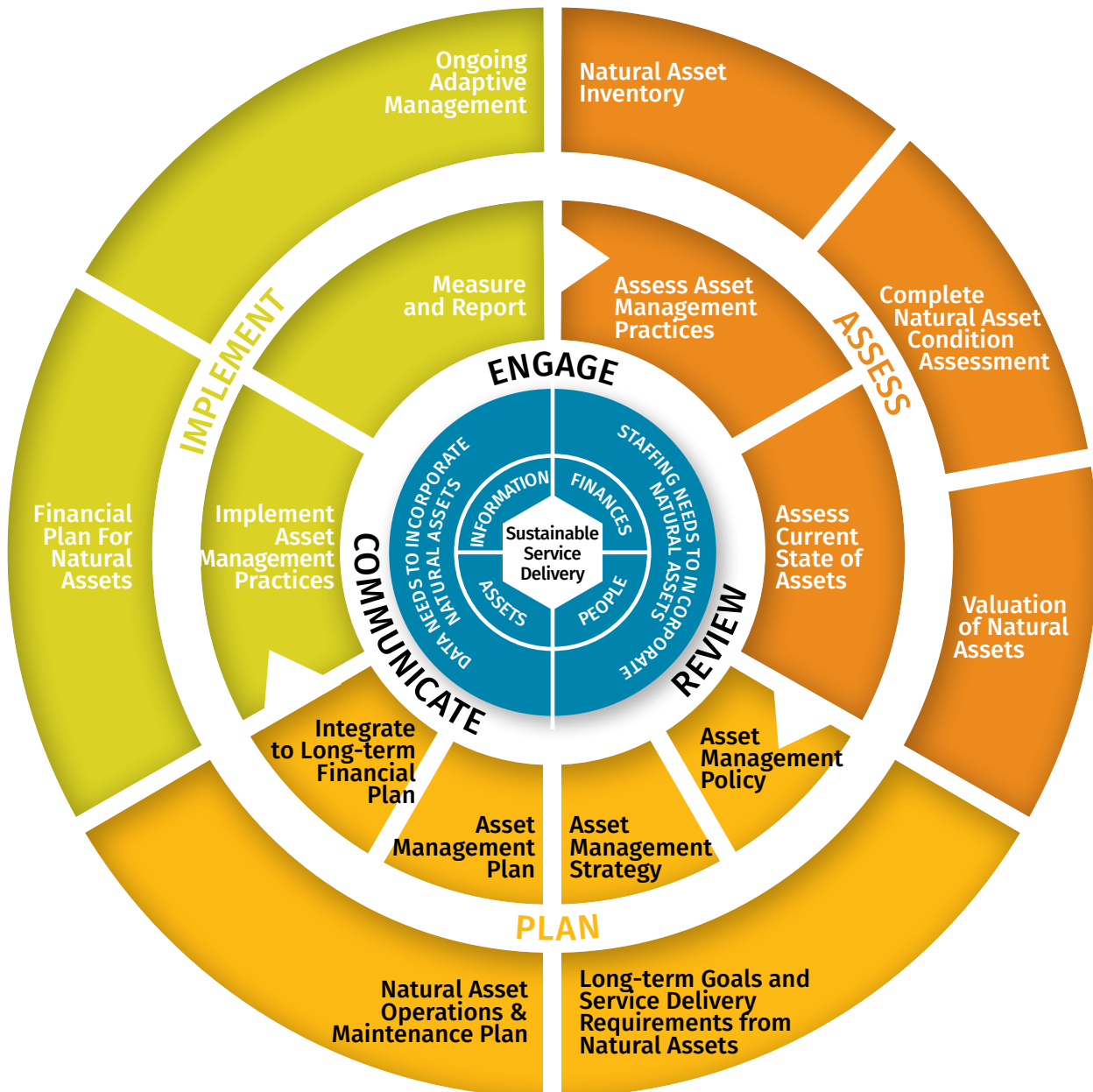
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<sup>1</sup> [mnai.ca/media/2018/02/finaldesignedsept18mnai.pdf](http://mnai.ca/media/2018/02/finaldesignedsept18mnai.pdf)



## What is a natural asset inventory

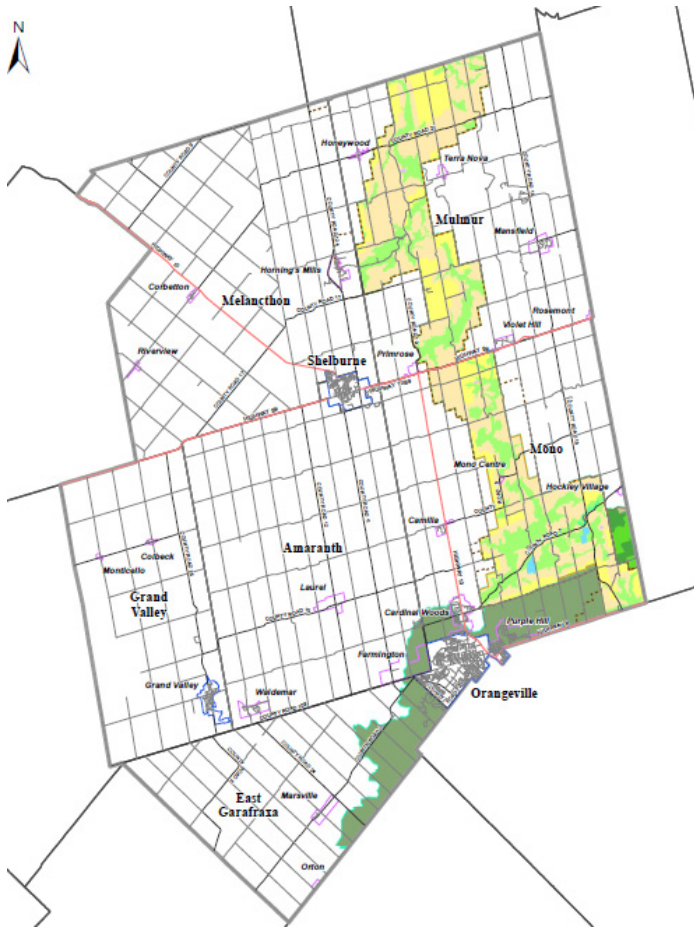
Inventories provide details on the type of natural assets a local government relies upon<sup>2</sup>, their condition, and the risks they face. As depicted in Figure 1 and explained in detail in the Annex, a natural asset inventory is the first component of the Assessment phase. The Assessment phase, 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.

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

### 3 Local government context



*Figure 2: Map of Dufferin County.  
Source: Dufferin County Official Plan (2017)*

Dufferin County (population ~61,000) is an upper-tier municipal government located in Central Ontario, north-west of Toronto. The County seat is the Town of Orangeville. Dufferin County and its eight-member municipalities have three interests in natural asset management. First, they want a stronger understanding of the provisioning, regulating, and cultural services that natural assets provide to their communities, the environment, and biodiversity. Second, they want to increase the visibility and appreciation of the County's natural assets. Third, they want to better the potential of natural assets to increase community and climate resiliency, including how they could use natural assets to increase the resilience of engineered infrastructure and municipal assets, and inform planning and asset-management decision-making.

Dufferin County's Official Plan lays out the protection for natural heritage features and natural assets including provincially significant wetlands, the habitat of endangered species, threatened species, woodlands, wildlife habitat areas, unevaluated and regionally significant wetlands, fish habitat, watercourses, and urban forest. The recently-released Climate Action Plan (Dufferin County 2021) emphasizes linkages between natural systems and services such as stormwater management and purification, mitigating extreme heat, and supporting biodiversity. It notes that Dufferin County will harness the resiliency of natural systems to support protection, restoration, and acquisition initiatives to increase the function of natural areas and minimize local flood risk.

Dufferin County is a significant local government within the headwaters of four major rivers: the Saugeen, Grand, Humber, Credit and Nottawasaga. Natural assets provide Dufferin County and member municipalities with critical services such as drinking water purification, stormwater management, wastewater capacity, and flood mitigation. Residents and businesses rely on groundwater resources as the principal source of drinking water.

These services are recognized as important components in building climate resilience as Dufferin County, along with other municipalities in the Greater Golden Horseshoe, is experiencing an increase in the intensity of extreme rainfall events, dry periods, higher overall temperatures, and an increase in the frequency of freeze-thaw cycles that contribute to riverine and overland flooding risks.

### 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 tool to include natural asset considerations. MNAI's adapted tool helps local governments measure progress on asset management generally, and natural asset management specifically. It does so in four competency areas, with each area describing outcomes based on five levels of progress or maturity.

The completed assessment will, in turn, help the local government prioritize actions that will increase its effectiveness in managing all assets, including natural ones.

Details of the readiness assessment are available at: [fcm.ca/sites/default/files/documents/resources/tool/asset-management-readiness-scale-mamp.pdf](https://fcm.ca/sites/default/files/documents/resources/tool/asset-management-readiness-scale-mamp.pdf).

Dufferin County's asset management readiness assessment shows it is at an intermediate to advanced level of competency in most areas for its engineered assets, and at an early stage for natural assets, with the exception of its forests where more progress has been made. Dufferin County has a Strategic Asset Management Policy and Plan that satisfies requirements of the Asset Management Planning for Municipal Infrastructure Regulation, O. Reg. 588/17. Senior management and County Council have supported the development of, and commitment to, resourcing an operations and maintenance plan for forests. Dufferin County has a cross-functional asset management team that has begun work on updating their current plan to meet the legislative requirements for July 2022.

Dufferin County currently has a 10-year capital plan for roads and bridges and a 20-year capital plan for buildings, equipment, and vehicles. It has a basic inventory of engineered assets in place and has done lifecycle analysis and risk analysis for most critical assets. It has a comprehensive inventory of forest assets. Data quality for forests is good, while confidence in data for other assets is low, particularly for road allowances. Dufferin County does not yet have formal level-of-service performance measures for engineered or natural assets. Asset management planning is done in a consistent way within departments but not necessarily across departments.



# 4 Natural asset inventory

## 4.1. Inventory overview

MNAI gathered a range of data for an area scoped to the Dufferin County municipal boundary. The inventory has two main components to express the information: an asset registry and an online dashboard. MNAI provided the registry to Dufferin County as Excel data, and the dashboard in a website format. 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

MNAI used the Southern Ontario Land Resource Information System (SOLRIS) 3.0 data as baseline for land use / land cover. MNAI then combined this spatial data with data the municipality provided to depict Dufferin County's natural assets. Table 1 describes the data sources used to develop the inventory and condition assessment.

**TABLE 1: DATA SOURCES SUMMARY**

| DATA  | SOURCE          | USE  |
|---|-----------------|--|
| Southern Ontario Land Resource Information System (SOLRIS) 3.0  | Ontario GeoHub  | Used as the base inventory of natural assets   |
| Wetlands_Oct2018_Dufferin   | Dufferin County | Used to identify wetland types   |
| deeryard_stratum1<br>deeryard_stratum2<br>ANSI_LIFE<br>ANSI_EARTH<br>Wooded_Area_2020<br>Dufferin_5km | Dufferin County | Used to determine total wooded areas and percent of natural asset containing wooded area           |
| Dufferin_County_Boundary  | Dufferin County | Used to establish study area boundary  |
| NVCA_Regulation_Limit<br>CVC_Regulation_Limit<br>GRCA_Regulation_Limit                                | Dufferin County | Used to determine total regulation limit size and percent of natural asset within regulation limit |
| THE_BRUCE_TRAIL_CONSERVANCY<br>ONTARIO_HERITAGE_FOUNDATION<br>ESCARPMENT_BIOSPHERE                    | Dufferin County | Used to determine total area of public lands and percent of natural asset containing public lands  |

**TABLE 1: DATA SOURCES SUMMARY**

| DATA  | SOURCE          | USE   |
|---|-----------------|---|
| Dufferin_Municipal_Boundaries   | Dufferin County | Used to assign assets to appropriate municipality   |
| NVCA_WHPAs_Apr2018<br>VSA_GRCA<br>CVC_WHPAs_AtoE_Apr2018  | Dufferin County | Used to determine total area of well head protection areas and percent of natural asset containing well head protection areas |
| Road_Centerlines_<br>DufferinCounty_Open_<br>Data   | Dufferin County | Used to assess linear road density within assets  |
| Conservation_Authority_<br>Grand<br>Credit_Valley_<br>Conservation<br>Nottawasga_Valley_<br>Conservation_Authority<br>Toronto_and_Region_<br>Conservation | Dufferin County | Used to assign assets to conservation authority and area of asset within that conservation authority                          |
| Municipal_Owned_Land_<br>All_Dufferin_May2020_3<br>Ministry_of_Natural_<br>Resources  | Dufferin County | Used to assign assets to applicable owner based on majority area<br>Used to assign area of asset owned by entity              |
| LSF_GRCA_Dufferin   | Dufferin County | Used to assign length of LSF to applicable asset as well as the majority LSF planting type                                    |
| CVC_Dufferin_Floodlines   | Dufferin County | Used to identify assets crossed by the CVC floodlines and add the floodline type and creek details as attributes              |
| GenRegs_Slope   | Dufferin County | Used to identify assets within slope polygons and assign area of asset overlap  |
| GenRegsFlood  | Dufferin County | Used to identify assets within NVCA floodplain and assign area of asset overlap   |
| FloodP  | Dufferin County | Used to identify assets within GRCA floodplain and assign area of asset overlap   |

The inventory defined a total of 27,497 individual assets covering 143,032 hectares (ha) of the municipal area, as noted in Table 2. The majority of this was agriculture cover, followed by wetlands.

**TABLE 2: SUMMARY OF NATURAL ASSETS BY TYPE**

| NATURAL ASSET TYPE | NUMBER OF ASSETS | TOTAL AREA (HA) | AVERAGE ASSET AREA (HA) |
|--------------------|------------------|-----------------|-------------------------|
| Agriculture        | 12,077           | 96,741          | 8.01                    |
| Forest             | 9,036            | 19,793          | 2.19                    |
| Wetland            | 5,682            | 25,919          | 4.56                    |
| Water              | 702              | 579             | 0.82                    |
| <b>Total</b>       | <b>27,497</b>    | <b>143,032</b>  | <b>5.20</b>             |

### 4.3. Asset registry

MNAI gathered the data, then sorted and analyzed it for relevance, and then delineated the type, location and extent of natural assets within the project area. Each asset 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. The information pertaining to each asset was then placed into an asset registry. An excerpt from Dufferin County's registry showing natural asset characteristics and details is in Table 3.

**TABLE 3: EXCERPT FROM THE REGISTRY**

| Dufferin County Natural Asset Inventory |             |                  |                 |                |                  |                             |                      |                           |                           | Summary         |                | Asset Registry        |                         | Condition          |                     | Decomposition         |  |
|---|-------------|------------------|-----------------|----------------|------------------|-----------------------------|----------------------|---------------------------|---------------------------|-----------------|----------------|-----------------------|-------------------------|--------------------|---------------------|-----------------------|--|
| Natural Asset Registry                  |             |                  |                 |                |                  |                             |                      |                           |                           |                 |                |                       |                         |                    |                     |                       |  |
| Asset ID                                | Asset Type  | SOLRIS Class     | Asset Area (ha) | Municipality   | WHPA Zone        | Designated Wooded Area (ha) | Regulation Area (ha) | NVCA Floodplain Area (ha) | GRCA Floodplain Area (ha) | LSF Length (km) | LSF Plant Type | Forest Interior Score | Adjacent Land Use Score | Permeability Score | Relative Size Score | Condition Total Score |  |
| AGR-134053                              | Agriculture | Tilled           | 340.78          | East Garafraxa | Not in WHPA Zone | 1.05                        | 45.53                | 0.00                      | 5.51                      | 0               |                | 0                     | 6                       | 10                 | 0                   | 17                    |  |
| AGR-122415                              | Agriculture | Undifferentiated | 0.00            | Mulmur         | Not in WHPA Zone | 0.00                        | 0.00                 | 0.00                      | 0.00                      | 0               |                | 0                     | 7                       | 5                  | 1                   | 14                    |  |
| AGR-122416                              | Agriculture | Undifferentiated | 0.04            | Mulmur         | Not in WHPA Zone | 0.00                        | 0.00                 | 0.00                      | 0.00                      | 0               |                | 0                     | 6                       | 5                  | 1                   | 13                    |  |
| AGR-122417                              | Agriculture | Undifferentiated | 0.00            | Mulmur         | Not in WHPA Zone | 0.00                        | 0.00                 | 0.00                      | 0.00                      | 0               |                | 0                     | 5                       | 5                  | 1                   | 12                    |  |
| AGR-122418                              | Agriculture | Undifferentiated | 0.00            | Mulmur         | Not in WHPA Zone | 0.00                        | 0.00                 | 0.00                      | 0.00                      | 0               |                | 0                     | 5                       | 5                  | 1                   | 12                    |  |
| AGR-122419                              | Agriculture | Undifferentiated | 0.04            | Mulmur         | Not in WHPA Zone | 0.00                        | 0.00                 | 0.00                      | 0.00                      | 0               |                | 0                     | 6                       | 5                  | 1                   | 13                    |  |
| AGR-122420                              | Agriculture | Undifferentiated | 0.00            | Mulmur         | Not in WHPA Zone | 0.00                        | 0.00                 | 0.00                      | 0.00                      | 0               |                | 0                     | 6                       | 5                  | 1                   | 13                    |  |
| AGR-122421                              | Agriculture | Undifferentiated | 0.00            | Mulmur         | Not in WHPA Zone | 0.00                        | 0.00                 | 0.00                      | 0.00                      | 0               |                | 0                     | 6                       | 5                  | 1                   | 13                    |  |
| AGR-122422                              | Agriculture | Undifferentiated | 0.00            | Mulmur         | Not in WHPA Zone | 0.00                        | 0.00                 | 0.00                      | 0.00                      | 0               |                | 0                     | 6                       | 5                  | 1                   | 13                    |  |
| AGR-122423                              | Agriculture | Tilled           | 0.01            | Mulmur         | Not in WHPA Zone | 0.00                        | 0.00                 | 0.00                      | 0.00                      | 0               |                | 0                     | 7                       | 10                 | 1                   | 19                    |  |
| AGR-122424                              | Agriculture | Undifferentiated | 0.01            | Mulmur         | Not in WHPA Zone | 0.00                        | 0.00                 | 0.00                      | 0.00                      | 0               |                | 0                     | 7                       | 5                  | 1                   | 14                    |  |
| AGR-122425                              | Agriculture | Undifferentiated | 0.00            | Mulmur         | Not in WHPA Zone | 0.00                        | 0.00                 | 0.00                      | 0.00                      | 0               |                | 0                     | 7                       | 5                  | 1                   | 14                    |  |
| Total                                   |             |                  | 143,031.65      |                |                  | 44,506.90                   | 54,654.94            | 10,220.88                 | 6,344.90                  | 15              |                |                       |                         |                    |                     |                       |  |

## 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 quickly 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 3 and Figure 4 are screenshots from the dashboard that MNAI provided to Dufferin County. The full version of the dashboard can be accessed at: [go.greenanalytics.ca/DufferinCounty](https://go.greenanalytics.ca/DufferinCounty).

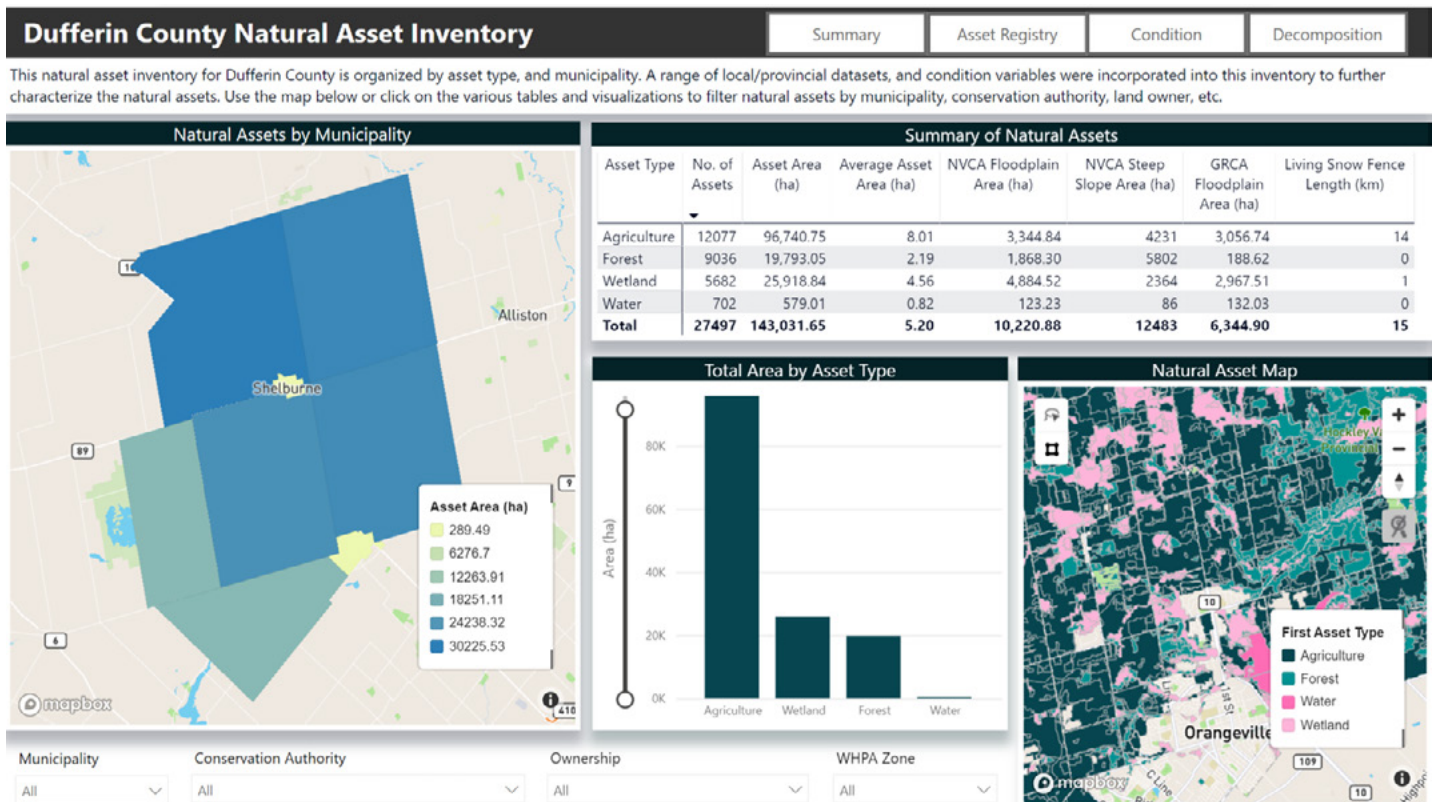


Figure 3: Screenshot of main inventory summary

## 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.

In Dufferin County, a desktop condition assessment was completed and built into the inventory to provide an initial understanding of the status of the natural assets for the municipality. The condition assessment steps and indicators are summarized in Table 4.

**TABLE 4: CONDITION ASSESSMENT APPROACH AND INDICATORS**

| Indicator                                     | Description & Methods for Quantification  | Data used to Quantify Indicator  |
|---|---|--|
| <b>Relative asset size</b>                    | 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  |
| <b>Road density</b>                           | Measures the density of the roads in and around the assets according to high density (assets with more than 2km of roads per square km), medium density (assets with between 1km and 2km of roads per square km) and low density (assets with less than 1km of roads per square km).  | Natural asset inventory plus spatial representations of roads.   |
| <b>Surface permeability</b>                   | <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. 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><a href="https://data.nasa.gov/dataset/Global-Man-made-Impervious-Surface-GMIS-Dataset-Fr/dkf4-4bi3">data.nasa.gov/dataset/Global-Man-made-Impervious-Surface-GMIS-Dataset-Fr/dkf4-4bi3</a></p> |
| <b>Adjacent land use (nearest neighbours)</b> | Considers the distance to, and the nature of, the area surrounding natural assets. Intense land uses (e.g., airports) 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.  | 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

Figure 4 is a screenshot of the condition assessment for the natural assets within Dufferin County as summarized in the online dashboard.

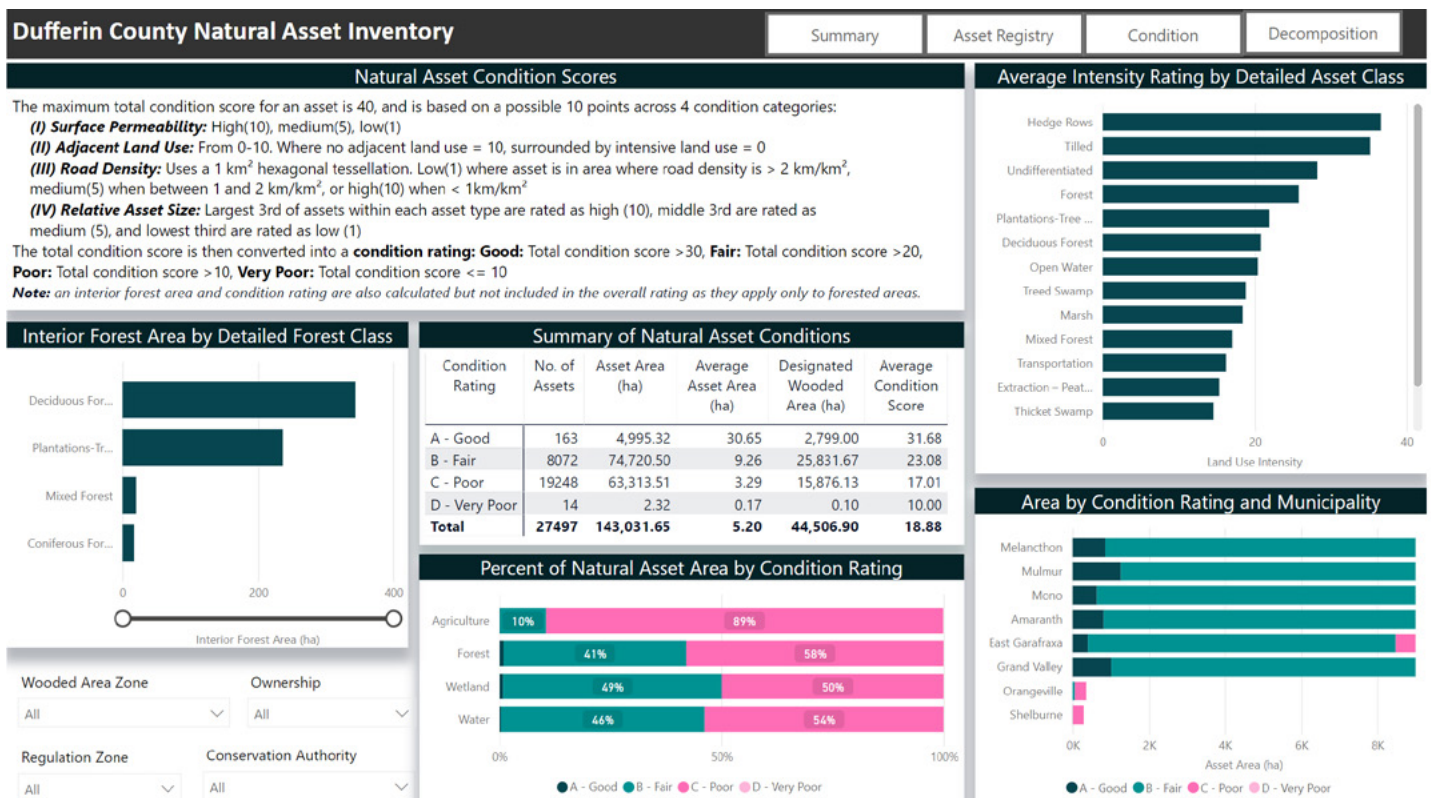


Figure 4: Snapshot of condition assessment details

Overall, about 4,995 ha (or about 3.5 per cent) of natural assets were assessed in good condition and 74,721 ha (or 52 per cent) were assessed in fair condition.

Agriculture lands were largely rated as poor. This is due to a combination of these assets being less permeable, degraded, and being in close proximity to roads.

The forest assets are generally in fair and poor condition. The forest assets in poor condition are due to being relatively small assets in close proximity to roads.

Within the project area, 49 per cent of wetlands are rated fair while 50 per cent are rated poor. As with forest assets, wetland assets rated poor were relatively small and in close proximity to roads.

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

**TABLE 5: SUMMARY OF NATURAL ASSET CONDITION RATINGS**

| Condition Rating | Number of Assets | Total Area (ha) | Average Total Score |
|------------------|------------------|-----------------|---------------------|
| Good             | 163              | 4,995           | 32                  |
| Fair             | 8,072            | 74,721          | 23                  |
| Poor             | 19,248           | 63,314          | 17                  |
| Very Poor        | 14               | 2.32            | 10                  |
| <b>Total</b>     | <b>27,496</b>    | <b>143,032</b>  | <b>19</b>           |

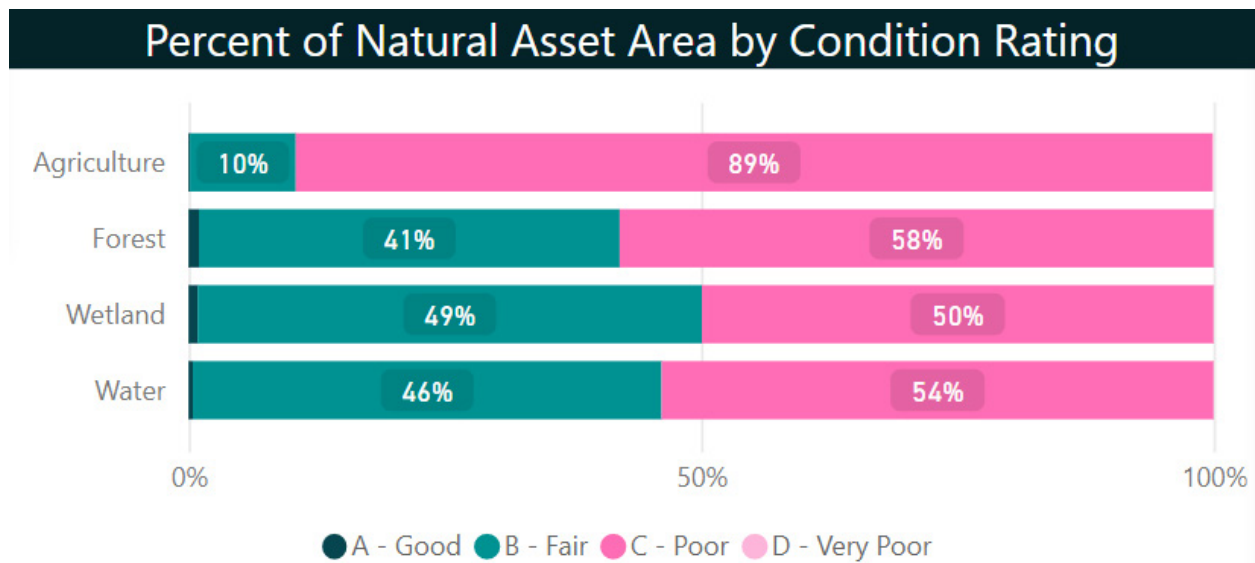


Figure 5: Summary of condition rating by natural asset type

## 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. 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 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 to assist them in self-administering it.

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 County 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, Dufferin County considered possible risks that the loss of natural asset functions could pose to engineered 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 (e.g., overuse of salt on roads)
- Drought (current and future)
- Erosion
- Lack of land management plans
- Political policy change

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, Dufferin County 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 impact probability 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:

- 6 high-level risks (overuse of trails/dumping, invasive species, development pressure, pollutant loading, flooding in Orangeville and Grand Valley, and future drought)
- 2 medium-level risks (county-wide flooding and policy change)
- 3 low-medium risks (current drought, erosion, and lack of land management plans)
- 1 low-level risk (forest fire)

In terms of scope, the identified risks affect natural assets across Dufferin County, particularly in the vicinity of trails, waterways, and the areas of increasing density within current urban settlement areas.

## Risk Matrix

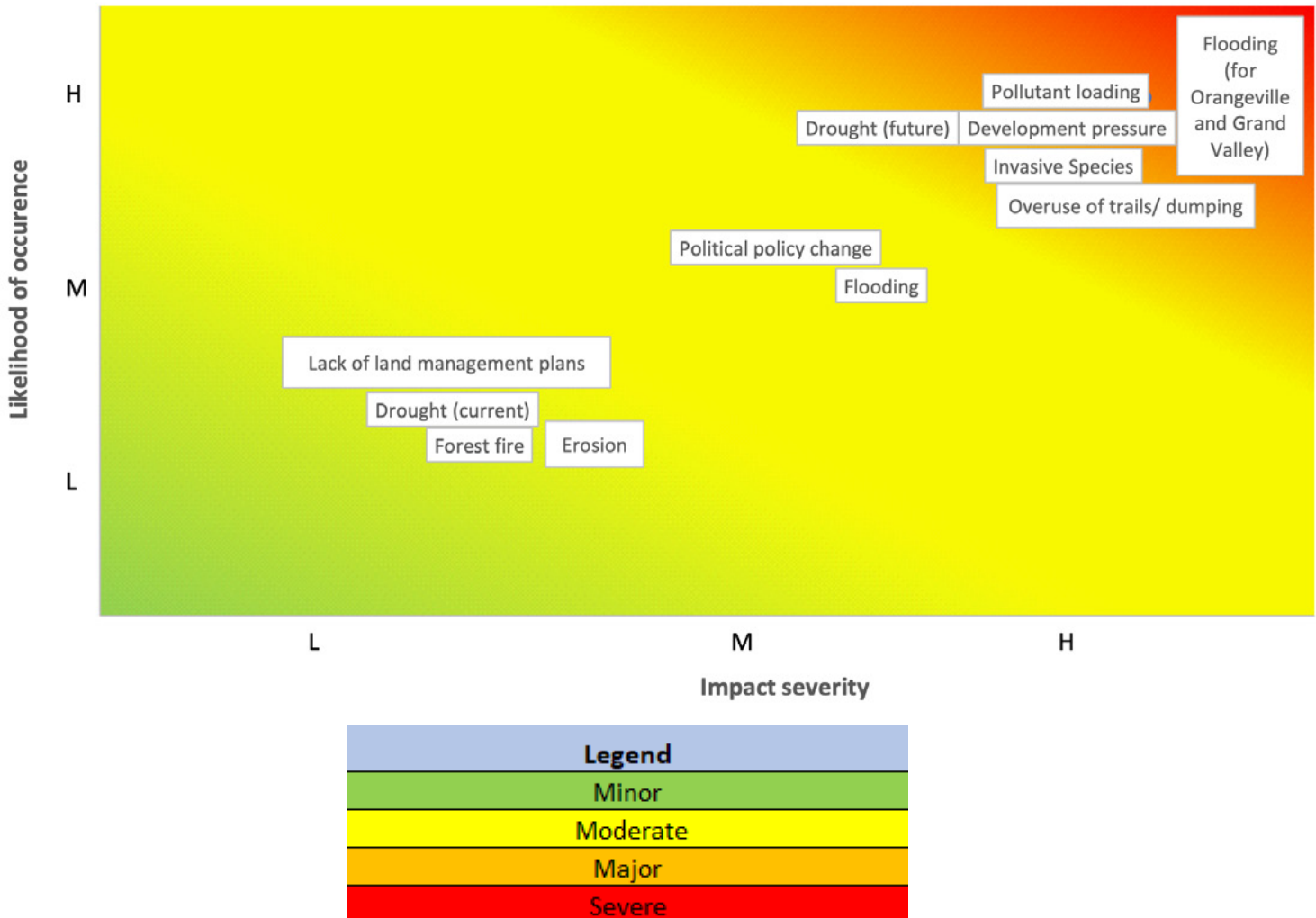


Figure 6: Results of risk management process

## 6 Implications

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) issues the community can consider to advance to a full natural asset management initiative.



## 6.1. Potential priorities for the local government

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

- **Overuse of trails/dumping:** The trails of the County Forest, Island Lake, Mono Cliffs, Hockley Nature Reserve, and the Bruce Trail have seen increased use during the COVID-19 pandemic. It is likely that dumping along trails, ditches, and forest entrances has also increased during this time. Impacts from trail overuse and dumping could increase with the marketing promotion resulting from the new tourism strategy. Consequences of overuse may include damage to natural resources, diminishing air quality, water degradation, reduced wildlife, and a decline in trail experience and solitude. With relatively small, forested areas, the promotion of Leave No Trace principles is vital to preserving the natural assets in the vicinity of trails.
- **Invasive species:** Natural assets across Dufferin County are at risk from invasive species, which could become unmanageable. The region is currently experiencing gypsy moths, hog weed, emerald ash borer, and possibly zebra mussels. Increased recreation in the region is perceived as a main contributor to risk since invasive species are often spread through human activity.
- **Development pressure:** Development around urban settlement boundaries within Shelburne, Grand Valley and Orangeville poses a high risk to natural assets. These areas have a greater percentage of forests and wetlands in poor condition than the Dufferin County average. While the Provincial Policy Statement 2020<sup>3</sup> stipulates that growth will be managed to optimize the use of existing infrastructure, develop complete communities, and protect natural environment and agricultural areas, there may be a need to move beyond minimum standards. Revisions to zoning and development permit by-laws to recognize and protect the role of critical natural assets to sustainable service provision could help reduce this risk.
- **Pollutant loading:** Pollutant loading from urban and agricultural sources poses a high risk to natural assets, particularly wetlands and waterways in Melancthon, Amaranth, Grand Valley and East Garafraxa. Agricultural run-off, impacts to drinking water, and increased salt run-off from roads associated with a changing climate can impact the services being provided by natural assets in the region. On a broad scale, MNAI recommends that Dufferin County seeks out priority pollutant reduction opportunities, protects natural assets such as wetlands and riparian buffers that help control run-off, and begin ecological restoration and retrofit activities to clean up degraded water bodies.

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<sup>3</sup> [www.ontario.ca/page/provincial-policy-statement-2020](http://www.ontario.ca/page/provincial-policy-statement-2020)

- **Flooding in Orangeville and Grand Valley:** Flooding is of medium risk across Dufferin County. However, Orangeville and Grand Valley have been singled out as high risk areas. Flooding in Orangeville and Grand Valley threatens municipal infrastructure, such as roads, culverts, bridges and buildings. Within urban areas, impacts to residents living on riverbanks are of concern. Currently there is no comprehensive flood mapping, which limits the ability to develop an effective plan.
- **Future drought:** Drought is not currently considered a risk to Dufferin County. However, it has been identified as a future risk given local climate change projections. Natural assets with dropping water tables, agricultural lands, Mono and Mulfur forests on sandy soils, and forest and grass fires could all bring about considerable economic, social, and environmental consequences. Water balance assessments that incorporate scenario modelling of future climate projections could help address this risk.

**TABLE 6: RISK MITIGATION STRATEGIES**

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

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

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

Dufferin County will update its Strategic Asset Management Policy and Plan in 2021. This provides an opportunity to incorporate natural asset considerations and add objectives that support continuous improvement of natural asset management. Dufferin County identified potential areas for improvement including formally establishing a cross-functional asset management team and improving communications among staff to support greater understanding of natural asset management and how it fits into the asset management process.

Dufferin County also identified the need to develop levels-of-service measures for both engineered and natural assets and to improve valuation of natural assets, all of which will support Dufferin County in strengthening its asset management plans. It was also suggested that Dufferin County would benefit from asset management software that could be used by multiple stakeholders.

While Dufferin County uses adaptive management regularly in its forest management, gaps that could be addressed in the near term include broadening the scope of natural assets considered at the County level. This could include, for example, developing management plans for road allowances,

or maintenance plans for the living snow fence. To develop staff capacity in natural asset management, a next step could be to complete a staff competency review to identify skillsets for natural asset management and to fill essential gaps.

## 6.2. Possible actions for the further development of the inventory

Based on the inventory, Dufferin County 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 inform Dufferin County's risk mitigation strategies (see Table 6).
- Further develop the condition assessment and risk assessment using local climate projections, land use modelling, and other data 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 flooding and stormwater management perspective, the wetlands and forested areas in the watersheds will be key.
- Share the inventory with adjacent local governments to stimulate collaboration.
- 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.
- 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 Dufferin County wishes to proceed with a full natural asset management project, including implementation, they would 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 and development pressure are the 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 could be filled.

- 3/ Modelling.** Modelling the levels of service that natural assets currently provide, and the levels of service 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, for example, “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 this, local governments can begin to consider and prioritize actions ranging from status quo to planning, regulatory, financial operations, maintenance, acquisition, and monitoring interventions.
- 6/ Implementation.** The natural asset implementation phase is an adaptive management cycle, not a finite journey. It is during this time that actions identified based on the previous steps can begin to be implemented. MNAI can provide ongoing advice / guidance on policy pieces and integration of the above information for 12-18 months. After this point, 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 from 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 Dufferin County's risk identification

This Annex contains the results of Dufferin County's use of MNAI's risk identification tool, which they self-administered with guidance from MNAI. Table 1 was the main product, developed by Dufferin County's personnel, that resulted 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 1: SIMPLIFIED RISK IDENTIFICATION SURVEY**

| Risk                                 | Ranking (L/M/H)  | Assets Affected   | Location                  | Notes  |
|--------------------------------------|--|---|---------------------------|--|
| <b>1/</b> Overuse of trails/ dumping | H  | <b>Trails:</b> County Forest Trails, Island Lake, Mono Cliffs, Hockley nature reserve, Bruce Trail<br><br><b>Dumping:</b> ditches, trails, forest entrances |                           | Because of COVID-19, there is an increased use of trails<br><br>New Tourism strategy intends to promote increased use of the trails<br><br>*manageable   |
| <b>2/</b> Flooding                   | M for whole County<br><br>H for Orangeville and Grand Valley | Municipal infrastructure (culverts, bridges, roads), all buildings  | Orangeville, Grand Valley | Urban areas of OV and GV are most at risk of flooding (current and future), some residents on riverbanks<br><br>no comprehensive updated flood mapping, have some data on “natural hazard” lines (yr: 2000)<br><br>*can become unmanageable with no plan |
| <b>3/</b> Forest fire                | L  | All forested areas, particularly young conifer plantations  |                           | Currently low, increases slightly for one month.<br><br>Could be higher in the future with hotter dry conditions due CC<br><br>N/A   |
| <b>4/</b> Invasive species (IS)      | H  | All natural assets  | Everywhere                | Increase of IS is associated with increased recreation use (shoes, horse hooves, bikes, boats etc.)<br><br>Currently experiencing gypsy moths, hog weed, emerald ash borer, zebra mussels (?)<br><br>*Can become unmanageable                            |

**TABLE 1: SIMPLIFIED RISK IDENTIFICATION SURVEY**

| Risk   | Ranking (L/M/H)             | Assets Affected   | Location   | Notes  |
|--|-----------------------------|---|--|--|
| <b>5/</b> Development pressure   | H                           | Around current urban settlement boundaries  | Shelburne, Grand Valley, Orangeville (density only, no expansion of urban settlement boundary) | PPS – guidelines for growth<br><br>*should be manageable; in reality it isn't  |
| <b>6/</b> Pollutant loading from urban, agricultural, or industrial sources (e.g., overuse of salt on roads) | H                           | All NA, but mostly wetlands and waterways<br><br>pollutants in drinking water (water treatment plants affected) | Melancthon, Amaranth, GV, EG   | Mostly agriculture run-off<br><br>Potential for increase risk with salt due to CC projections for DC of less snow and more ice<br><br>County tracks how much salt is used<br><br>Not a lot of industrial sources<br><br>*Manageable to an extent |
| <b>7/</b> Drought (current and future)   | Current L/M<br><br>Future H | All NA with water table dropping  | Everywhere, agriculture land   | CC pressure<br><br>Mono & Mulmur forests on sand<br><br>potential for more forest and grass fires<br><br>CA's have water conservation data<br><br>*unmanageable  |
| <b>8/</b> Erosion  | L / M                       | Forest, soils, ag land, road  | Mono & Mulmur because of sandy forest<br><br>Some on CR124 (Melancthon) because of high wind   | Erosion can become worsened by overuse on trails<br><br>erosion line data from CAs<br><br>*manageable  |

**TABLE 1: SIMPLIFIED RISK IDENTIFICATION SURVEY**

| Risk                                    | Ranking (L/M/H) | Assets Affected | Location  | Notes  |
|---|-----------------|-----------------|---|--|
| <b>9/</b> Lack of land management plans | L / M           | All NA          | everywhere  | <p>Not an issue for County NA (forest), other than Living Snow fences and road allowances</p> <p>CAs have land acquisition policies/ plans</p> <p>No control over private lands, or those under the CAs</p> <p>*Manageable</p> |
| <b>10/</b> Policy change                | M               | All NA          | Everywhere, particularly in expanding urban settlement boundaries | <p>Planning policy changes are the biggest threat – both provincially and municipally</p> <p>*manageable</p>   |

## Municipal Natural Assets Initiative

