Toward natural asset management in

The Town of Logy Bay-Middle Cove-Outer Cove

Newfoundland & Labrador

Summary of inventory results and recommendations
January 2021

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Municipal Natural Assets Initiative

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Making Nature Count

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.

Disclaimer

Municipal Natural Assets Initiative
Website: *MNAI.ca*

Table of Contents

1 Purpose

This document summarizes the results of a project to develop a natural asset inventory in Logy Bay-Middle Cove-Outer Cove, Newfoundland and Labrador, 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[1].

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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1   *https://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[2], their condition, and the risks they face. As depicted in Figure 1 and explained in detail in Annex 1, 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. A description of the steps MNAI uses to produce inventories is in Annex 2.
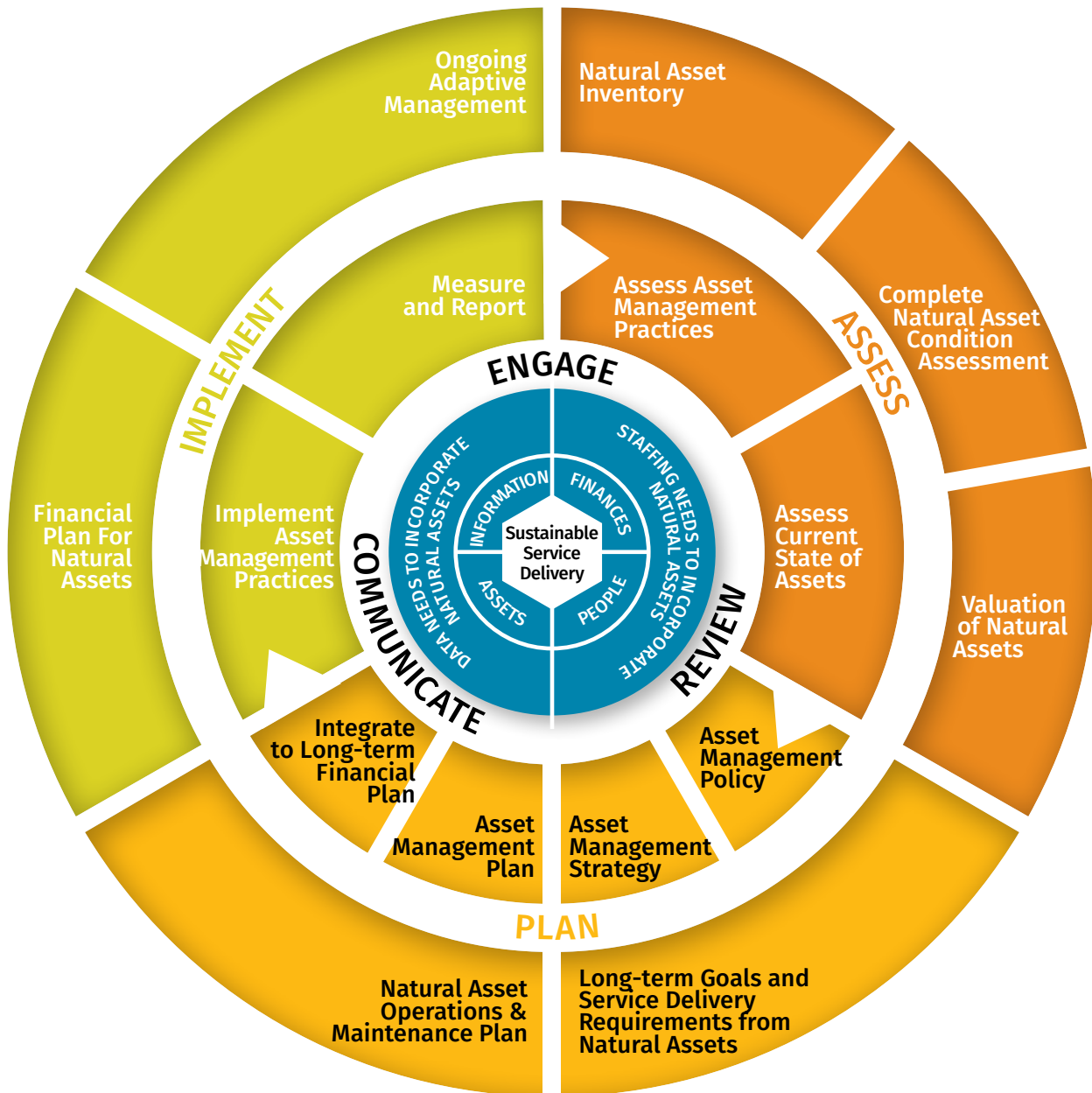
Figure 1: The Asset Management Process. MNAI has adapted this for use with natural assets.

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2   *Many local governments rely on services from natural assets they do not own.*

3 Local government context

3.1. General

Logy Bay-Middle Cove-Outer Cove (population ~2,200) is a town located approximately 10 km from St. John's, on the Avalon Peninsula of Newfoundland, Canada.

Logy Bay-Middle Cove-Outer Cove has three main interests in natural asset management. First, the Town recognizes that natural assets are critical to manage flooding and ensure water quality for the community. Concerns regarding flooding have been amplified by the risk of hurricanes during autumn. Second, Logy Bay-Middle Cove-Outer Cove faces significant development pressure, and wants to ensure that any development decisions are based on full evidence regarding both the services provided by natural assets, and the value of these services. Third, as with many communities, the headwaters for the watershed in which Logy Bay-Middle Cove-Outer Cove are located are outside the community boundary. Therefore, the Town wants to understand the extent to which it relies on natural assets outside its ownership and jurisdiction, and what coordination may be required with adjacent local governments.

The natural assets inventory will provide the Town with a starting point for incorporating natural asset management into asset management practices, and thus ensure that any action related to these interest areas is evidence-based.

Figure 2: *Logy Bay-Middle Cove-Outer Cove. Source: Google Maps*

3.2. Asset management readiness assessment

MNAI helps local governments determine their overall state of asset management maturity and helps them build asset management capacity across departments.

To do this, MNAI has adapted the Federation of Canadian Municipalities (FCM)'s asset management readiness assessment tool[3] for use with natural assets. MNAI's adapted tool helps local governments measure progress on asset management in four competency areas, with each area describing outcomes based on five levels of progress or maturity.

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

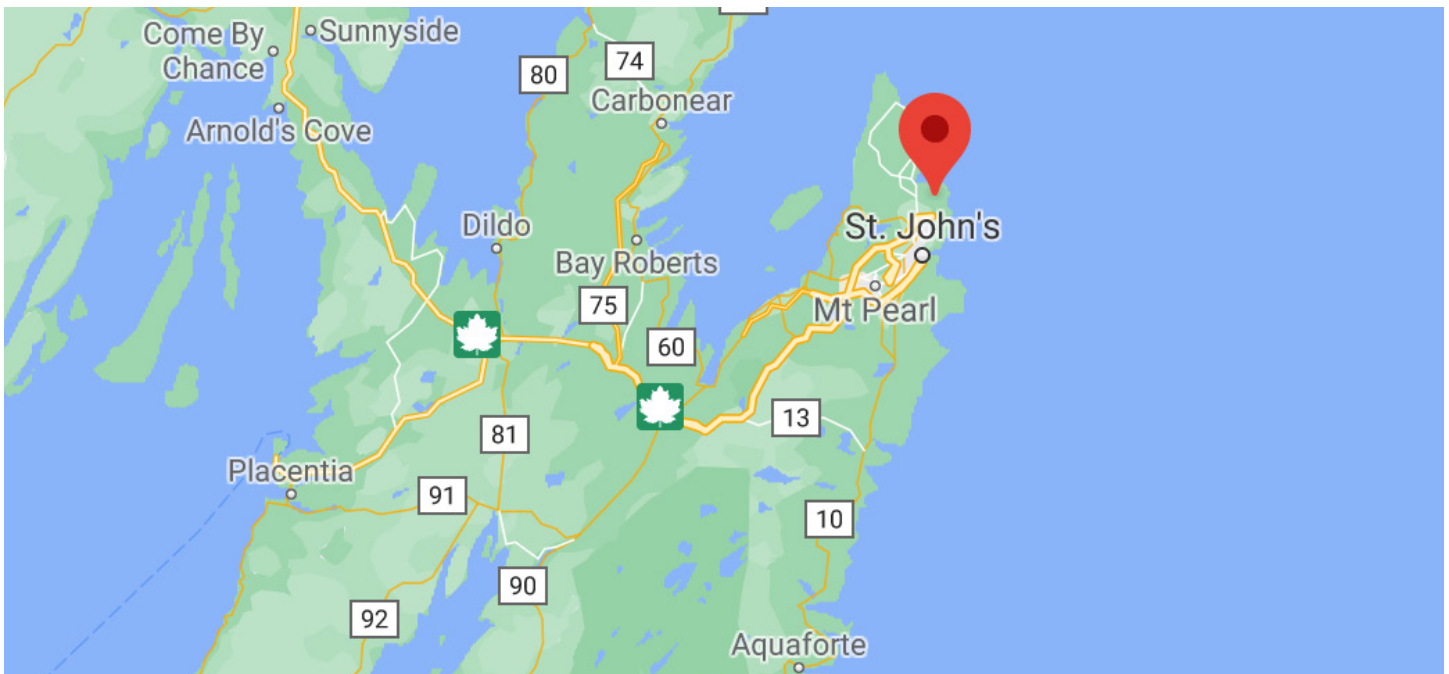The results of Logy Bay-Middle Cove-Outer Cove's readiness assessment indicate that the Town is at a very early stage of their asset management journey. At the outset of this project, they were either working on Level 1 or had completed Level 1 in all competency areas. They have data in their asset registry for engineered assets that conform to the Public Sector Accounting Board 3150 reporting requirements, and are further advanced in collecting data in asset categories such as roads. They currently have limited data on the three buildings they own. Logy Bay-Middle Cove-Outer Cove has recently developed an asset management policy that includes natural asset considerations.

These findings are taken into consideration in Section 6, below.

4   Natural asset inventory

4.1. Inventory overview

The project first developed a preliminary natural asset inventory[4] to establish a basic understanding of the natural assets within Logy Bay-Middle Cove-Outer Cove. MNAI gathered a range of data for an area scoped to the Logy Bay-Middle Cove-Outer Cove municipal boundary and has two main components, or ways to express the information: an asset registry and an online dashboard. MNAI provided the registry to Logy Bay-Middle Cove-Outer Cove 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.

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3   *See https://fcm.ca/sites/default/files/documents/resources/tool/asset-management-readiness-scale-mamp.pdf for details*

4   *The inventory is 'preliminary' in that it was based on available data and involved only limited data processing and related only to areas within the Town's boundaries.*

4.2. Inventory data

To establish the inventory, MNAI used the most recently available annual crop inventory data produced by Agriculture and Agri-Food Canada (AAFC) as baseline for land use / land cover.[5] MNAI then combined this spatial data with data the municipality provided on wetlands and water bodies 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 SOURCES		
ITEM	USE	SOURCE
AAFC Annual Crop Inventory	To establish a baseline land cover / land use.	Annual Crop Inventory - Open Government Portal (*canada.ca*)
Wetlands, Waterbodies, Water Courses Spatial data provided by municipality	To help define assets.	**Logy Bay – Middle Cove – Outer Cover GIS Data:** CBCL_DIGITIZED_WATERBODIES.shp CBCL_DIGITIZED_WATERCOURSES_FIELD_VERIFIED_REV01.shp CBCL_DIGITIZED_WETLANDS_FIELD_VERIFIED_REV00.shp
Watershed boundaries Spatial data provided by municipality	To summarize assets.	**Logy Bay – Middle Cove – Outer Cover GIS Data:** Coakers_DA.shp Drukens_DA.shp Kennedys_DA.shp OuterCove_DA.shp
Street Network, Municipal Land Use (Planning) Spatial data provided by municipality	For condition assessment.	**Logy Bay – Middle Cove – Outer Cover GIS Data:** Lb-mc-oc-streetnetwork-june8-2020.shp logybay-currentmunicipalplan.shp
Global Man-made impervious surfaces dataset	Informed the condition assessment	**NASA** *https://data.nasa.gov/dataset/Global-Man-made-Impervious-Surface-GMIS-Dataset-Fr/dkf4-4bi3*

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5   *[1] For more information on AAFC annual crop inventory, see: Annual Crop Inventory - Open Government Portal (canada.ca)*

The inventory project defined a total of 4,958 individual assets, covering 980 hectares (ha) of the municipal area, as noted in Table 2. The majority of this was forest 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)	MAX ASSET AREA (HA)
Pasture / Forages	19	54.9	2.89	7.82
Forest	3,143	711.4	0.23	29.57
Wetland	1,524	190.0	0.12	4.09
Water Body	96	8.5	0.09	2.74
Grassland	176	15.4	0.09	0.85
Total	**4,958**	**980.2**	**3.42**	**45.07**

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 the Town's registry showing natural asset characteristics and details is in Table 3.

TABLE 3: EXCERPT FROM THE REGISTRY

Logy Bay - Middle Cove - Outer Cove Natural Asset Inventory | Summary | Asset Registry | Condition | Decomposition

Natural Asset Registry

Asset ID	Natural Asset Class	River Basin	Asset Area (ha)	Trail Name	Trail Length within Asset	Road Length within Asset	Disturbance Rating	Surface Permeability Rating	Adjacent Land Use Rating	Relative Asset Size	Condition Rating
AGR0000001	Pasture / Forages	Outer Cove	1.70		0.00	0	Category 1 (intact)	Medium	Poor (Close to Intense land uses)	1	3 - Poor
AGR0000002	Pasture / Forages	Outer Cove	6.28		0.00	0	Category 2 (degraded)	Medium	Poor (Close to Intense land uses)	1	4 - Very Poor
AGR0000003	Pasture / Forages	Kennedys	7.82		0.00	6	Category 2 (degraded)	Low	Poor (Close to Intense land uses)	1	4 - Very Poor
AGR0000004	Pasture / Forages	Kennedys	4.60		0.00	0	Category 1 (intact)	Medium	Poor (Close to Intense land uses)	1	3 - Poor
AGR0000005	Pasture / Forages	Kennedys	1.96		0.00	8	Category 2 (degraded)	Low	Poor (Close to Intense land uses)	1	4 - Very Poor
AGR0000006	Pasture / Forages	Outer Cove	4.06		0.00	0	Category 2 (degraded)	Medium	Poor (Close to Intense land uses)	1	4 - Very Poor
AGR0000007	Pasture / Forages	Kennedys	1.65		0.00	4	Category 2 (degraded)	Low	Poor (Close to Intense land uses)	1	4 - Very Poor
AGR0000008	Pasture / Forages	Kennedys	4.25		0.00	25	Category 2 (degraded)	Low	Poor (Close to Intense land uses)	1	4 - Very Poor
AGR0000009	Pasture / Forages	Outer Cove	0.00		0.00	0	Category 2 (degraded)	Medium	Poor (Close to Intense land uses)	1	4 - Very Poor
AGR0000010	Pasture / Forages	Outer Cove	0.36		0.00	0	Category 2 (degraded)	Medium	Poor (Close to Intense land uses)	1	4 - Very Poor
AGR0000011	Pasture / Forages Cove		2.58		0.00	0	Category 2 (degraded)	Medium	Poor (Close to Intense land uses)	1	4 - Very Poor
AGR0000012	Pasture / Forages	Coakers	3.40		0.00	0	Category 2 (degraded)	Low	Poor (Close to Intense land uses)	1	4 - Very Poor
AGR0000013	Pasture / Forages	Coakers	4.49		0.00	0	Category 2 (degraded)	Medium	Poor (Close to Intense land uses)	1	4 - Very Poor
AGR0000014	Pasture / Forages	Coakers	6.89		0.00	0	Category 2 (degraded)	Medium	Poor (Close to Intense land uses)	1	4 - Very Poor
AGR0000015	Pasture / Forages	Coakers	0.00		0.00	0	Category 2 (degraded)	Medium	Good (Distant land uses)	1	3 - Poor
AGR0000016	Pasture / Forages	Coakers	1.97		0.00	0	Category 2 (degraded)	Medium	Poor (Close to Intense land uses)	1	4 - Very Poor
AGR0000017	Pasture / Forages	Drukens	0.72		0.00	0	Category 1 (intact)	Medium	Poor (Close to Intense land uses)	1	3 - Poor
AGR0000018	Pasture / Forages	Coakers	0.98		0.00	0	Category 2 (degraded)	Medium	Poor (Close to Intense land uses)	1	4 - Very Poor
AGR0000019	Pasture / Forages	Coakers	1.19		0.00	0	Category 2 (degraded)	Medium	Poor (Close to Intense land uses)	1	4 - Very Poor

4.4. Online dashboard

Inventories may provide more insights when characterised 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 screen shots from the dashboard that MNAI provided to Logy Bay-Middle Cove-Outer Cove. The full version can be accessed at *go.greenanalytics.ca/logybay*
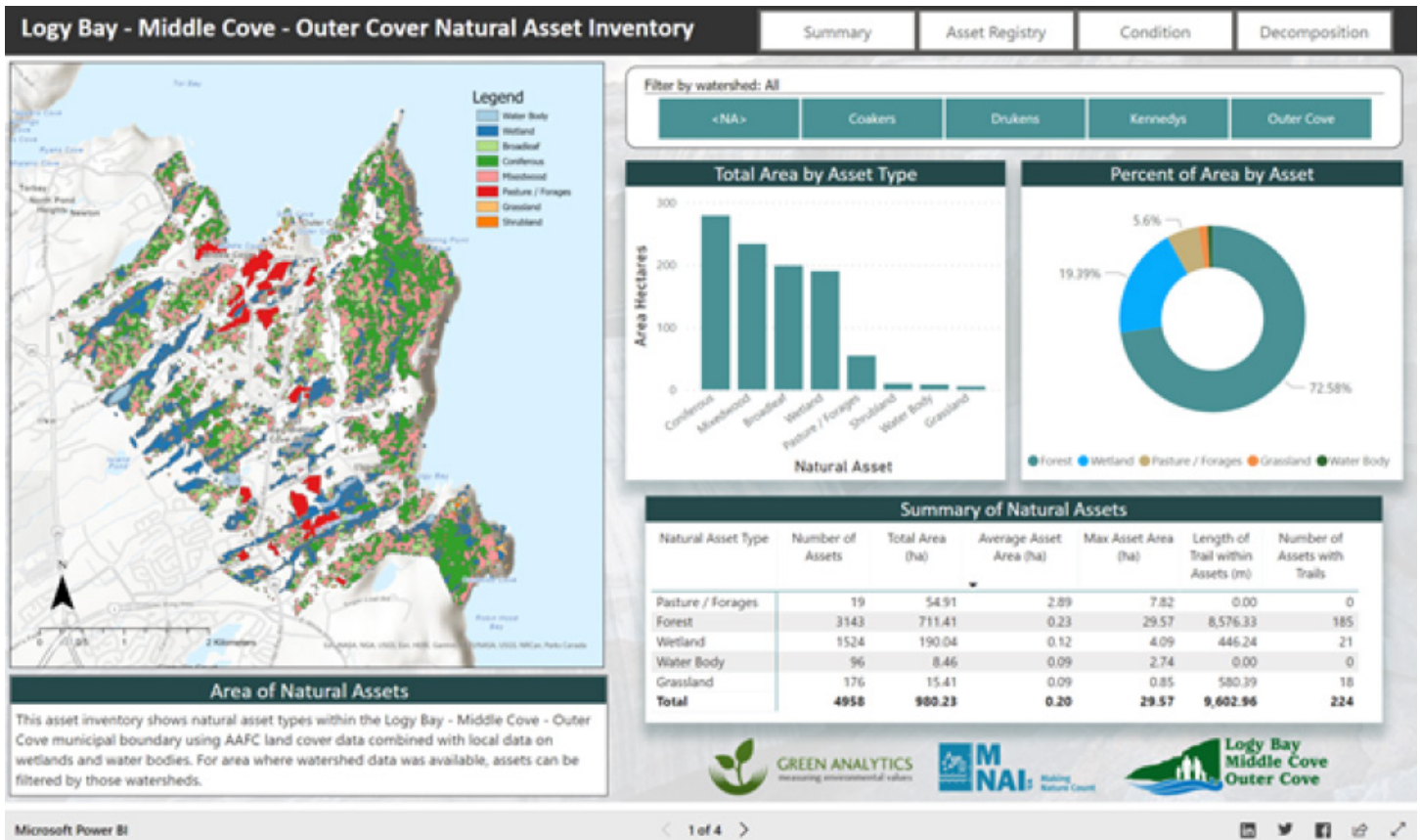
Figure 3: *Screenshot of main inventory summary*

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 Logy Bay-Middle Cove-Outer Cove, a desktop-based 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.

Figure 4: *Snapshot of condition assessment details*

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
Disturbance within asset	Natural assets are classified as either Category 1 (intact) or Category 2 (degraded), based on intersections between natural assets with development layers in GIS. Development includes urban and agricultural land cover and roads.	Natural asset inventory plus spatial representations of land uses, roads and disturbance activities.

TABLE 4: CONDITION ASSESSMENT APPROACH AND INDICATORS

Indicator	Description & Methods for Quantification	Data used to Quantify Indicator
Surface Permeability	The permeability of surfaces is ranked on a scale of nil to high depending on the type of landcover present. Urban areas, roads and industrial areas are ranked as nil. Assets within impervious surfaces are assigned as low permeability. Agriculture and shrublands are ranked as medium. Wetlands, waterbodies and forests are ranked as high.	Natural asset inventory, spatial representations of land uses and roads, as well as the Global Man-made impervious surfaces dataset from NASA. *data.nasa.gov/dataset/ Global-Man-made-Impervious-Surface-GMIS-Dataset-Fr/dkf4-4bi3*
Adjacent land use ('nearest neighbours')	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:

- Disturbance rated as either intact (10) or degraded (0).
- 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

Overall, about 204 ha (or 21 per cent) of natural assets were assessed in good condition and 425 ha (or 43 per cent) were assessed in fair condition.

Pasture and grassland assets were largely rated poor or very poor. This is due to a combination of these assets being less permeable, degraded, and in close proximity to intense land uses. Note, however, that these assets only account for a small portion of the overall natural asset area (about 7 per cent).

The forest assets are generally in good or fair condition. The forest assets in poor or very poor condition are due to being degraded and in close proximity to intense land uses.

Within the project area, 55 per cent of wetlands is rated poor or very poor due to being degraded and in close proximity to intense land uses. Wetlands play a very important hydrologic role by treating surface water and controlling surface water flows, so this asset type should be the target for closer analysis.

Figure 5 shows a dashboard summary of natural asset condition; Table 5 summarizes condition ratings; and Figure 6 summarizes condition by natural asset type.

TABLE 5: SUMMARY OF NATURAL ASSET CONDITION RATINGS

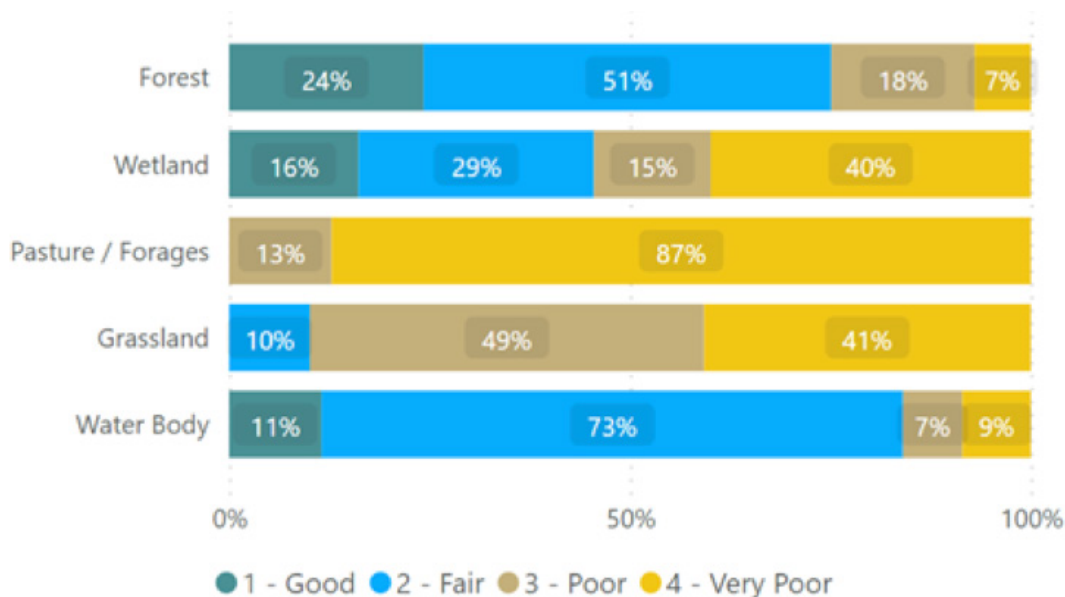| Condition Rating	Number of Assets	Total Area (ha)	Average Total Score	Percent of Assets Considered Intact	Percent of Assets Close to Intense Land Use
1. Good	1,236	204.27	31.00	100	0
2. Fair	1,516	425.23	21.11	100	98
3. Poor	1,341	170.19	11.67	7	93
4. Very Poor	867	180.66	3.88	0	100
Total	**4,958**	**980.23**	**18.01**	**57**	**73**

Figure 5: Snapshot of condition assessment details

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 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 at 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.

Logy Bay-Middle Cove-Outer Cove identifies risk management as a four-stage process, including: 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 town 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, Logy Bay-Middle Cove-Outer Cove 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 (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

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, Logy Bay-Middle Cove-Outer Cove considered four questions:

1/ what is likely to happen?
2/ what is the impact of that happening?
3/ what can be done to mitigate the 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:

- 4 high-level risks (forest fire, development pressure, pollutant loading, and political policy change)
- 6 medium-level risks (dumping, flooding, drought, erosion, storm surge, and construction activity)
- 3 low-level risks (overuse of trails, invasive species, and ice jams)

In terms of scope, the identified risks affect natural assets across the entire area within Logy Bay-Middle Cove-Outer Cove boundaries, with four exceptions: flooding, which is restricted to waterways, waterbodies, and wetlands; erosion, which is most pronounced along coastlines and in Stick Pond Brook; storm

surge, which is impacting coastal areas; and ice jams, which have been experienced in Middle Cove Beach and Outer Cove Beach.

Risk Matrix
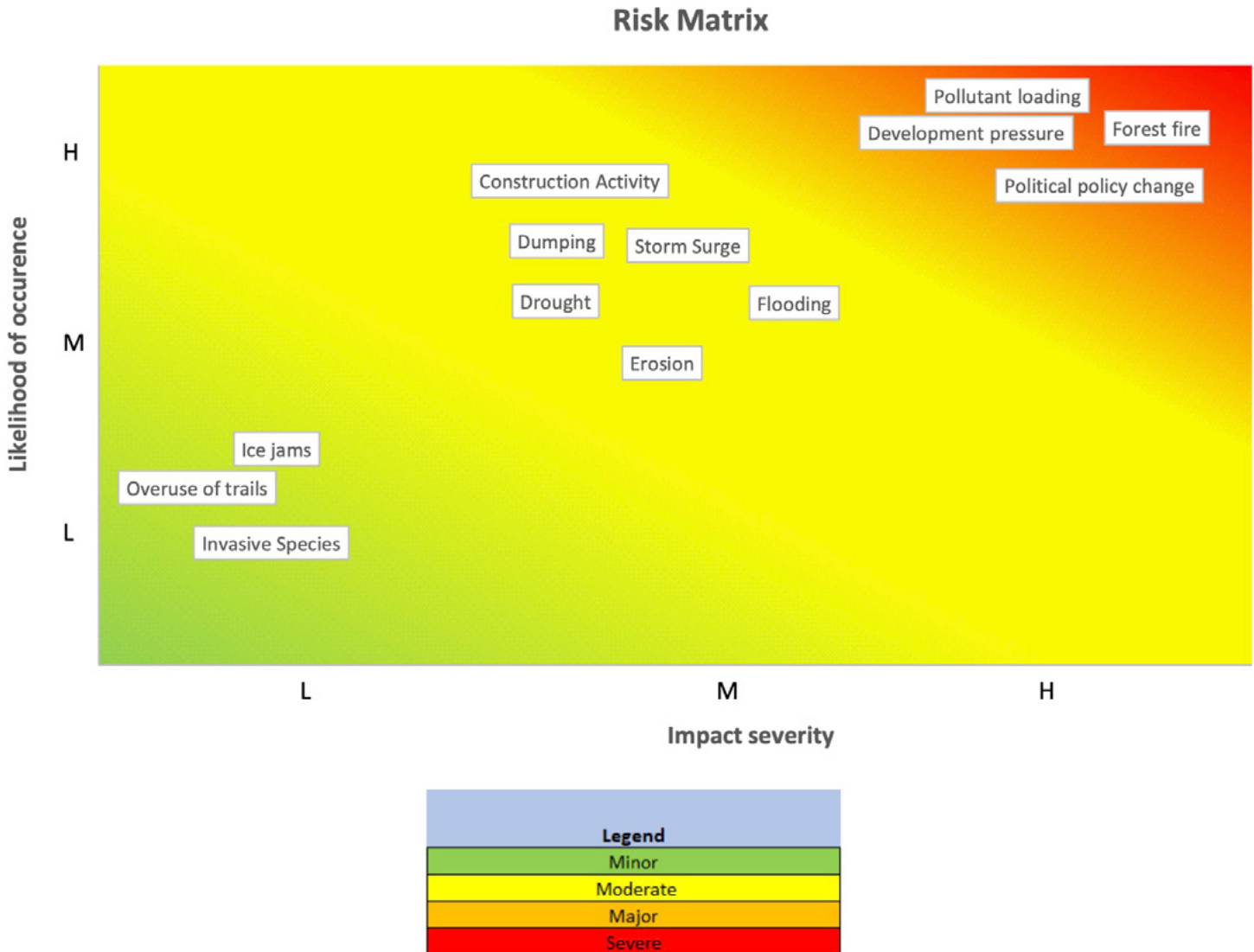
Figure 6: Results of risk management process

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 (6.1.) potential priorities for the local government (6.2.) possible actions for the further development of the inventory, and (6.3.) 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 for the Town to focus their natural asset management efforts. In the case of Logy Bay-Middle Cove-Outer Cove, these are as follows:

- **Forest fire:** Overall, forest assets are in good or fair condition. However, those that are degraded and in close proximity to areas of intense land uses require heightened attention. Forests within the Drukens watershed, followed by the Kennedys watershed, contain the highest proportions of forest in poor or very poor condition (59 per cent and 37 per cent respectively).

- **Development pressure:** Overall, development pressures have had a significant impact on pastures, grasslands, and wetlands, particularly in the Kennedys and Outer Cove watersheds. Wetlands, which have historically experienced loss due to development pressures across Canada, are at high risk in the Drukens and Coakers watersheds where the proportion in poor or very poor condition are 84 per cent and 71 per cent respectively.

- **Pollutant Loading:** The waterbodies of the Coaker watershed are showing the highest scores of degradation with 53 per cent ranked as poor or very poor. Overall, 75 per cent of natural assets in this watershed are close to intense land uses, which may be a primary factor in pollutant loading.

- **Political policy change:** Natural asset risks related to the nature of municipal politics are present across the watershed, but are of heightened importance in the headwaters, which lie outside of the community boundary.

- **Flooding and wetlands:** Given stated concern with flooding, wetlands - 55 per cent of which are identified as being in poor or very poor condition - should be a point of emphasis given their important hydrologic role.

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

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.

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

Logy Bay-Middle Cove-Outer Cove can leverage its newly adopted asset management policy to ensure there is sufficient commitment and resources to support natural asset management. The policy should be reviewed to ensure it has incorporated natural asset considerations.

While Logy Bay-Middle Cove-Outer Cove has an asset management champion in Councillor Paul Ryan, it will be important to ensure that all council members are made aware of the results of this project and its implications for the social, financial and environmental sustainability of the Town. This will help mitigate the political risks Logy Bay-Middle Cove-Outer Cove identified. It will also be important to ensure there is a staff designated with the responsibility to bring natural asset considerations into infrastructure management and decision-making.

In order to develop staff capacity in natural asset management, a key next step could be to complete a staff competency review to identify required skillsets for natural asset management and to fill any essential gaps.

Finally, it will be important to identify priority natural assets and the resources required to incorporate natural asset management into Logy Bay-Middle Cove-Outer Cove's asset management system and requirements to make progress on the asset management readiness scale.

6.2. Possible actions for the further development of the inventory

Based on the inventory, the Town 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 to field verification of results.
- Determine acceptable levels of risk to inform Logy Bay-Middle Cove-Outer Cove's risk mitigation strategies (see Table 6).
- Further develop the condition assessment and risk assessment using Logy Bay-Middle Cove-Outer Cove's 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 flooding and stormwater management perspective, the wetlands and forested areas in the watersheds will be key.
- Share the inventory to stimulate collaboration with adjacent local governments.
- Add more condition ratings - for example, canopy cover, which also links to stormwater management services.

- Examine how urban development, forest fire, pollutant loading, and political pressures could increase risk to assets.
- 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 the Town 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 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. The latter answers questions such as "what happens to the services provided by the wetland if everyone builds upstream?" or "what happens to the services if the forest is restored?"

5/ Planning. Based on the foregoing, the communities will have the opportunity to undertake actions ranging from status quo to planning, regulatory, financial operations, maintenance, acquisition and monitoring interventions. These would occur during the natural asset management planning phase and MNAI would be able to provide technical support as required throughout.

6/ Implementation. MNAI can provide ongoing advice / guidance on policy pieces and integration of the above information over a period of 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. Project monitoring is essential 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 a period of three years through a monitoring arrangement to be established with the communities.

7 Sources

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7.1. Annex 1 – Overview of natural asset management phases

Assess Phase

During the Assess phase, local governments identify natural assets, assess their condition, the risks they face, the services they currently provide, and the value of those services. This information is typically contained in a natural asset inventory.

Plan Phase

During the Plan phase for natural asset management, local governments seek to understand:

- how natural asset services may change for better or worse as a result of land use changes, rehabilitation, degradation, climate change and other potential changes.
- the values of the services provided by natural assets in future modelled scenarios.
- based on the foregoing, consideration of natural asset management priorities, timing and funding required to achieve different outcomes.
- what high-level policies require change or need to be developed (actual changes and/or development occurs as part of the implementation phase).

Implementation phase

Implementation options for natural asset management can span a range of activities, as shown in Table 7 Implementation is an ongoing process of continual improvement (as are all phases in the asset management cycle). Priorities will therefore change over time based on a local government's needs.

TABLE 7:
EXAMPLES OF NATURAL ASSET MANAGEMENT (NAM) IMPLEMENTATION PHASE ACTIVITIES

Local government education and capacity	Strategy, policy, bylaw	Programmes, financing, investments, and operations
Increase staff understanding of the role of NAM in delivering service	Natural asset management policy	Rehabilitation projects
Human resources practices are adapted	Natural asset management strategy	Acquisition projects
Staff receive training where needed	Official Community Plan updates	Integration of NAM into stormwater management
	Subdivision bylaw changes	Monitoring project
	Development charge bylaw changes	Activities to scale up from subwatershed
	Zoning changes	Costed operations and management plans

External Engagement, Awareness, and Partnerships	Third-party support for NAM	
Mechanisms in place to engage others with title/jurisdiction	Funding from public infrastructure programs	
Incorporation of traditional Indigenous knowledge	Insurance Sector	
School/community engagement	Capital markets funding	
University partnerships		
Communication through financial reports and to the community on NAM		

7.2. Annex 2 – MNAI process to develop natural asset inventories

At a basic level, a natural asset inventory is a list of natural assets that provide services to a local government, an understanding of the services provided, and the boundaries of the natural assets.

Many variables can be taken into consideration when identifying data inputs for an asset inventory; however, at a minimum, almost all inventories start with two data sets:

- Watershed, sub-watershed, or other catchment area boundary
- Detailed land cover (e.g. forest, wetlands, grasslands, etc.) and land use mapping of the area within the catchment boundary

MNAI's standard process to develop inventories is as follows.

Activity 1: MNAI conducts launch webinar with community / communities to understand and document their context and interests in natural asset management and explain the process and scope.

Output: brief documentation of webinar discussions and results.

Activity 2: MNAI conducts adapted Federation of Canadian Municipalities (FCM) readiness scale assessment with community / communities to determine their state of asset management maturity.

Output: completed readiness assessment.

Activity 3: MNAI shares natural asset management data needs checklist with the community / communities and requests that they (a) complete the checklist and (b) provide MNAI with the data in a timely manner.

Output: completed data needs checklist.

Activity 4: MNAI completes the inventory, including identifying and quantifying the location and extent of various assets, completing an assessment of their condition, reviewing data provided by the local government(s) and developing feedback / analysis on the data suitability, needs and gaps related to natural asset management, and provides support to communities to help them fill in any data gaps.

Output: completed Inventory Template that includes inventory or inventories and condition and risk identification using data the communities have provided.

Activity 5: Analysis webinar to present community with inventory of natural assets, explain its maintenance, and discuss potential future next steps in natural asset management process.

Output: completed MNAI inventory based on discussion. MNAI also provides the community in electronic format: a completed asset registry, dashboard, and instructions for upkeeping the inventory.

Activity 6: MNAI will develop a brief document identifying potential next steps for the community to move from the inventory phase to a full natural asset management project.

Output: brief summary document that summarizes results of inventory and recommendations for next steps.

7.3. Annex 3: Results of Town's risk identification

This Annex contains the results of the Town's use of MNAI's risk identification tool, which they self-administered with guidance from MNAI. Table 1 was the main product, developed by Town 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 8: SIMPLIFIED RISK IDENTIFICATION SURVEY				
Risk	**Ranking** Low (L), Medium (M), High (H)	**Assets Affected and ID #**	**Location** (on map, with risk #)	**Notes**
1. Overuse of trails	L	9,602.96 m	Throughout Town	Applies to all trails
2. Dumping	M	980.23 Ha	Throughout Town	Applies to entire Town limits
3. Flooding	M	All waterways, waterbodies, and wetlands	Throughout Town	Applies to entire Town limits
4. Forest fire	H	980.23 Ha	Throughout Town	Applies to entire Town limits
5. Invasive species	L	980.23 Ha	Throughout Town	Applies to entire Town limits
6. Development pressure	H	980.23	Throughout Town	Applies to entire Town limits
7. Pollutant loading from urban, agricultural, or industrial sources	H	980.23 Ha	Throughout Town	Applies to entire Town limits
8. Drought	M	980.23 Ha	Throughout Town	Applies to entire Town limits
9. Erosion	M	All coastlines and Stick Pond Brook	Middle Cove, Outer Cove, and Stick Pond Brook	
10. Ice jams	L	Middle Cove Beach & Outer Cove Beach	Beach areas	Only occurs during winter months and early spring
11. Storm surge	M	All coastlines	All coastlines	
12. Political policy change	H	980.23	Throughout Town	Applies to entire Town limits
13. Construction activity	M	980.23	Throughout Town	Applies to entire Town limits

Municipal Natural Assets Initiative