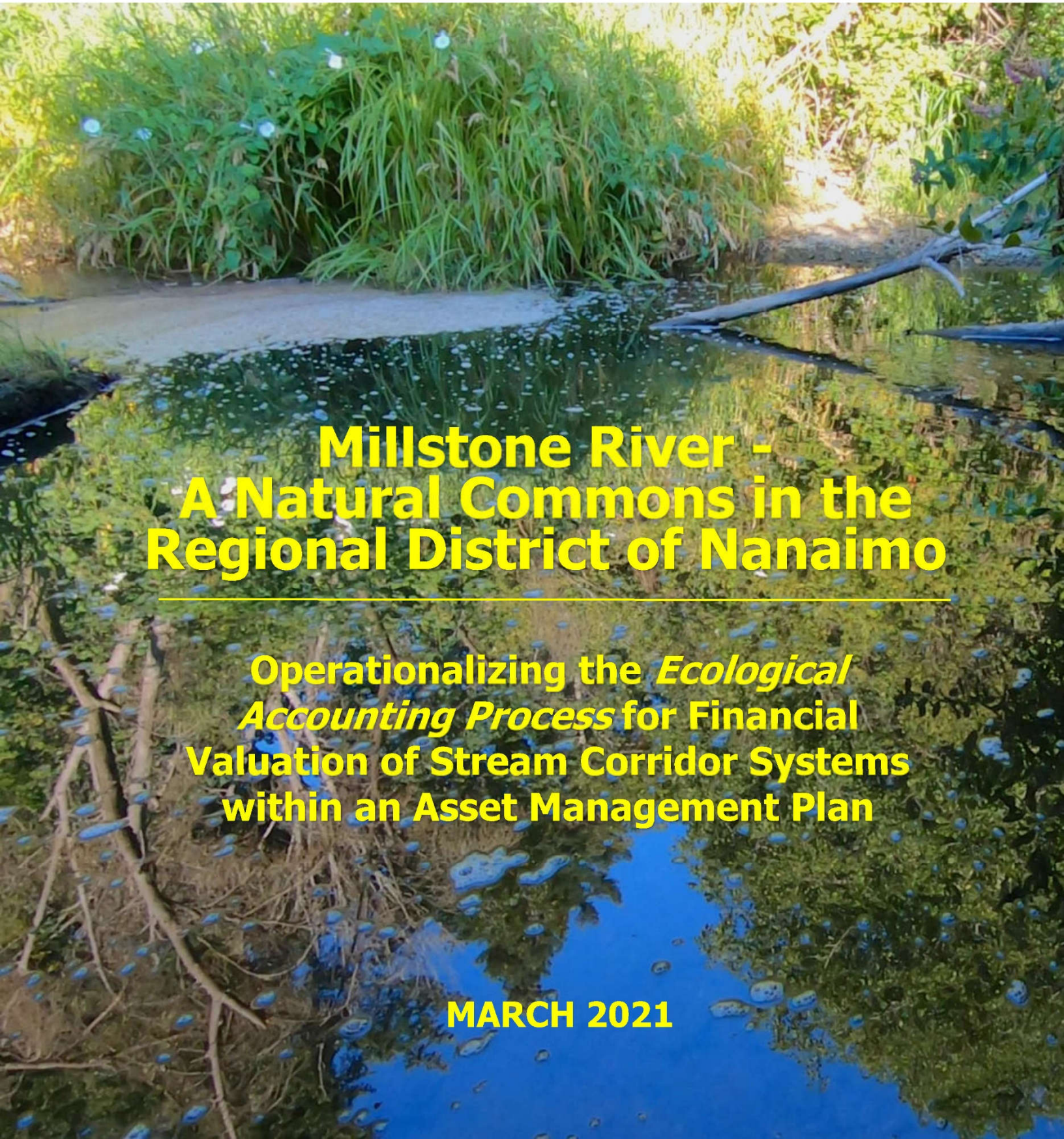
the partnership
for water sustainability in bc



# Millstone River - A Natural Commons in the Regional District of Nanaimo

## Operationalizing the *Ecological Accounting Process* for Financial Valuation of Stream Corridor Systems within an Asset Management Plan

**MARCH 2021**

# Note to Reader:

Under the umbrella of the Georgia Basin Inter-Regional Education Initiative, this publication is the fifth in a series of demonstration applications that have evolved EAP, the Ecological Accounting Process - A BC Process for Community Investment in the Natural Commons.

The EAP program is multi-year (2016-2021) and multi-stage to test, refine and mainstream the EAP methodology and metrics. EAP supports Asset Management for Sustainable Service Delivery: A BC Framework.

**To download a PDF copy of this Millstone River EAP report**, as well as any of the others in the series, visit the Green Infrastructure community-of-interest on the waterbucket.ca website at:

https://waterbucket.ca/gi/category/ecological-accounting-process/

Or go directly to:
https://waterbucket.ca/gi/wp-content/uploads/sites/4/2021/03/RDN_Millstone-EAP-Project_March-2021.pdf

**ACKNOWLEDGMENTS:** Funding from four organizations made it possible to undertake the project - Regional District of Nanaimo (RDN), Real Estate Foundation of BC, FCM Municipal Asset Management Program, Partnership for Water Sustainability.

Julie Pisani (RDN), Rob Lawrance and Kevin Brydges (both with City of Nanaimo) and Bernie Heinrichs (Island Waters Fly Fishers) played substantial roles in contributing to the successful project outcome. Their timely feedback throughout the process was a source of inspiration and direction for the research team.

The Partnership also recognizes the valuable support provided by Ariel Verhoeks of the Mount Arrowsmith Biosphere Region Research Institute (Vancouver Island University) in carrying out the foundational GIS analyses and community survey.



COVER PHOTO CREDIT: David Mackenzie

# Application of EAP to Millstone River Natural Commons

## What the Reader Will Learn

In this document, readers will encounter some uncommon concepts about the **use and conservation of land** as applied to natural asset management. EAP, the Ecological Accounting Process, considers use and conservation of land to be equally important values for prosperous human settlements.

- **The First Big Idea:** Streams are **Natural Commons**, systems that provide ecological services (uses) that the community jointly can access and enjoy. The idea of the commons includes social, ecological and financial qualities. Use and conservation of natural commons assets implies a social contract; that these natural assets will be maintained and managed to ensure access to ecological services in the future. The community has similar expectation concerning constructed commons - roads, storm drainage systems, potable water systems.
- **The Second Big Idea:** A stream in settled areas is a **Land Use**. The setback zone for streamside protection is defined in the Riparian Areas Protection Regulation. The financial value of the setback zone is measured using BC Assessment data. This calculation may be used to assign financial value to riparian areas beyond the stream setback zone that are conserved to enhance the stream's functioning condition.
- **The Third Big Idea:** A stream is an ecological system that has **Worth**, described by the investment the community has made to maintain and manage the stream. The stream, depending on its ecological condition, may influence positively or negatively the financial value of nearby parcels of land.

The EAP analyses concluded that two significant factors have supported the functioning condition of the Millstone River stream corridor, which is sound but can be more robust. The first is that the City of Nanaimo and the Regional District of Nanaimo have, for at least two decades, understood the Millstone River in both jurisdictions to be a riparian system offering important ecological, social and financial values.

The second is that the local governments have and continue to support long-term, strategic plans employing periodic projects - often involving several collaborators - to maintain (prevent degradation) and manage (enhance) the stream. Involvement of the stewardship sector through application of citizen science has proven to be an essential aspect of these strategies and projects.

---

*Tim Pringle, Chair*
*Ecological Accounting Process (EAP) Initiative*
*January 2021*

---

# Millstone EAP Project Committee

The members of the Project Committee provided invaluable feedback throughout the analytical process. This feedback resulted in helpful guidance. This was critical to ensuring a successful project outcome that would inform future decision-making related to development and implementation of asset management plans for stream corridors in the Nanaimo region.

| Participating Organization | Representative |
|---|---|
| **Regional District of Nanaimo** | Julie Pisani, Committee Chair<br>Coordinator, DWWP Program<br><br>Greg Keller<br>Senior Planner, Current Planning |
| **City of Nanaimo** | Rob Lawrance, RPP, MCIP<br>Environmental Planner<br><br>Kevin Brydges, R.P.Bio<br>Environmental Coordinator |
| **Island Waters Fly Fishers** | Bernie Heinrichs<br>Past-President |
| **Partnership for Water Sustainability in BC** | Tim Pringle<br>EAP Chair / Program Manager<br><br>Kim Stephens, M.Eng., P.Eng.<br>Executive Director |
| **Vancouver Island University** | Ariel Verhoeks<br>Graduate Student<br><br>Graham Sakaki, MCP<br>Research & Community Engagement Coordinator |

# Georgia Basin Inter-Regional Education Initiative (IREI)

## Educational Goal

Build practitioner capacity within the local government context to implement the whole-system, water balance approach known as ***Sustainable Creekshed Systems, through Asset Management***.

**Mandate:** Provide value through collaboration and partnerships.


## Acknowledgments

The Partnership for Water Sustainability gratefully acknowledges the support of the Province of British Columbia through the Ministry of Municipal Affairs, as well as that of the Real Estate Foundation of BC. Their financial support enables the Partnership to deliver the IREI program.


## About the Partnership for Water Sustainability

*Incorporation of the Partnership for Water Sustainability in British Columbia as a not-for-profit society on November 19, 2010 was a milestone moment. Incorporation signified a bold leap forward. Two decades earlier, a group of like-minded and passionate individuals, including representatives of three levels of government, came together as a technical committee. Over time, this "water roundtable" evolved into The Partnership.*

*The umbrella for Partnership initiatives and programs is* **the Water Sustainability Action Plan for British Columbia**. *In turn, the Action Plan is nested within* **Living Water Smart, British Columbia's Water Plan**. *Released in 2008, Living Water Smart was the provincial government's call to action, and to this day transcends governments.*

*The Partnership's guiding philosophy is to help others be successful. When they are successful, we are successful. The Partnership is led by a team of mission-focused volunteers, elders and collaborators. These individuals bring experience, knowledge and wisdom to the Partnership roundtable. This enhances the effectiveness of the Partnership as "the hub for a convening for action network". Although many on the Partnership leadership team have retired from their day jobs, the water-centric mission continues.*

## Regional Districts supporting the IREI

Regional District of Nanaimo

Comox Valley Regional District

CVRD

CRD — Making a difference...together

Metro Vancouver

# Guide for the Busy Reader

## Table of Contents / Storyline

This document is structured in four parts: Findings, Framework, Application and Supporting Details. The purpose of this structure is to provide a complete picture of the Millstone River EAP project, including the provincial context for the EAP program. The storyboard approach to the *Table of Contents* distils the essence of what the busy reader needs to know. Capsule summaries create a storyline to guide readers.

# Guide for the Busy Reader

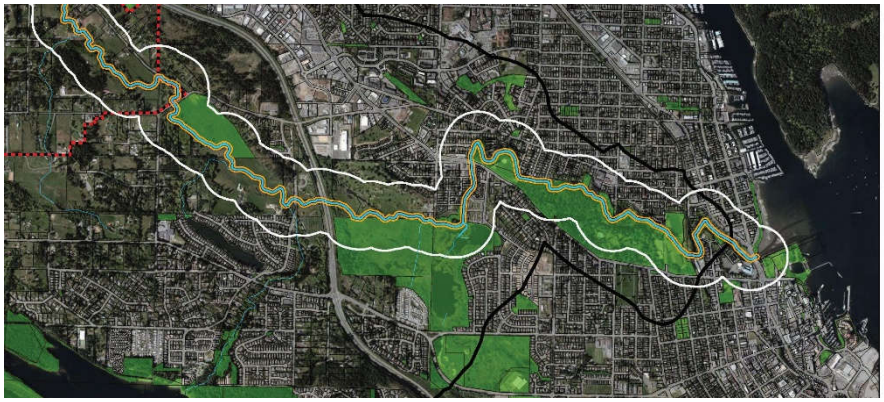
## Table of Contents / Storyline (continued)

| Section Theme | What the Reader will Learn | page |
|---|---|---|
| **PART C - EAP Applied** | | |
| **Step One: Watershed Profile** | Land use to accommodate human settlement alters the functioning condition of a stream system. The health of the Millstone depends on the extent and quality of riparian ecosystem area supporting it. | 31 |
| **Step Two: Stream System Functioning Condition** | The EAP focus is on riparian integrity to maintain the stream's functioning condition. The EAP benchmark assessment provides a starting point for strategy development to systematically invest in restoring riparian woodlands and tall vegetation. | 39 |
| **Step Three: Worth of Millstone River as a Natural Commons** | Worth is defined as the social, ecological and financial values residents and property owners attribute to the stream as a Natural Commons. The primary measure of 'worth' is the community's investment in maintenance and management. | 47 |
| **Step Four: Financial Value of the Natural Commons** | The Natural Commons Asset (NCA) is a land use and is defined as the setback zone required by provincial regulation. The EAP methodology uses BC Assessment data to find financial value. Metrics are expressed in $ per $m^2$ and $ per lineal metre. | 52 |
| **Step Five: Influence of the Stream on Parcel Values** | In a developed area, a stream with a functioning riparian zone may influence the assessed value of parcels abutting the stream. Within the City of Nanaimo, assessed values of residential parcels are 4% to 8% higher than those for parcels located away from the stream. | 60 |
| **PART D – EAP Research** | | |
| **List of References** | | |
| **Report on the "Survey of Property Owners and Residents"** | The survey received a total of 57 responses from a total of 356 survey invitations mailed to homeowners and renters living adjacent to the Millstone River within the Regional District of Nanaimo and City of Nanaimo. | |

This page left blank intentionally

PART A

# EAP Findings



# Water Regions in the RDN


**Figure 1**

# Synopsis of Research Findings

## Asset Management Context

EAP, the Ecological Accounting Process, bridges a gap. It provides local governments with a methodology and metrics so that they can operationalize "maintenance and management" (M&M) of stream corridor systems under the umbrella provided by Asset Management for Sustainable Service Delivery. The Millstone River EAP Project is the fifth of ten demonstration applications (case studies) in five regions that will be completed by the end of 2021.

Go to Steps One & Two in Part C for supporting details

***Watershed Description:*** With an area of about 93 km², the Millstone River is the largest system in Water Region 5. It lies in the Regional District of Nanaimo and the City of Nanaimo as shown on **Figure 2**. Platting of land parcels began in the watershed 160 years ago evolving into today's farms, rural residential and much denser urban areas. These land uses are the primary focus of the EAP analysis.

The EAP project focuses on the river reach from Brannen Lake to the Nanaimo harbour. The lower 3.3 km of the stream flows through Bowen Park, the segment with the most diverse riparian area and steepest gradient. The balance comprises lowland (floodplain) characteristics with large portions in agricultural use as well as wetland conservation. Nearby upland areas host residential and other land uses.

### Water Regions

*The 7 major basins in the Nanaimo region are shown on Figure 1. For planning purposes, the 7 areas are referred to as Water Regions.*

*Situated in Water Region 5, the Millstone River is a central feature in the Nanaimo region. The watershed accommodates some of the most densely populated areas of the region.*

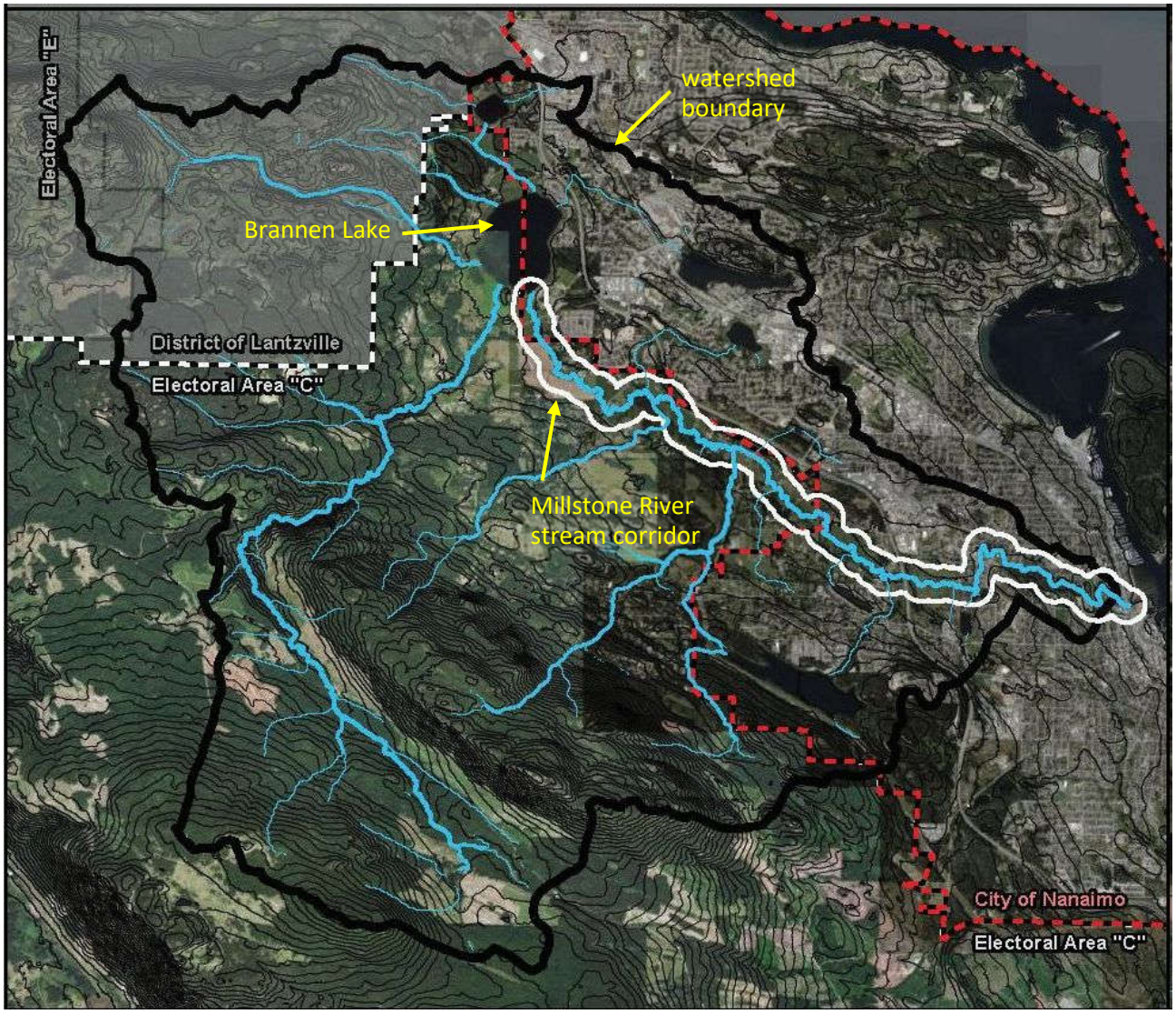
***Primary Focus of EAP:*** EAP considers streams and their corridors to be Natural Commons and an indicator of watershed health. Historical and current land uses alter a stream's riparian ecosystem, influence hydrology and result in the current functioning condition. Natural phenomenon can also alter the stream. Climate change impacts increasingly provide evidence of nature's influence.

**Land Use and Altered Landscapes:** In any case, the *state of the stream corridor riparian ecosystem* in any watershed (or creekshed) is one of two factors that have the greatest influence on the functioning condition of a stream. The other dominating factor is *changes in watershed hydrology*. Where streams have no riparian area due to alteration, removal, culverts, hardened ditches, or other interventions, the ecological services may be reduced to mere conveyance.



A program deliverable for *Sustainable Creekshed Systems, through Asset Management.*
Implemented under the umbrella of the Georgia Basin Inter-Regional Education Initiative

## Figure 2




# Millstone River Watershed - An Overview

## Research Questions

This case study research application of EAP addresses two questions:

> ***What influence does the stream as an ecological system (as a natural commons) have on urban and rural land use near the stream system; and does the stream influence the utility and financial value of parcels?***

The research and analyses confirm that in recent decades the community has gained an understanding of the Millstone River corridor as a natural commons or ecological system offering a range of uses or services. Changes to official plans and regulations provide measures to improve maintenance and management of these natural commons.

### Scope of Part A

*The Millstone EAP project is part of an applied research program to refine application of the EAP methodology and metrics. The intent is that they would used by local government to establish line items in budgets for maintenance and maintenance of ecological assets in stream corridors.*

***No recommendations are made. However, a framework is outlined for operationalizing EAP within an Asset Management Plan.***

*Part A serves as a 'report within a report'. It provides the reader with a picture of the approach to the research plus what we learned from the process.*

## Research Objectives

1. Establish a measure of stream corridor worth to the community.
2. Quantify the financial value of the stream corridor as a Natural Commons Asset (NCA).
3. Determine whether the stream influences the assessed values of parcels that abut or are adjacent to the stream.

## Research Findings

The results of the research and analyses are presented in Part C. The key findings for Objective Nos. 1 and 2 are synthesized below. An overview of what the numbers mean is sketched in the next three pages. The discussion concludes with guidance for implementation.

| **Section of Millstone Corridor** | **Stream Length** (km) | **Community Investment** ($ per year) | **Natural Commons Asset Values** | |
|---|---|---|---|---|
| | | | Total $ | $ per km |
| within City | 7 | $500,000 | $68.2M | $9.6M |
| within RDN | 8 | $60,000 | $11.5M | $1.4M |
| Combined | 15 | $560,000 | $79.7M | $5.5M |



A program deliverable for *Sustainable Creekshed Systems, through Asset Management.*
Implemented under the umbrella of the Georgia Basin Inter-Regional Education Initiative

## Community Investment in the Millstone River Corridor (Research Objective #1)

As an ecological system altered by historical land use, the Millstone stream corridor requires maintenance and management (M&M). Research Objective #1 is to quantify how many dollars have been invested over the past decade.

Go to Step Three in Part C for supporting details

The notion of **Worth** is a foundational concept underpinning the EAP methodology. The scale and magnitude of community investment in M&M is a demonstrable measure, over time, of the worth to the community of the Millstone stream corridor.

***Annual Maintenance and Management:*** Over the past decade, both the City of Nanaimo and RDN have invested in initiatives to utilize and protect the value of the Millstone stream corridor as a Natural Commons Asset. Their combined investment is a tangible measure of the worth of the ecological system to the community.

### Maintenance & Management (M&M) Defined

*Maintenance is defined as actions that prevent or avoid degradation of ecological assets that constitute the stream corridor system.*

*Management is defined as actions that improve the condition of the ecological system and the services it provides.*

| Section of Millstone | Stream Length (km) | Community Investment in Maintenance & Management of the Natural Commons Asset | |
|---|---|---|---|
| | | Total Over Past Decade | Annual Average |
| within City | 7 | $5.0M | $500,000 |
| within RDN | 8 | $0.6M | $60,000 |
| Combined | 15 | $5.6M | $560,000 |

**Discussion:** There is no central repository of information and data on annual investments in streams in the Nanaimo region. Thus, the EAP research has involved sourcing and compilation of relevant material to develop a picture of how much is being invested in the Millstone system. The $560,000 figure is therefore viewed as a baseline figure.

The research included interviews of key individuals with relevant knowledge. Based on judgment and experience, it is believed that undocumented in-kind contributions could add another 20% to the investment totals.

## Financial Value of the Millstone River Natural Commons Asset (Research Objective #2)

Go to Step Four in Part C for supporting details

If the stream did not exist, the land it occupies would be used for nearby (residential or agricultural) development. Thus, the EAP methodology uses property transaction information to describe the financial value of a natural commons such as a stream and fulfill Research Objective #2. The information comes from BC Assessment Authority valuations of land parcels.

***What the Numbers Tell Us:*** BC Assessment data for a total of 11 parcel sample groups were analyzed – four within Area C of the RDN, and seven within the City of Nanaimo. The results are distilled in the table below. The NCA values can be viewed four ways. Refer to the sidebar for the definition of the NCA.

### Natural Commons Asset Defined

*The NCA is the portion of the stream corridor that lies in the regulatory setback zone. The NCA width measured from the centre of the stream is the sum of the stream width plus the setback distance on each side. Thus, the width of the Millstone River NCA is 68 metres (i.e. 8m + 30m + 30m).*

| Section of Millstone Corridor | Stream Length (km) | Natural Commons Asset Values | | | |
|---|---|---|---|---|---|
| | | Total $ | $ per km | $ per m | $ per m$^2$ |
| City | 7 | $68.2M | $9.6M | $9535 | $139 |
| RDN | 8 | $11.5M | $1.4M | $1420 | $21 |
| Combined | 15 | $79.7M | $5.5M | $5480 | $143 |

***Guideline for an Annual M&M Budget:*** The annual expenditure for the Millstone stream corridor might reasonably be set at 1% of the value of the NCA. This aligns with commercial real estate maintenance guidelines that use 1% to 2% of the capital value of assets to budget annual expenditures. The 1% guideline establishes a benchmark for budget planning purposes. The close correlation between benchmark and actual is considered remarkable.

Go to page 9 for operational implications

| Section | NCA Value | Annual M&M Budget | |
|---|---|---|---|
| | | Based on the 1% Guideline | Compared with the Actual Investment |
| City | $68.2M | $680,000 | $560,000 (0.8%) |
| RDN | $11.5M | $115,000 | $60,000 (0.5%) |



A program deliverable for *Sustainable Creekshed Systems, through Asset Management.*
Implemented under the umbrella of the Georgia Basin Inter-Regional Education Initiative

## Influence of the Stream on Parcel Values
(Research Objective #3)

Go to Step Five in Part C for supporting details

The research examined three case study scenarios – **whether parcels abut the stream, are adjacent to the stream, or are distant from the stream**. For each scenario, parcel group samples were selected for analysis and comparison. Assessed values for the parcels in each group were extracted from the BC Assessment database.

BC Assessment tracks property market activity to calculate assessments for different classes of property. Assessed values are influenced by parcel characteristics and land uses such as: parcel size; period of subdivision; proximity to community amenities; proximity to the stream; and proximity to other categories of community benefit.

### A Positive Influence on Parcel Values

*The data suggest significantly that the well-defined riparian qualities of the Millstone River system in the City of Nanaimo positively influence the assessed values of residential parcels.*

*EAP included a survey of owners of sample parcels. Of the 57 respondents (16% response rate), most confirmed that the stream positively influenced their purchase decision and subsequent property enjoyment.*

***Within the City of Nanaimo:*** The EAP methodology was applied to five parcel sample groups in the Buttertubs Marsh and Bowen Park areas. Only the abutting and adjacent scenarios were applied to Buttertubs Marsh; whereas all three were applicable to Bowen Park.

**Assessed values for parcels that abut streams in the Bowen Park and Buttertubs Marsh areas are 4% and 8% higher than the assessed values of parcels that are distant from and adjacent to the stream, respectively.**

**Within the RDN Electoral Area C:** The Millstone River meanders through the flood plain. The setback area and adjoining riparian areas are dominated by farmland parcels which occupy about three quarters of the flood plain area. Most of this land is in the ALR. **Figure 3** is included to provide the reader with an impression of conditions.

The EAP methodology was applied to four parcel sample groups, with two each in farmland and rural residential areas. Assessed values of farmland parcels are set at rates determined by the Province rather than by the BC Assessment Authority. Low assessment rates reflect broad community support for agriculture and farmland protection. Thus, it is necessary for EAP to look to market value (rather than assessed value) for a meaningful metric for analysis.

**The findings with respect to the influence of the stream on parcel values in Electoral Area C are inconclusive.**

**Figure 3** The Millstone River lowland environment is a floodplain used for forage agriculture, small farm enterprises, and some rural residential parcels.


View of riparian area along Maxey Road near small lot agricultural usage. Location: Bridge on Durnin Road.

## Benchmark Assessment of Riparian Cover
(An Unexpected Research Outcome)

Not only did the EAP research fulfil the three stated objectives, it also resulted in a benchmark assessment of woodlands and tall vegetation within the regulated riparian set-back zone and larger riparian area of the Millstone stream corridor.

Go to Step Two in Part C for supporting details

The health or functioning condition of the Millstone stream riparian zone could be improved by restoring tree cover. The EAP analysis results in a qualitative rating that provides a starting point for strategy development to systematically invest in restoring riparian woodlands and tall vegetation. The findings are synthesized as follows:

### Definition of Riparian Ratings

***GOOD*** *- riparian vegetation extends 30m or more from the top of bank*

***FAIR*** *– riparian vegetation extends 15 m or less*

***POOR*** *– riparian vegetation extends less than 5 metres*

| RATING OF REGULATED RIPARIAN SPEA ZONE | | | | |
|---|---|---|---|---|
| | **DISTANCE** km | **POOR** < 5m | **FAIR** Up to 15m | **GOOD** > 30m |
| **Within RDN** | ~8 | 62% | 25% | 13% |
| **Within City** | ~7 | 49% | 20% | 31% |
| **Combined** | ~15 | 56% | 23% | 21% |

***Setting Goals and Targets for Millstone Stream Corridor:***
Based on the information in the above table, the process for restoration of woodland and native vegetation within the regulated Streamside Protection and Enhancement Area (SPEA) zone might be as follows:

- **A near-term goal might be:** Restore a minimum 15m for the entire channel length. (The City's zoning bylaw is a tool for restoration of the full 30m when there is redevelopment of streamside parcels.)
- **The associated target would then be:** Restore ~8 km of channel length to improve the riparian quality rating from POOR to FAIR.

The elements of an implementation strategy would likely be guided by considerations such as these:

Involve landowners, especially farmers, in considering strategies (incentives) to restore land area to riparian vegetation.

Identify and develop tools (contracts, agreements, easements, ecological gifts, etc.) to facilitate riparian restoration.

Identify the social, ecological, and financial advantages or limitations for landowners who commit to having parcel area placed in long-term or permanent conservation status.

### Regulatory Context for NCA Approach

*The NCA is the portion of the stream corridor that lies in the Streamside Protection and Enhancement Area (SPEA) as defined in the Riparian Areas Protection Regulation (RAR).*



A program deliverable for *Sustainable Creekshed Systems, through Asset Management.*
Implemented under the umbrella of the Georgia Basin Inter-Regional Education Initiative

## Framework for Operationalizing EAP within an Asset Management Plan

The context for EAP is Asset Management for Sustainable Service Delivery. The emphasis is on the service that the asset provides and the life-cycle cost. Over time, M&M represents 80% of the total life-cycle cost; the first 20% represents the initial capital investment.

The Millstone EAP Project is co-funded by FCM which has developed a tool called the Asset Management Readiness Scale Assessment. The 5-part tool defines five levels of readiness. **Table 1** is included for illustrative purposes only. It is currently applied to M&M of constructed aspects. However, it could well be applied to M&M of natural assets.

Go to Part B for supporting details

### Strategic Significance of Millstone River EAP Project

*Pulls the thread of collaboration, community outreach and stream stewardship from the first decade of the RDN's Drinking Water & Watershed Protection (DWWP) program through to its second.*

*Adds the new lens of accounting for natural (ecological) assets and ecosystem valuation.*

*Demonstrates how EAP supports the vision for integrating ecological assets in* **Asset Management for Sustainable Service Delivery: A BC Framework**.

***Drainage and the Unfunded Infrastructure Liability:*** The RDN is in the early stages of implementing the BC Framework. Looking ahead, the desired outcome of the Millstone EAP Project is that it would inform how the RDN and City of Nanaimo would incorporate M&M of stream corridor assets in their Asset Management Plans.

Drainage infrastructure, or the lack thereof, is typically an unfunded liability that grows over time. EAP supports local governments adopting a life-cycle perspective of M&M. Both natural and constructed assets need to be addressed in the drainage context. Both are systems and require similar M&M strategies. Effective M&M of natural assets requires commitment backed by line items in an annual report.

**Application of the 1% Guideline:** Introduced on page 5, the 1% guideline is a "benchmark for planning purposes". It reflects and aligns with an established life-cycle approach to M&M of constructed assets, whether those assets are buildings or infrastructure in the ground.

> The leap forward for Asset Management for Sustainable Service Delivery is whole-system action. Whether constructed or natural, an asset is an asset. And in the built environment, an asset requires an annual budget for M&M.

**The 1% benchmark for natural asset M&M need not be 100% funded by local government.** The stewardship sector has access to resources and funding that complement what local governments bring to the table. This underscores the potential power of collaboration to address the unfunded liability for M&M of stream corridors.

## **Table 1:** FCM Asset Management Readiness Scale Assessment for Constructed Assets (*included for illustrative purposes*)

| Competency | Current State | Expected Future State |
|---|---|---|
| **Policy and Governance** | *By developing this competency, the local government is putting in place policies and objectives related to asset management (AM), bringing those policies to life through a strategy and roadmap, and then measuring progress and monitoring implementation over time.* | |
| A. Policy & Objectives | | |
| B. Strategy & Roadmap | | |
| C. Measurement & Monitoring | | |
| **People and Leadership** | *By developing this competency, the local government is setting up cross-functional teams with clear accountability and ensuring adequate resourcing and commitment from senior management and elected officials to advance asset management (AM).* | |
| A. Cross-Functional Teams | | |
| B. Accountability | | |
| C. Resourcing and Commitment | | |
| **Data and Information** | *By developing this competency, the local government is collecting and using asset data performance data and financial information to support effective AM planning and decision-making.* | |
| A. Asset Data | | |
| B. Performance Data | | |
| C. Financial Information | | |
| **Planning and Decision Making** | *By developing this competency, the local government is documenting and standardizing how it sets AM priorities, conducts capital and O&M planning, and decides on budgets.* | |
| A. Documentation & Standardization | | |
| B. Asset Management Plans | | |
| C. Budgets & Financial Planning | | |
| **Contribution to Asset Management Practice** | *By developing this competency, the local government is supporting staff in AM training, sharing knowledge internally to communicate the benefits of AM, and participating in external knowledge-sharing.* | |
| A. Training and Development | | |
| B. Internal Communication & Knowledge-Sharing | | |
| C. External Communication & Knowledge-Sharing | | |

**Intentionally left blank** (typical)

**System Context for the 1% Guideline:** Figure 4 conceptualizes the asset management context for EAP. Embedding the 1% guideline in the sustainable service delivery process requires an appreciation of what life-cycle costs mean in a drainage system context.

When stream system integrity is fully protected in a pristine creekshed, there is no need for stream restoration or improvement. However, changes to hydrology and riparian condition due to changes in land use are the top two factors influencing system integrity (refer to sidebar).

Restoring land drainage and stream corridor system integrity for the Millstone as a whole system would require looking beyond the stream corridor to the surrounding landscape – that is, **reconnect hydrology and stream ecology by design**; maintain the natural flow paths by which rainwater reaches streams. Refer to Part B to learn more.

The 1% guideline is grounded by the financial value of the NCA. Because it uses the BC Assessment database, the NCA value is as real a number as the replacement costs for buildings and buried pipes.

***Framework for Action:*** The nature of the EAP project is to pilot the EAP methodology so that the RDN and City would learn about its application. In that spirit, the following list of considerations provides a starting point to help guide further action by the RDN and City to prevent degradation and improve stream corridor condition along the Millstone River.

1. Establish a registry for tracking M&M investments, both cash and in-kind, in the Millstone stream corridor as well as within other creeksheds within the region.
2. Make the case for a long-term funding mechanism to enable investment in stream corridor and riparian area M&M.
3. Integrate budget line items for stream corridor and riparian area M&M within Asset Management Plans.
4. Build support for a target-based strategy for systematic M&M investment over decades in restoring riparian woodlands and native vegetation for the full 30m width of the regulated SPEA setback zone.

## System Context for Protecting Stream Integrity

*West Coast research in the 1990s demonstrated that the factors limiting the ecological values of urban streams are, in order of priority:*

1. *Changes in Watershed Hydrology*
2. *Disturbance and/or Loss of Integrity of the Riparian Corridor*
3. *Degradation and/or Loss of Aquatic Habitat within the Stream*
4. *Deterioration of Water Quality*

Reference: Chapter 2, Stormwater Planning: A Guidebook for British Columbia, 2002

**Figure 4**

# Sustainable Creekshed Systems and the Asset Management Continuum


*Branding logo for* **Asset Management for Sustainable Service Delivery: A BC Framework, 2014**

**GROUND ZERO:** There is no **Asset Management Plan**. There is an 'unfunded infrastructure liability'.

**STEP ONE:** Embrace **BC Framework**. Focus first on constructed assets (pipes & buildings). Implement Asset Management Strategy / Plan / Program.

**STEP TWO:** Life-cycle approach and **Sustainable Service Delivery** are standard practice for maintenance and management of constructed assets.

**STEP THREE:** Apply the **Ecological Accounting Process** to determine Natural Commons Asset values and establish budgets for stream corridor maintenance and management. Account for Water Balance services. Integrate climate adaptation.

As understanding grows, local governments progress incrementally along the **Continuum.**

## EAP Study Area

The Millstone River is a feature of the Nanaimo Lowland Eco-Region. As shown on **Figure 5,** the EAP analysis considers the section from Brannen Lake to Nanaimo harbour. Watershed characteristics are:

- The Millstone is defined as a 4th order stream and is influenced by nine named tributaries and six lakes. The tributaries are classified as 1st order creeksheds.
- The Millstone itself flows for about 15 km from Brannen Lake to the Nanaimo harbour.
- For the upper 8 km half, the Millstone flows through Electoral Area C. For most of this distance:
  - Lowland environment is a floodplain used for forage agriculture, small farm enterprises, and some rural residential parcels.
  - Adjacent upland areas have residential development including two areas annexed by the City of Nanaimo and developed to urban standards.
- There are about 315 parcels in or near the Millstone floodplain within the RDN jurisdiction:

| | |
|---|---|
| Rural Residential | 253 |
| Agricultural Use | 46 |
| Institutional, Commercial, or Industrial | 16 |

- There are about 488 parcels situated near or adjacent to the Millstone within the City of Nanaimo. The city includes some rural areas that include farms, urban reserve lands and other zoning.
- For the lower half of its length, about 7 km, the Millstone is a Natural Commons feature in the centre of the City of Nanaimo. **The stream is the key aesthetic and ecological landscape for the Millstone River Greenway**.

In summary, the Millstone River system connects natural and human communities, rural and urban landscapes.

### Regional Context

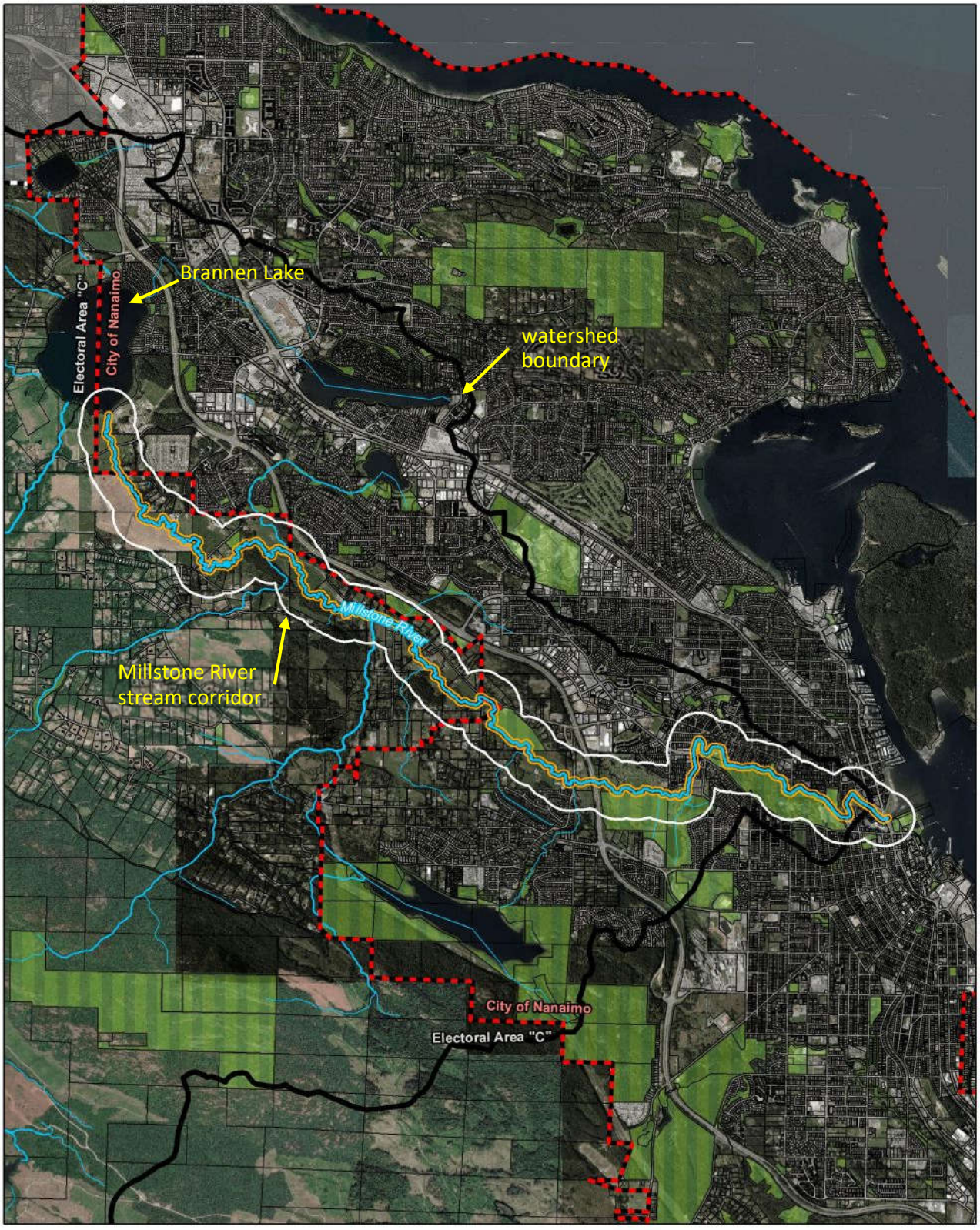
*The Millstone is a landmark stream occupying the central place for the City of Nanaimo greenway and parks system. In the RDN area it defines a rural landscape prized for agricultural land uses and rural residential parcels.*

Go to Steps One & Two in Part C for supporting details



A program deliverable for *Sustainable Creekshed Systems, through Asset Management.*
Implemented under the umbrella of the Georgia Basin Inter-Regional Education Initiative

## Figure 5




Millstone River Study Area

## What is a Natural Commons?

*This is a broad term referring to a natural asset recognized by the community. Recognition includes legislation, regulation, and common usage.*

***Common usage** refers to the opportunity for residents and property owners to enjoy the ecological services of a natural commons.*

*Private parcel ownership will restrict access to some areas of a natural commons.*

### Commons Examples

*A stream is an example of a natural commons.*

*Drainage infrastructure is a type of constructed commons and schools are institutional.*

*Parks may combine elements of all three commons. For example, four City of Nanaimo parks along the Millstone provide natural areas and habitat, attenuation of flooding, alignments for trails and greenways, as well as other facilities for active recreation.*

# The Idea of the Commons

**Figure 6** depicts the three categories of 'commons'. Communities rely on **natural, constructed** and **institutional** commons for services that support quality of life and property enjoyment. This is a foundational concept. It underpins EAP. Figure 6 is a key visual aid.

All residents and property owners may use and enjoy these services. Because natural systems and human settlement share the landscape and the river system, the values associated with the commons must include social, ecological and financial considerations.

Example of what the Millstone River Natural Commons looks like in a residential area

***Central Ideas of the EAP Methodology:*** EAP broadly deals with naturally occurring features in the landscape which produce ecological services intrinsic for nature but also used and enjoyed by residents and property owners. EAP focuses on streams and the riparian system. Four Natural Commons concepts are introduced below. Then, each is described in order over the next three pages.

1. Package of Ecological Services
2. Riparian Ecosystems vs Riparian Zones
3. Worth of the Stream
4. Financial Value of the Natural Commons Asset (NCA)

## Figure 6


*The image above is used for illustrative purposes simply because all three types of commons are situated within a short distance of each other. This location is in North Vancouver.*

| Foundational concepts that underpin EAP, the Ecological Accounting Process | | |
|---|---|---|
| **Natural Commons** | **Constructed Commons** | **Institutional Commons** |
| As defined by the EAP, a **Natural Commons** is an ecological system that provides ecological services used by nature and the community. | Communities rely on a range of services such as roads, underground utilities and parks to support life-style and property enjoyment. These are **Constructed Commons**. Through taxation, they are maintained and managed in order to ensure the availability of desired services. | Services such as fire protection and schools are a related kind of constructed commons. |

## Concept 1 – Package of Ecological Services

A stream comprises the stream channel plus the riparian zone. Both support ecological systems. The stream itself is part of a hydrologic system that originates in the landscape draining into the stream.

The surrounding zone and interrelated ecological systems work with the hydrology to provide a range of ecological services and aesthetic uses. These constitute the 'Package of Ecological Services'. Refer to the sidebar for a concise definition. The table below provides supplementary details that further illustrate the 'range of uses' desired by the community.

### 'Package of Ecological Services' Defined

*This concept refers to the combined range of uses desired by the community. Thus, a strategic plan that supports this diversity will appear worthwhile to the greatest number of interested parties.*

*Three key words capture the essence of what the phrase 'range of uses' means, namely:* ***drainage, recreation*** *and* ***habitat****. Use of these terms helps readers visualize what the package of ecological services encompasses.*

| | |
|---|---|
| Hydrology | *Rainwater interception, detention, infiltration, release to interflow and ground water, attenuation of flooding, aquifer recharge, supply to wells and springs* |
| Aesthetic Uses | *Landmarks, features in parks, natural areas, alignments for trails and greenways, and dedicated conservation areas* |
| Intrinsic Nature | *Interface with riparian areas – water temperature influence, nutrients for streams, detain infiltration in vegetation and soils*<br>*Habitat for terrestrial and aquatic life, rearing conditions for fish* |
| Support of Municipal Infrastructure | *Conveyance of stormwater from roads and drainage systems*<br>*Detention of rainwater, attenuation of flooding* |

***What the Range of Uses Looks Like:*** The phrase 'package of ecological services' was as an outcome of the Stage 1 EAP program. It was coined by Marvin Kamenz, Director of Development Services with the Town of Comox, to describe the uses the community expects to receive from a creekshed, now and in future.

The Millstone Greenway is a perfect example of what a package of ecological services looks like in the form of **drainage, recreation** and **habitat.** The City of Nanaimo has a substantial investment in initiatives that utilize and protect the value of the Millstone as a Natural Commons Asset. The strategy for investment is founded on the vision for the *Millstone Greenway Plan*.

The Millstone River is a Natural Commons feature in the centre of the City of Nanaimo. The stream is the key aesthetic and ecological landscape for the Millstone River Greenway.

## Millstone Greenway Plan

*The long-term vision is to increase the community's use and enjoyment of the stream and protect habitat condition.*

*Actions taken include acquisition of park land, building of access trails and facilities, research, as well as maintenance and management.*

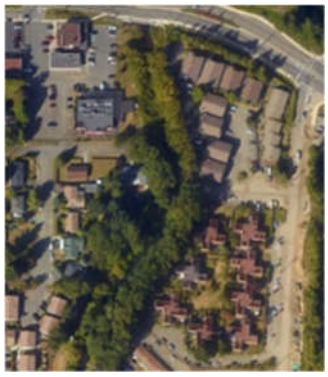
*Some of these ventures involve financial, volunteer and professional collaborations; all imply that the functioning condition of the Millstone system is essential for success of the City's strategy.*


Riparian area adjacent to residential development.
Location: Riverside Drive footbridge connecting to Bowen Park.



A program deliverable for *Sustainable Creekshed Systems, through Asset Management.*
Implemented under the umbrella of the Georgia Basin Inter-Regional Education Initiative

# Concept 2 – Riparian Ecosystems and Riparian Zones



**Riparian Network**

*An alternative term, riparian network, could also be used to describe a system composed of a physical stream channel and adjacent riparian (vegetated) corridor. This system provides a critical ecological function in linking terrestrial and aquatic ecosystems in a watershed or creekshed (i.e. 1st order stream)*

The EAP analysis makes a distinction between **'riparian ecosystems'** and **'riparian zones'**. A stream in a natural condition is supported by a riparian ecosystem, those areas of a watershed that directly influence the functioning condition of the stream. A riparian zone is a fragmented portion of the riparian ecosystem in developed areas where land uses have reduced the vegetated streamside area to the channel width plus a regulated setback each side (typically 15 to 30 meters metres).

***Human Alteration of the Landscape:*** A common history of land use (settlement) on the east coast of Vancouver Island has been the fragmentation of the riparian network in both rural and urbanizing landscapes. However, current official plans contain policies, zoning (bylaws) and development permit area designations that intend to improve the balance between use and conservation of land, especially the valued NCA.

**Riparian ecosystems (networks) have become reduced to riparian zones as shown on the maps of today**.

**Definitions:** EAP considers diminution due to fragmentation to be a loss of a riparian network's ecological services that a Natural Commons provides for aquatic and terrestrial life, as well as for property owners, residents, and others in the community. EAP also describes the actions that intervenors undertake to improve streams and riparian areas through ongoing maintenance and management. In a financial valuation context, the following definitions are applied in this document:

| Riparian Ecosystem Defined | Riparian Zone Defined |
|---|---|
| A *riparian ecosystem* in a pristine setting broadly describes a stream and supporting hydrological pathways that sustain flow to the stream as rainwater is infiltrated through surface and sub-soils, gradually moving to groundwater, and then to the stream itself. Within a stream corridor, a riparian ecosystem is the transitional zone between aquatic and terrestrial systems. Typically, it is wetter, cooler and has more diverse habitat then adjacent upland areas. It is also more biologically distinctive. | A *riparian zone* is a fragmented portion of the riparian network in developed areas where land uses have reduced the vegetated streamside area to the channel width plus a regulated setback each side (typically 15 or more metres). |

## Concept 3 - Worth of the Stream

Step Three in Part C of this provides details about the worth of the Millstone stream corridor. The concept of **Worth** refers to the ecological uses the community expects and draws from the stream.

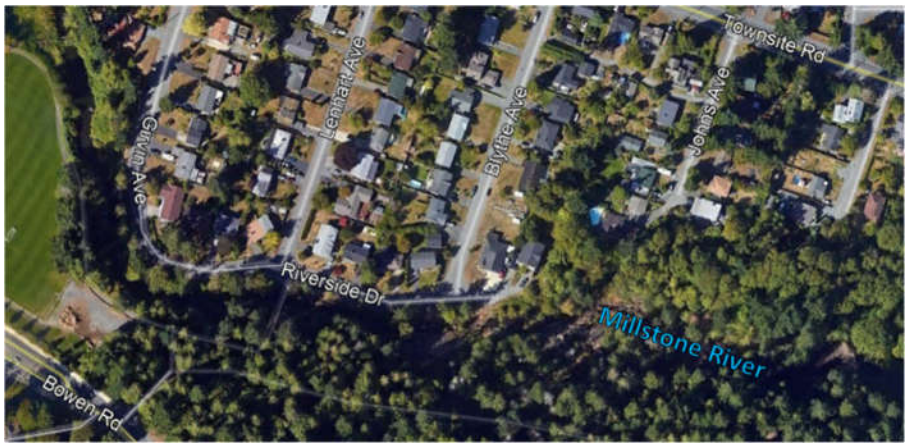
Community uses refers to the social, ecological and infrastructure expectations of this natural asset. This reality includes an implied social contract; that is, the stream will be maintained and managed for future uses and enjoyment. This is an asset management challenge.

## Concept 4 - Financial Value of the Natural Commons Asset (NCA)

Steps Four and Five in Part C of this report provide details about the Financial Value of the stream corridor based on the NCA concept.

***A Stream is a Land Use:*** EAP defines the stream width and setback area as a land use. The rationale is that the stream is defined in regulations and has a financial value. This ribbon of land is the **Natural Commons Asset** (NCA).

EAP uses BC Assessment data to calculate the NCA value based on the assessed value of abutting and adjacent parcels. The implication is that if the stream were not there, the land area it occupies would be committed to the existing nearby land uses.

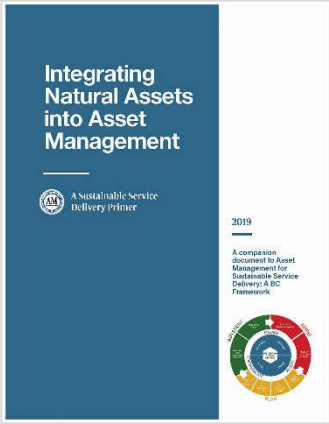



Based on a representative sample of parcels, EAP finds the aggregate average area and values of the parcels. The portion of parcels in the regulatory setback area is found. This ratio or percentage of aggregate parcel values is the basis to determine the financial value of the NCA.

Within the RDN Electoral Area C portion of the Millstone, EAP uses residential and agricultural parcels in its sampling.

PART B

# EAP Framework




## Sustainable Delivery of Core Services

*The Primer introduces EAP with this statement:*

*"Significant strides have been made in natural asset management in British Columbia and across Canada. Several initiatives have built on each other, forming a foundation for local governments to increase their consideration of the potential of natural assets."*

## Asset Management for Sustainable Service Delivery

The EAP methodology and metrics have been developed to support Asset Management for Sustainable Service Delivery. Moreover, EAP is a pillar of the whole-system, water balance approach to integration of land and water management. **Figure 7** conceptualizes the inter-connection of activities outside and inside the NCA. What happens on the land (changes in hydrology) matters to stream corridor ecology.

The Millstone River EAP project is the fifth of ten demonstration applications (case studies) in five regions that will be completed by the end of 2021. These are part of a 3-stage program for testing EAP in 2018, refining it in 2019, and mainstreaming it in 2020 and 2021.

***Provincial Context for Valuation of Ecological Assets:*** Asset Management BC, which is co-chaired by UBCM (Union of BC Municipalities) and the BC Ministry of Municipal Affairs and Housing, released the Primer on Integrating Natural Assets with Asset Management[1] in September 2019. The Primer opens with this context:

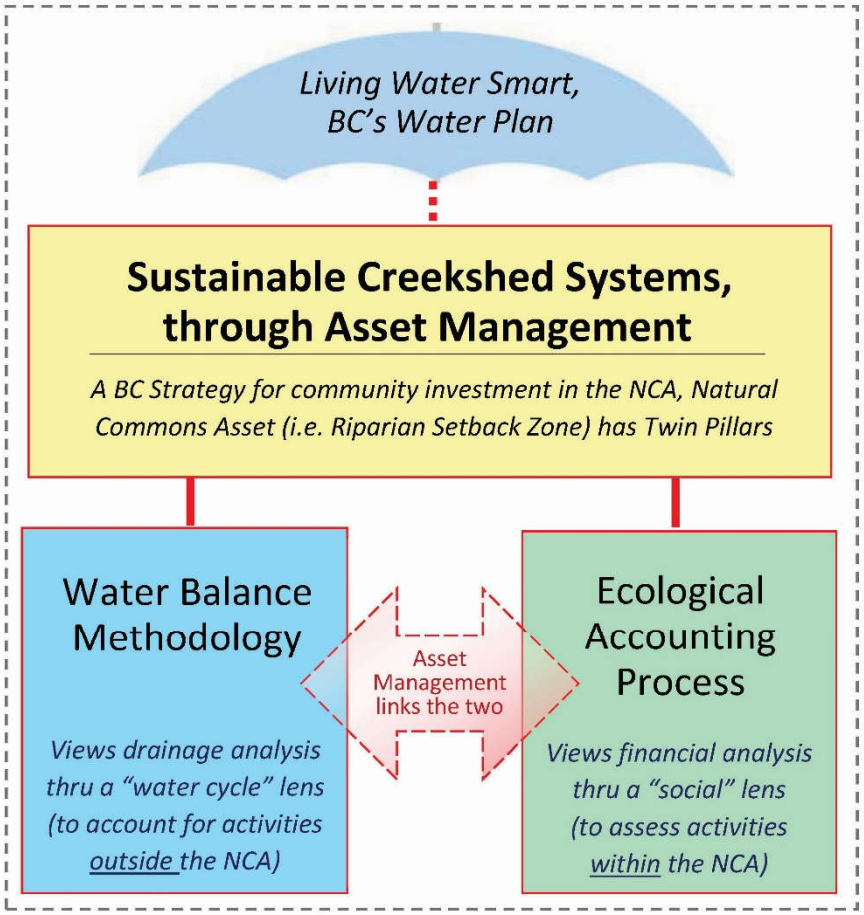
> *"The sustainability of core service delivery is a concern for local governments across Canada. Rather than continuing to attempt to do more with less, local governments have an opportunity to do things differently - and achieve better results - by including natural assets in asset management processes."*

**Budget Line Items:** EAP bridges a gap. While local governments have existing tools in the form of policies and legislation for 'maintenance and management' of ecological assets, they have until now lacked a pragmatic methodology and meaningful metrics to incorporate stream systems as line items in Asset Management Plans.

**Using numbers generated through application of EAP, local governments would have a sound basis for implementing a baseline annual budget for enhancement of the stream system (which is the natural or ecological asset) within a setback zone.**

[1] https://www.assetmanagementbc.ca/wp-content/uploads/Integrating-Natural-Assets-into-Asset-Management.pdf

# Twin Pillars of Whole-System Approach




**EXPLANATORY NOTE:**

*By definition, a creekshed is a 1st order stream. This means it has no flowing tributaries.*

*This situation is representative of most creeks in settled areas.*

*EAP uses the term 'creekshed' because it is relatable to a local context and a sense of place.*

## Hydrology is the Engine that Powers Ecological Services

*Twin Pillars of the Whole-System, Water Balance Approach to Maintenance & Management (M&M) of Riparian Ecological Assets in the Natural Commons*

**Figure 7**

## The Unfunded Infrastructure Liability

Traditionally, asset management is about constructed infrastructure – pipes, roads and buildings. As a financial objective, sustainable service delivery dates back to 2010 when the Province introduced the concept in order to focus local governments on two desired outcomes:

> Shift the local government focus from the infrastructure itself to the **service** AND the **level-of-service** that the infrastructure provides.
>
> Reduce the unfunded liability due to initial infrastructure capital costs being a mere 20% of life-cycle costs over time. This is known as the **80/20 rule**. This is the asset management challenge.

### Hydrology Powers Ecology

*The flow of rainwater from cloud to stream is comprised of three water balance pathways:* ***surface runoff, horizontal shallow interflow****, and* ***deep groundwater*** *(aquifer discharge).*

*Yet the latter two are routinely ignored by planners and designers. Time, a critical factor, is also ignored. These omissions have stream health consequences.*

***Reconnect Hydrology and Stream Ecology:*** Stream systems are natural infrastructure assets and support drainage of residential and agricultural lands. But there is no funding mechanism for drainage M&M such as for water and sanitary sewer utilities. So, the unfunded M&M liability associated with drainage grows over time.

This is the driver for a life-cycle approach to drainage that considers the water balance. The approach is founded on a whole-system understanding of how **water balance pathways connect creekshed hydrology and stream ecology**, how changes on the land disconnect them, and how green infrastructure design can reconnect them.

***Move from Reactive Remediation to Stream Restoration:*** A life-cycle approach to sustainable service delivery means manage the built and natural environments as components of **one system**. This holistic management approach must be reflected through line items in an annual budget for investing in the natural components. This is standard practice for constructed infrastructure assets.

Once local governments embrace a guiding philosophy that ecological services and use of land for development are equally important, then the next step is for them to include M&M budgets for stream systems in their Asset Management Plans. This would begin the process of reconnecting hydrology and stream ecology by design.

### What / So What / Now What / Then What

*Table 2 distills what has been learned over two decades, and factors in sustainable service delivery.*

**Table 2 complements Figure 7:** It is a synthesis of what is necessary to integrate M&M of the natural and built environments under the umbrella of an Asset Management Plan. The table conceptualizes considerations that shape a **strategy for moving from stop-gap remediation to long-term restoration of stream corridors** – by connecting land and water by design, and over time restoring water balance in altered landscapes.

## TABLE 2 - RECONNECT HYDROLOGY & STREAM ECOLOGY: "Whole-System Approach" (4 Steps) to Integration of Built & Natural Environments

| | *1. WHAT is the issue? –* **"Call to Action"** | *2. SO WHAT can be done? –* **"Core Building Blocks"** | *3. NOW WHAT can we do? -* **"Desired Outcomes"** | *4. THEN WHAT? –* **"Mainstreaming"** |
|---|---|---|---|---|
| **Under each step, Cascading Key Messages define "What Really Matters"** | | | | |
| | ***Success in Solving 'In Your Face' Problems Would Mean:*** | ***Integrating Natural Assets into Asset Management Relies on Understanding that:*** | ***There are Paybacks When a Community 'Gets it Right':*** | ***Restorative Development Results in Sustainable Stream Restoration:*** |
| 1 | Less flooding | Hydrology is the engine that powers ecological services | AVOID an unfunded and unaffordable financial liability for drainage infrastructure | Require 'design with nature' standards of practice for drainage and servicing of land |
| 2 | Less stream erosion | Three pathways by which rainfall reaches streams are 'infrastructure assets' that provide 'water balance services' | ADAPT to a changing climate to restore the water balance and reduce risks | Shrink the destructive footprint while growing the restorative footprint |
| 3 | More streamflow when needed most | Taking action depends on what a community thinks a creekshed is worth. | REDUCE life-cycle costs for drainage infrastructure | Demonstrate what is achievable thru a restoration imperative |
| **Below, each "Problem Statement" establishes Context & defines the Central Issues in the 4-Step Process** | | | | |
| | **Recognize** that it is necessary to 'get it right' with respect to planning, engineering and asset management standards of practice – especially as they relate to and impact upon creekshed health and restoration - because "getting it right" would mean the sustainable and cumulative "community benefits" would then ripple through time | **Acknowledge** that there is a problem with current standard practices for servicing and drainage of land - and that these practices are the root cause of degraded urban streams – because 'getting it wrong' results in an unfunded and unaffordable infrastructure liability that is then a financial barrier to restoration of creekshed function | **Re-focus** local government business processes on outcomes so that they align with provincial policy, program and regulatory framework for **Living Water Smart** - which encompasses both the *Whole-System Approach* and *Sustainable Service Delivery* - and thereby achieve desired outcomes that would have tangible community and financial benefits | **Get it right**, province-wide. B.C. is one of the last places on the planet where it is still possible to transcend the climate debate and lead by example. B.C. has enough remaining natural capital to protect and restore its way back to true sustainability. Improve where we live. |

## What We Have Learned through EAP

*"Integrating natural assets into asset management processes leads to a full understanding of the role of natural assets in sustainable service delivery and how local governments can integrate the protection, maintenance, and enhancement of these assets into strategic and operational decision-making*," states the 2019 Primer.

***Evolution of the Methodology:*** The EAP methodology focuses on the historical and current land use practices that have changed landscapes, modified hydrology, and have led to present-day community perceptions of the worth of the stream or creekshed and the ecological services it provides. **A whole-system understanding is the starting point for developing meaningful metrics**.

The EAP methodology has evolved with each demonstration application. Each situation is unique, but the approach is universally applicable. **Table 3** is a succinct synopsis of the strategic relevance of the previous EAP applications. Four major observations have emerged from the first four EAP projects completed to date:

**Each EAP case study advances refinement of the methodology**

*Each case study is unique in that partner communities frame creekshed-specific questions to be addressed by their EAP application.*

*Each case study yields key lessons and results in fresh observations. Each has supported the depth of analysis for subsequent EAP applications.*

- **Observation #1 -** Some streams may be so altered by changes in the landscape and hydrology that few "normal" ecological functions are observable. In essence, the stream becomes a discounted natural asset.
- **Observation #2 -** In urban areas, the value of the Natural Commons Asset can be calculated, with confidence, using BC Assessment data.
- **Observation #3 -** The degree of influence that a stream may have on the financial value of abutting and adjacent parcels depends on the variables in play. Size of parcels, date of subdivision, proximity to the stream, neighbourhood and other variables sometimes result in very broad generalizations.
- **Observation #4 -** Rural residential subdivision and agricultural land uses impair the riparian ecosystems that sustain streams. The riparian zone required under regulations is, at best, a partial measure for management.

**The Millstone EAP demonstration application is the flagship project. It has provided the RDN, the City and Island Waters Fly Fishers with the opportunity to get a real measure of how far they have advanced M&M of the Millstone. They knew it intuitively but did not have the numbers to make the case. Now they do.**

## Table 3

| Region | Collaborating Organizations | Creek Name | What We Have Learned | NCA Value |
|---|---|---|---|---|
| **STAGE 1 - Test the EAP Concept** | | | | |
| Cowichan Valley | Cowichan Valley Regional District<br>Sh-hwuykwselu Streamkeepers | Busy Place Creek<br>Coast Salish: *Sh-hwuykwselu* | A 1st order stream system that is almost completely developed with equal proportions of agricultural, residential and industrial land uses.<br>▪ The systems perspective is missing due to fragmentation of responsibilities.<br>▪ There is an opportunity-in-waiting to interweave Indigenous knowledge and Western science in building a strong collaboration around hydrology. | $1.2 million per km of channel length in residential areas<br>$0.4 million per km in agricultural areas |
| Comox Valley | Town of Comox<br>Brooklyn Creek Watershed Society | Brooklyn Creek | A 1st order stream that is almost completely urbanized by residential development, with the creekshed area divided among three local governments.<br>▪ Local government collaboration with the stewardship sector is essential and powerful because it drives successful maintenance and management.<br>▪ The concepts for the Natural Commons and Package of Ecological Services crystalized. | $2.7 million per km of channel length |
| **STAGE 2 - Refine the EAP Methodology** | | | | |
| Nanaimo Region | Mid Vancouver Island Habitat Enhancement Society (MVIHES)<br>Regional District of Nanaimo | Shelly Creek | A 1st order stream comprised of forest and agricultural lands (90%), with urban development concentrated in the lower reaches.<br>▪ Another concept emerged: "a riparian zone is not a riparian ecosystem."<br>▪ EAP methodology evolved: Analytical results more reliable and informative when the subdivision history of the sampled parcels is similar (within the same decade) and there are sufficient parcels in a sample (30 or more). | $1.4 million per km of channel length in the urbanized area |
| Metro Vancouver | District of North Vancouver | Kilmer Creek | A 1st order branch of the multiple-tributary Hastings Creek system which drains the Lynn Valley suburban area into Lynn Creek, a small regional river.<br>▪ The Natural Commons concept led to the idea of the Constructed Commons and Institutional Commons within an asset management context.<br>▪ When there is no riparian zone, there are no ecological functions - other than conveyance and continuation of the stream alignment. | $2.9 million per km of channel length in the urbanized area |

## EAP in a Nutshell

*The EAP philosophy, methodology and metrics recognize the importance of the stream system in the landscape. It is a natural asset.*

*The logic behind EAP is quite straightforward.*

*Apply the methodology to get the numbers, tie the numbers to other research, and then say - we have this asset, it is worth X, we should invest Y each year to maintain and manage it. And these are the reasons why.*

*Streams are a fundamental part of the water balance and a primary asset for sustainable service delivery.*

# How Communities Decide How Much to Invest in Stream Restoration

EAP provides communities with a philosophy, pragmatic methodology and metrics to make financial decisions about how much to invest to prevent degradation and improve the condition of ecological assets.

***Local Government Services:*** Utilities, roads, parks, and recreation take up the bulk of a local government budget and therefore are the focus of asset management. These are described as core services. Prior to publication of the Primer in 2019, ecological services were not part of the asset management mind-set.

At best, ecological services have been considered as an add-on. They are not intuitively understood by the public, elected representatives and asset managers. To stimulate awareness and advance uptake of a whole-system approach to asset management, it helps to define ecological services in terms of drainage, recreation and habitat uses.

**Ecological Services are Core Services:** Once communities make the mental transition to view ecological services as core local government services, and then look at their budgets differently, the change in mind-set should lead to this question: how can we do things better? This shift in perspective logically leads to the next question:

**How do we establish an annual budget for M&M that sustains the 'package of ecological services' in a stream system that humans depend upon for drainage, recreation and habitat uses?**

***Framework for Application of EAP Methodology:*** Three tables are presented herein:

- **Table 4** is a synopsis of the EAP approach, with an emphasis on philosophy and strategy / audience.
- **Table 5** lists ten key messages that capture the essence of EAP.
- **Table 6** introduces the 5-step methodology as applied to the Millstone stream corridor.

The content is cascading, from high level in Table 4 to ground level in Table 6. The last one is the springboard to Part C. Each step in the methodology is a deliverable.



A program deliverable for *Sustainable Creekshed Systems, through Asset Management.*
Implemented under the umbrella of the Georgia Basin Inter-Regional Education Initiative

## TABLE 4 - **Synopsis of EAP Approach**

| PHILOSOPHY |
|---|
| EAP, the Ecological Accounting Process, provides metrics that enable communities to appreciate the worth of stream corridors in order to improve their maintenance (prevent degradation) and management (enhancement). |
| EAP is an evolution of green infrastructure ideas and practices that had their genesis in the 1990s, and is a point along a "green infrastructure continuum" |
| Ecological systems (natural assets) provide ecological services which support quality of life and property enjoyment. |
| EAP uses the concept of the **natural commons** to understand how the community (local government staff & politicians, property owners, stewardship sector) use or expect to use ecological systems and services.<br>The natural commons are features of a watershed (creekshed) that can be used / enjoyed by all residents and property owners for social, aesthetic and economic purposes. Streams are essential to provide sustainable service delivery for drainage, recreation and habitat.<br>A social contract exists: The community can expect the natural commons to be maintained and managed. EAP informs communities about the condition of their natural commons, investment that has been made, and the value of the land underlying natural commons. |
| **STRATEGY / AUDIENCE** |
| Work with community (stewardship sector, property owners, politicians, businesses, external funders, professionals working in local gov't context)<br>Describe the uses (**package of ecological services**) the community draws from the natural commons: EAP focuses on the stream (as defined in the *Riparian Areas Regulations* Act)<br>Calculate the financial investment made (if any) in the watershed or reaches.<br>Assess condition of the hydrology by applying **Water Balance Methodology** |
| Acknowledge TEV (Total Economic Value); reference and use concepts of worth applied to both the natural commons and constructed commons. |
| Analysis based on entire watershed ecological system – because lasting management (enhancement) would not be successful unless based on a whole system perspective and strategy. |
| **DELIVERABLES** |
| Watershed profile, includes perceptions of risks and opportunities.<br>Review of the stream system functioning condition.<br>Calculation of the worth of the creekshed based on community investment.<br>Statement of the value of the land in the Natural Commons Asset zone |

## How Much to Invest?

*EAP focuses on worth rather than dollar value specifically.*

*EAP emphasizes both social and financial values.*

*EAP employs one financial valuation process - that is, calculation of the land value of the natural commons asset.*

*In the case of a stream, this is the ribbon of land underlying the stream itself and the adjoining set-back area required in bylaws and Riparian Areas Regulations.*

*BC Assessment land values are used for this calculation, thus reflecting the social commons. Property owners purchase in locations that they think are worth their investment.*

*Both the calculation of the land value of the natural commons asset and the account of investment in maintenance and management of a stream are reports that can be used for budget strategy and planning as well as for asset management analysis.*

TABLE 5:

## 10 Key Messages to Remember about EAP

1. Every urban creekshed (watershed) comprises a **constructed commons** (roads, utilities, etc.) and a **natural commons** (streams, riparian corridors, etc.). Each commons is a system.
2. Hydrology is the **engine that powers** ecological services. Both hydrology and the ecological services it supports are defined as natural assets.
3. **Impaired hydrological** function results in **diminished** ecological services.
4. The **worth** of a creekshed is a **package of ecological services** made possible by the hydrology. EAP focuses on wetlands, ponds, streams and riparian areas because these natural features provide a number of services desired by communities.
5. EAP deals with **real numbers** which practitioners need to deliver outcomes.
6. EAP uses the **BC Assessment database** regarding land value to calculate the financial value of the **Natural Commons Asset** (NCA) – that is, the land underlying the stream and adjacent set-back area.
7. View choices through the **worth lens** if the goal is to motivate communities to implement strategies that restore stream function.
8. Both the record of expenditures for maintenance and management (**calculation of worth**) and the financial value of the **natural commons asset calculation** provide information about ecological (natural) assets that can be included in local government financial planning and **Asset Management Strategies and Plans**.
9. Taking action depends on **what a community thinks** the stream is worth.
10. Distinguish between maintenance and management – because maintenance is about **preventing or avoiding** degradation, whereas management is about **improving** the condition of the ecological asset.

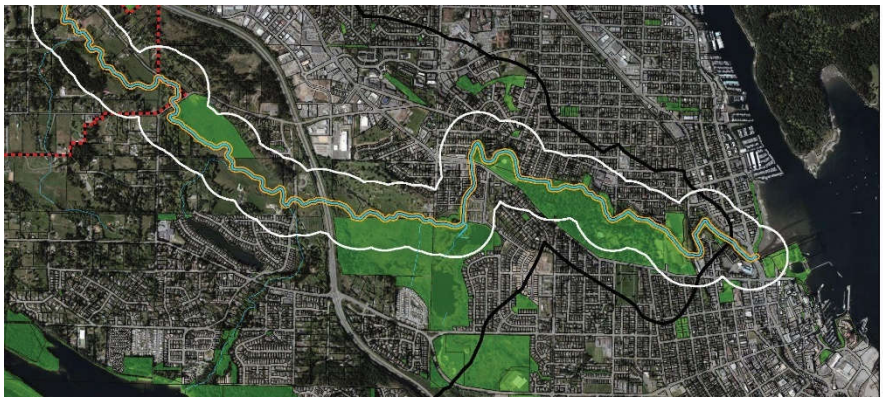
## Table 6

| Set of Five Deliverables for the Millstone EAP Project | |
|---|---|
| **Step One** | **Watershed Profile**<br>The key question is: *How have historic land uses altered the riparian quality of the Millstone River?*<br>This information is based largely on previous research/studies/air photos and noting opportunities and risks for maintenance and management of the ecological services provided by the stream. |
| **Step Two** | **Stream System Functioning Condition**<br>The key question is: *What are the primary changes in the water pathways in relation to land use?*<br>This question would help communities understand how 'riparian ecosystems' become 'riparian zones'. |
| **Step Three** | **Worth of the Millstone River as a Natural Commons**<br>The key question is: *How does the community use and enjoy the Millstone River stream corridor?*<br>This analysis calculates investment made during the past decade to reduce risks and realize opportunities to protect of ecological services available from the natural commons. The analysis is supported by community surveys. |
| **Step Four** | **Financial Value of the Natural Commons**<br>The key question is: *What is a reasonable estimate of the value of the land occupied by the stream* corridor (i.e. the creek itself and the adjoining setback areas - the shared natural commons).<br>This calculation based on assessed land value allows the community to appreciate the natural commons as a community asset with significant financial value as well as unique ecological importance. This analysis is a tool that fits into the orbit of asset management. |
| **Step Five** | **Influence of the Stream on Parcel Values**<br>The key question is: *Are assessed values of residential parcels influenced by proximity to the stream*; *and can dollar amounts be determined?*<br>The extent to which the Millstone River influences parcel values, either positively or negatively, is not known. The EAP methodology uses GIS data to identify and understand the characteristics of urban and rural parcels in the vicinity of the stream. |

This page left blank intentionally

PART C

# EAP Applied



A program deliverable for *Sustainable Creekshed Systems, through Asset Management*.
Implemented under the umbrella of the Georgia Basin Inter-Regional Education Initiative

# Step One: Watershed Profile

## Scope of Step One

The system perspective brings into focus the interconnected features of the landscape. About half the 15 km distance from Brannen Lake to the harbour lies in the RDN. The balance is in the City of Nanaimo. The Watershed Profile, the first of five steps in the EAP analysis, considers how land use to accommodate human settlement has altered the functioning condition of the Millstone River system.

**The goal in this Step One** is to present a broad view of the present-day state of the stream corridor (stream width and regulatory setback zone) and its capacity to provide ecological services needed for nature and desired by the community. Step Two then drills down and provides the type of guidance that would inform an Asset Management Plan.

**The objectives in Step One** are four-fold as identified below and described in the following pages.

### At a Glance

*The Millstone and its tributaries have lost much of the riparian ecosystems that support the functioning condition of streams. The remaining riparian zones required under regulation intend protection of habitat for fish and other aquatic life as well as terrestrial life.*

1. Identify and review some of the historic and current land use and conservation activities that have altered the condition of the stream.
2. Describe the functioning condition of the stream and the riparian areas which support it.
3. Review opportunities and risks associated with the functioning condition of the Millstone.
4. Characterize the asset management realities illustrated in the watershed profile review.

Several research projects have reviewed the health of the Millstone. These are listed in Part D. They identify the state of the riparian areas along the stream as a critical factor influencing its functioning condition. As is the case with any stream**:**

**The health of a watershed system depends on the extent and quality of riparian ecosystem area supporting it**.

## Objective One: The Stream System - History and Current Land and Conservation Uses

EAP uses the Riparian Areas Regulation Act definition of a stream. As noted in Part A, the Millstone is a Category Four (non-headwater) stream with several headwater tributaries.

***Interconnected Features of the Landscape:*** A full picture of the whole-system approach requires a view of historical land use changes and the evolution of efforts by the community to maintain (prevent degradation) and manage (enhance) the stream system.

Inevitably this line of enquiry considers official community plans, land use regulation, and efforts by local government and community interests to address perceived risks and take advantage of opportunities to enhance the Millstone's condition.

These combined efforts encompass research, citizen science, removal of invasive species, and numerous other tasks to protect and enhance the functioning condition of the stream.

M&M actions have addressed risks and opportunities; they reflect the community's recognition of the Millstone system as a Natural Commons. Looking ahead, the analysis presented in Step Three establishes the worth of the Natural Commons Asset.

### Land Use Over Past 120 Years

*Landscapes for coal mining, logging/forestry, fishing, power generation, mining of aggregates, and utility corridors.*

*Rural development for agriculture and residential uses*

*Urban development for residential, commercial, and other uses.*

*Infrastructure including roads, railroads, utility corridors, drainage, water systems, parks, etc.*

***Watershed History:*** Since time immemorial, the people of the Snuneymuxw First Nation lived in and used the watershed, imposing few alterations of its natural condition. The village, Sxwuyum, site at the mouth of the Millstone was one of five villages historically occupied by the Snuneymuxw. Following the treaty of 1854 settlers of European descent eclipsed the Snuneymuxw way of life.

**In the latter half of the 1800s,** regions on the east coast of Vancouver Island attracted settlers of European heritage to colonize land and work in an economy based on resources. For about 120 years, the post-treaty Nanaimo region was a place where the economy focused on goods - coal, timber, fish, and arable soils.

**By the early 1970s** community expectations of economic prosperity were turning to enterprise and employment involving services. Employment in forest sector declined from about 25% in 1973 to less than 2% in 2018.

***Demographic Trends:*** Between 1981 and 2016, the population of the RDN doubled from 78,074 residents to 155,698. Since 2016, the regional population has grown by an additional 5 percent.

## Population Growth

*In its 2018 Community Profile, Nanaimo Economic Development reports that "Nanaimo's population growth has resulted from migration" (referring to the region). In recent years (2013 to 2016) migrants from other provinces account for about 60% of population growth.*

| Jurisdiction | 2001 | 2019 | Change (%) |
|---|---|---|---|
| RDN | 127,016 | 168,947 | 33 |
| City of Nanaimo | 72,980 | 98,957 | 36 |
| Area C of RDN | 1,932 | 2,810 in 2016 | 45 |

**Perspectives are Changing:** Over the past two decades, RDN households depending on employment income have decreased in number while those relying on government transfers and investment income have increased.

These trends are consistent with an aging population including in-migration of retirees. In 2009, for example, 52% of households in the region relied on employment income while 34% used pension and investment income to support their needs.

These population and economic trends suggest that resident views (preferences / ideas) regarding conservation, land use, and community growth are changing.

**Community Surveys:** During the past decade, several surveys have been undertaken to obtain resident perspectives about the environment and ecology (natural asset values) all place high regard for natural assets.

Go to Part D for the 18-page report on the analysis and findings of the "Survey of Property Owners and Residents".

While the economy and land use tend to dominate the community's view of prosperity, the natural environment is receiving growing respect as one foundation of quality of life in the region.

This EAP analysis includes a survey of property owners and residents who live near the river. Invitations were mailed to 356 households and 16% submitted responses.

As in previous surveys, respondents support M&M of the ecological values of the Millstone. A detailed review of the 57 responses is summarized in Part D.

***Demographic Influences:*** Demographic realities influence local government and community priorities. For example, **during the past decade the budget for parks, recreation and culture has been one of the top three expenditure categories for the City of Nanaimo**.

Surveys show that residents place a priority on waterfront access and trails/greenways as passive recreation facilities. The city has steadfastly implemented the Millstone Greenway Plan, spending more than $2.5 million to acquire connecting parcels since the plan was adopted in 2002.

**Drinking Water & Watershed Protection (DWWP) Program:** In its first decade between 2009 and 2019, the RDN's DWWP program defined water regions and complied a considerable body of research, while engaging external funders and the community through various initiatives including volunteers to work on M&M projects.

Moreover, the DWWP output includes a benchmark review (by Dave Clough in 2016) of the fish habitat condition of the Millstone.

The RDN recently adopted the implementation strategy for the second decade of its regional DWWP program.

**Regional Growth Strategy:** This perspective on streams as systems provides a fundamental approach to understanding opportunities and risks. The RDN Regional Growth Strategy under its second goal, **Protect the Environment**, quotes Living Water Smart, British Columbia's Water Plan, released by the province in 2008**:**

> ***"Healthy riparian zones can effectively store carbon dioxide, put water vapor back into the air, and help slow global warming."***

**Social Importance:** The profile of the Millstone watershed reveals the growing use (enjoying adjacent parks, greenways and riparian zone features) of the stream and confirms its social importance.

More importantly, the City of Nanaimo and the RDN share the common reference to the Millstone River as an ecological system. From a human settlement point of view, this is the essence of natural commons thinking.

## A Perspective

*The EAP analysis brings into focus the need to more fully understand land use conditions that have and will influence the stream.*

***Current Land Use in the Millstone Watershed:*** A view of the larger Millstone watershed (77 km²) begins with Benson Creek which rises at Lucid Lake on Mount Benson and flows to Brannen Lake (108 hectares). From the lake, the Millstone flows to Nanaimo harbour.

The watershed area upstream from Brannen Lake in the RDN has forest resource lands, aggregate mining, recreational uses as well as a few farms and residential parcels. This expanse of the watershed is outside the EAP study area.

## Land uses (zones) in the RDN section

*315 zoned parcels*

*253 residential parcels*

*46 agricultural parcels*

*16 other (institutional, recreational, parks, winery)*

**Within the RDN:** From Brannen Lake to East Wellington Road, a distance of 8.1 km, the Millstone defines a floodplain of considerable area bordered by upland parcels where small residential and farm uses occur. Most of the flood plain area is agricultural uses and large residential acreages (2 hectares or more).

Several small wetlands occur along the river in or adjacent to the riparian setback zone. These features add about 19,000 $m^2$ or about 3.5% to the regulatory setback zone. This is described in Step Two.

Near Brannen lake a wetland extends into abutting rural residential and farm parcels, creating a riparian ecology several hectares in area.

## Land uses (zones) in the City section

*488 parcels (approximately)*

*447 are residential*

*41 are urban reserve or rural resource (agriculture, rural residential - specific large lot uses without urban services)*

**Within the City of Nanaimo:** The Millstone corridor and floodplain in the City of Nanaimo extends 7 kilometres from East Wellington Road to the Nanaimo Harbour.

This portion of the stream has the most diverse topography and riparian areas. It includes a large seasonal wetland (27 ha) in East Wellington Park which connects the river to Buttertubs Marsh, a large (54ha) permanent wetland. This is one of the City of Nanaimo's best known, landmark natural assets.

The City of Nanaimo has added to the regulatory setback zone to the extent of 79,000 $m^2$ or 17.5%. This is described in Step Two.

Less than 500 metres beyond the border of Buttertubs, the Millstone passes under the Quarterway Bridge. The stream drops about 70 metres in elevation during its 3.8 km passage through Bowen Park to the harbour. This area of the Millstone has the most intact riparian ecosystem area, although active and passive recreational uses occur throughout the park, often bordering on the stream.



A program deliverable for *Sustainable Creekshed Systems, through Asset Management.*
Implemented under the umbrella of the Georgia Basin Inter-Regional Education Initiative

## Objective Two: The Functioning Condition of the Stream and Adjacent Riparian Areas

Based on a review of the resources listed in Part D, the functioning condition of the Millstone is characterized as fair. That is, the riparian zone and adjacent riparian areas are sufficient to support stream flows in the dry months and detain rain and slowly release water in the winter and spring months.

Looking ahead to Step Two, a perspective is provided as follows - an effective strategy to maintain and enhance a stream's functioning condition for hydrology and habitat has two aspects:

> Improve and add to its riparian area.
>
> Manage the stream and surrounding landscape cooperatively. It is a system and involves all parcel owners, local government departments, provincial agencies, community organizations, especially stream keepers.

***Millstone River as a Natural Asset:*** Both the City of Nanaimo and the RDN have recognized the Millstone River system as a key environmental asset. In terms of a long-term strategy, **Table 7** provides context by listing highlights. Step Three provides more detail.

### A Perspective

*The stream corridor, adjacent flood plain areas, and the adjoining uplands influence the functioning condition of the habitat and flow regimes in the Millstone. Extensive subdivision and land use realities throughout the landscape describe the lower two thirds of the watershed.*

**Within the City of Nanaimo:** The city, over about 20 years, has secured the land assets for the Millstone Greenway. These include Bowen Park, Buttertubs Mash, and newly acquired East Wellington Park. These assets are connected by small sites acquired by the city as opportunities arose.

This 7 km corridor provides one of the city's most popular areas for active and passive recreation. The Greenway also protects the sensitive ecological features of the stream.

**Within the RDN:** Goal number two of the Regional Growth Strategy, Protect the Environment, has targets to **"improve surface water quality"** and **"increase the amount of land in protected status"**. The DWWP program addresses surface water quality monitoring in the Millstone and other watersheds. Through initiatives led by the parks and/or planning departments, the RDN has made modest gains in protecting sites through purchases or other legal arrangements - for example, Anders and Doritt's Community Park.

## **Table 7 –** M&M of the Millstone River as a Natural Asset

| Within the City of Nanaimo | Within Electoral Area C of the RDN |
|---|---|
| Some highlights of the City's greenway strategy:<br>▪ Keeping most of the riparian areas along the stream intact; these include the tall, forested vegetation in Bowen Park that protects aquatic and terrestrial life.<br>▪ Collaboration with several partners to construct a fish bypass channel around the Millstone falls to allow trout and salmon to access the upper reaches of the stream.<br>▪ Acquiring sites to enlarge and protect Buttertubs Marsh.<br>▪ Research (by Municipal Natural Assets Initiative) to calculate the financial value of the ecological services provided by Buttertubs Marsh.<br>NOTE: Calculation is based on Total Economic Valuation theory, "cost-based approach" (reference: Bradner et al in *The Economics of Valuing Ecosystem Services and Biodiversity).*<br>▪ Acquiring East Wellington Park and currently working with community collaborators on a plan to improve riparian areas, enhance some wetland features, accommodate food security farming, etc. | Some highlights of DWWP Action Plan 1.0 in the first decade:<br>▪ Defining water regions and their surface and ground water assets.<br>▪ Public education, community awareness and outreach programs related to water stewardship.<br>▪ Assessing the functioning condition of streams (lakes, wetlands, riparian areas).<br>▪ Collaborating with the community to implement ongoing monitoring of water quality.<br>▪ Sponsoring and collaborating in research initiatives related to these assets. |

## Objective Three: Review of Opportunities and Risks

The following two items were identified from a broad review of the Millstone watershed and the influences on land use generated by residents on the region.

### Natural Commons Perspective

*EAP provides both a qualitative and quantitative perspective on the Millstone River and the watershed which supports it. Human settlement and the stream system share the watershed.*

*This profile is not merely a land use or bio-physical perspective. Rather, it presents a view of worth, those social, ecological and financial values that accompany human settlement. This is the Natural Commons perspective.*

***First Opportunity:*** In view of the degree of migration into the region, there is an opportunity and probably a need to inform residents about the importance of natural assets and the accomplishments of the two local governments and collaborators in M&M of these assets.

The two local government websites have considerable information about the environment. The RDN 2019-2022 Strategic Plan has this vision: "*RDN honours and protects its natural assets, respects its diverse communities and promotes and enhances the well being of all its residents.*"

**The associated risk is when there is failure to honour and protect.**

***Second Opportunity:*** The EAP review suggests that the relatively good functioning condition of the Millstone stems from the extent of riparian area along the system. There is an opportunity to enhance riparian areas and increase stream resiliency. Lessons learned from other initiatives to enhance watershed functions are that a long-range strategy with focused targets of works in the field will be required.

**The associated risk is that the necessary collaboration to work throughout the stream system may not be pursued.**

## Objective Four: Asset Management Realities Identified in the Watershed Profile

Several factors indicate commitment by the RDN, City of Nanaimo and various collaborators to understand the financial value of the Millstone River system as a natural asset.

Objective Two established that the two local governments have adopted strategies and implemented M&M with a long-range view characteristic of asset management. Property acquisitions by the City of Nanaimo are clearly capital investments in natural assets.

***The Opportunity:*** Use the outcomes of the EAP analyses to support strategies and M&M budgets related to ecological assets such as the Millstone.

# Step Two: Stream System Functioning Condition

## Scope of Step Two

Step Two draws on field observations, GIS analysis, previous research, and other initiatives that address the functioning condition of the Millstone system. The principal considerations are:

- The importance of riparian areas for support of the condition of the stream. **Figure 8** provides context. It shows the extent of the existing Millstone riparian area.
- Actions by local government and collaborators, including landowners, to maintain and manage the stream system.

Of importance, the discussion in Step Two also references the details of the "Streamside Protection and Enhancement Area" content of the Riparian Areas Protection Regulation.

***Benchmark Assessment of Riparian Woodland and Tall Vegetation:*** Step Two describes the quality of the of the riparian set-back zone and larger riparian areas of the Millstone. This provides a benchmark based on two separate assessments:

- The research by Dave Clough in 2016.[2]
- The EAP review of riparian condition based on 2018 air photos.

Although this analysis results in a qualitative rating, it supports adoption of strategy and implementation targets to enhance the stream. These targets would identify the extent of work that might be done to increase riparian vegetation cover in the set-back zone.

**The four factors limiting stream health** are listed in the sidebar. Landmark research by the University of Washington in the 1990s established the order of importance. The landscape draining to the Millstone River has been transformed by human uses over time.

### Ranking of Factors that Limit Stream Health

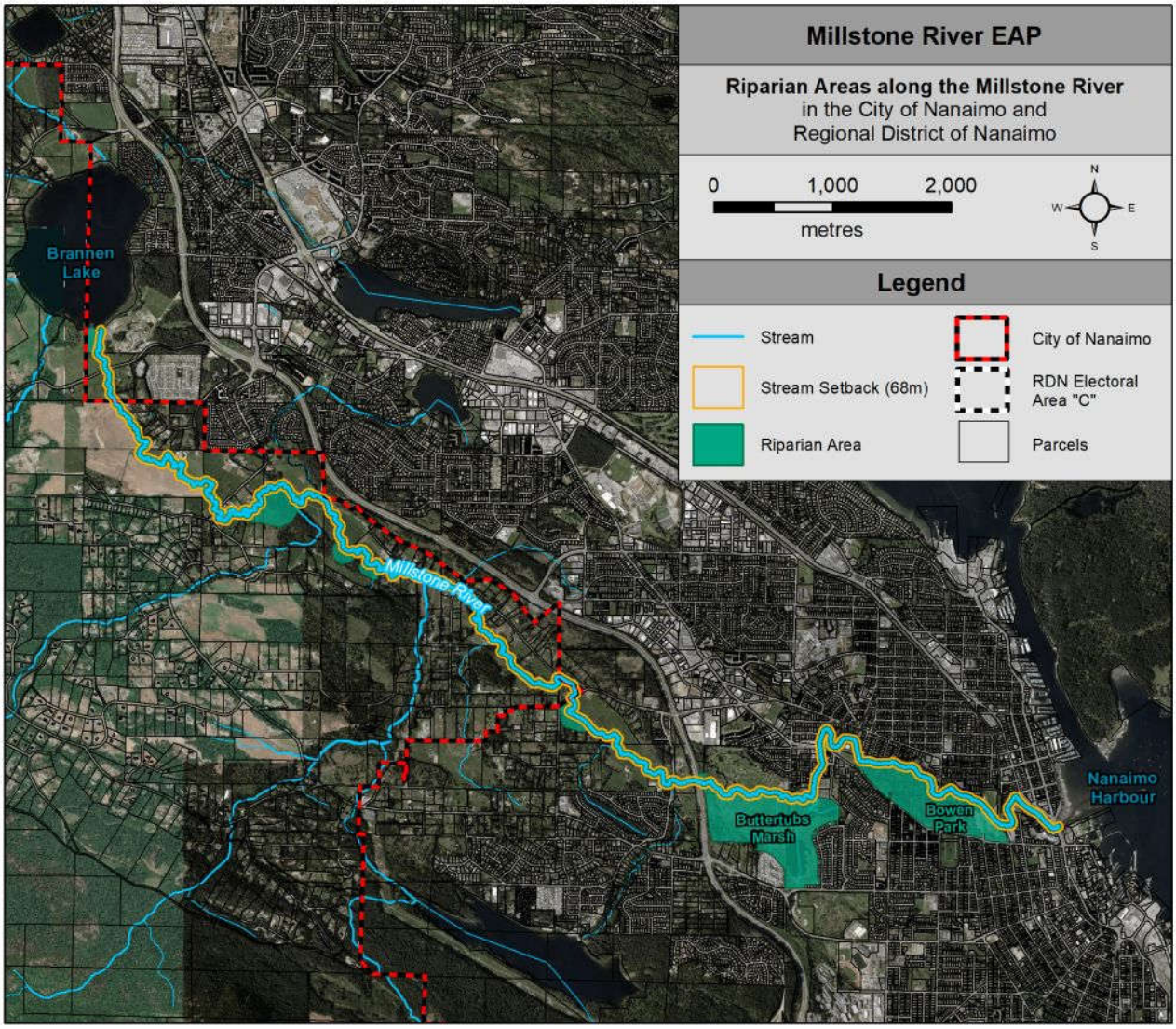
*West Coast research in the 1990s demonstrated that the factors limiting the ecological values of urban streams are, in order of priority:*

1. *Changes in Watershed Hydrology*
2. *Disturbance and/or Loss of Integrity of the Riparian Corridor*
3. *Degradation and/or Loss of Aquatic Habitat within the Stream*
4. *Deterioration of Water Quality*

Reference: Chapter 2, Stormwater Planning: A Guidebook for British Columbia, 2002

[2] Refer to Part D for a complete list of research references

## Figure 8




*"Generally speaking, the eastern portion of the drainage basin is residential/commercial and comprises approximately 10% of the drainage basin; the western portion of the basin is forested and comprises approximately 75% of the basin while approximately 15% is agricultural and is more-or-less centered on the Millstone River Valley." (A.A. Brown, 1987 – BC Ministry of the Environment)*

## Millstone River is a Natural Asset

The Millstone River is a natural asset or Natural Commons which provides various ecological services for the community and intrinsic nature. Residents and property owners can enjoy these services if the stream system functions well.

**What an Alternative Context Would Look Like:** Imagine the river in a culvert several kilometres long. The only ecological service in such a condition would be conveyance. The rich links between aquatic and terrestrial ecosystems would be lost. There would be no landmark and aesthetic features for adjacent parks or urban woodlands. Nor would private parcels have preferred locations near the stream.

**From an asset management point of view, the stream has value as a land use. Depending on its functioning condition, it may enhance or degrade the social and financial values of land uses along its course.**

***Regulatory Context for NCA Approach:*** What comprises the Millstone as a natural asset and what are the ecological services it provides? The Riparian Area Regulation (RAR) defines the asset as the "streamside protection and enhancement area" (SPEA). EAP refers to this area as the **Natural Commons Asset**.

### Natural Commons Asset (NCA) Defined

*The NCA is the portion of the stream corridor that lies in the Streamside Protection and Enhancement Area (SPEA) as defined in the Riparian Areas Protection Regulation (RAR).*

*The NCA width is the sum of the stream width plus the setback distance on each side.*

However, EAP measures the width of the set-back zone from the centre of the stream rather than the top of the bank (as described in the Regulation). The EAP calculation allows accurate measurement using Geographic Information System (GIS) resources.

**The detailed science behind the RAR** deems this landscape to be minimum protection for fish habitat. By inference, the SPEA is a defined area that supports the ecological services that can be drawn from the Millstone. EAP methodology defines this area - the set-back zone or Natural Commons Asset (NCA) - as a land use.

This is the asset to be managed. However, there is more to it. SPEA "means an area adjacent to the stream that links aquatic to terrestrial ecosystems and includes both existing and potential riparian vegetation and existing and potential adjacent upland vegetation that exerts and influence on the stream" (RAR).

**SPEA** *is the acronym for Streamside Protection and Enhancement Area.*

*It is used in the provincial Riparian Area Regulation under the Riparian Area Protection Act.*

***Views of the Condition of the Millstone SPEA (Setback Zone) in the RDN and the City of Nanaimo:*** The Millstone River Habitat Survey, completed by Dave Clough in 2016 for the RDN, reviewed the river in seven reaches and applied the Urban Salmon Habitat Program assessment method for rating fish habitat.

The method included ratings for the condition of "vegetation depth", a measure of the distance that riparian vegetation extends from the top of the stream bank on both sides to the edge of the set-back zone 30 metres away. Clough's research covered 10% to 20% of the stream corridor in each of the 7 reaches. This was a visual measurement from a point within the creek; it was intended as a generalization.

As a comparative and complementary measure of vegetative cover in the riparian zone along the Millstone, EAP used GIS measures and 2018 air photos of the stream to roughly calculate the extent of the riparian vegetation on both sides of the stream. The results of the two assessments are consolidated in **Table 8** below.

**TABLE 8** - Ratings for vegetative extent from the stream (top of bank) to the extent of the set-back zone (30 metres)

| | Stream Reach | Clough (2016) | EAP (2018) |
|---|---|---|---|
| **Within RDN** | #7 - Brannen Lake to Jinglepot Road | Poor | 50% Poor<br>50% Fair |
| | #6 - Jinglepot Road to Newfield Road | Poor | 35% Good<br>45% Fair<br>20% Poor |
| | #5 – Newfield Rd to East Wellington Rd | Poor | 10% Good<br>40% Fair<br>50% Poor |
| **Within City** | #4 – E. Wellington Rd to Bowen Road | Poor | 60% Poor<br>40% Fair |
| | #3 – Bowen Road to start of fish bypass | Poor | 30% Good<br>55% Fair<br>15% Poor |
| | #2 – the reach is short and was not assessed<br>#1 – fish bypass to harbour | Fair | 30% Poor<br>70% Fair |

## Definition of Riparian Ratings

***GOOD*** *- riparian vegetation extends 30m or more from the top of bank*

***FAIR*** *– riparian vegetation extends 15 m or less*

***POOR*** *– riparian vegetation extends less than 5 metres*

**Discussion of Findings in Table 8:** The combined rating for the riparian vegetative extent along the Millstone is, at best, only fair. Perhaps two primary influences result in the "fair" rating.

- Most land uses along the stream in both the RDN and the City are subdivision and development that altered the landscape decades ago. Often, development of structures, fields and other uses occurred near the bank of the stream.
- In the RDN, agricultural parcels dominate the margins of the stream and the flood plain. Farmland uses are exempted from the SPEA provisions of the RAR.

**Figure 7** shows where riparian set-back zones are connected to larger riparian ecosystem areas. Within the RDN, these lands have forest cover and/or wetlands. Within the City, parkland acquisition has added 17.5% to the SPEA zone. **Figure 9** shows wetland locations.

## Restoration of Riparian Ground Cover

The health or functioning condition of the Millstone stream riparian zone could be improved by restoring ground cover. **Table 8** provides a starting point for strategy development to systematically investment in restoring riparian woodlands and tall vegetation.

### Elements of a Riparian Strategy

*Involve landowners, especially farmers, in considering strategies (incentives) to restore land area to riparian vegetation.*

*Identify and develop tools (contracts, agreements, easements, ecological gifts, etc.) to facilitate riparian restoration.*

*Identify the social, ecological, and financial advantages or limitations for landowners who commit to having parcel area placed in long-term or permanent conservation status.*

***Setting Goals and Targets for Improving Millstone SPEA:*** Key information from Table 8 is summarized below. **Table 9** presents the supporting analysis. Therefore:

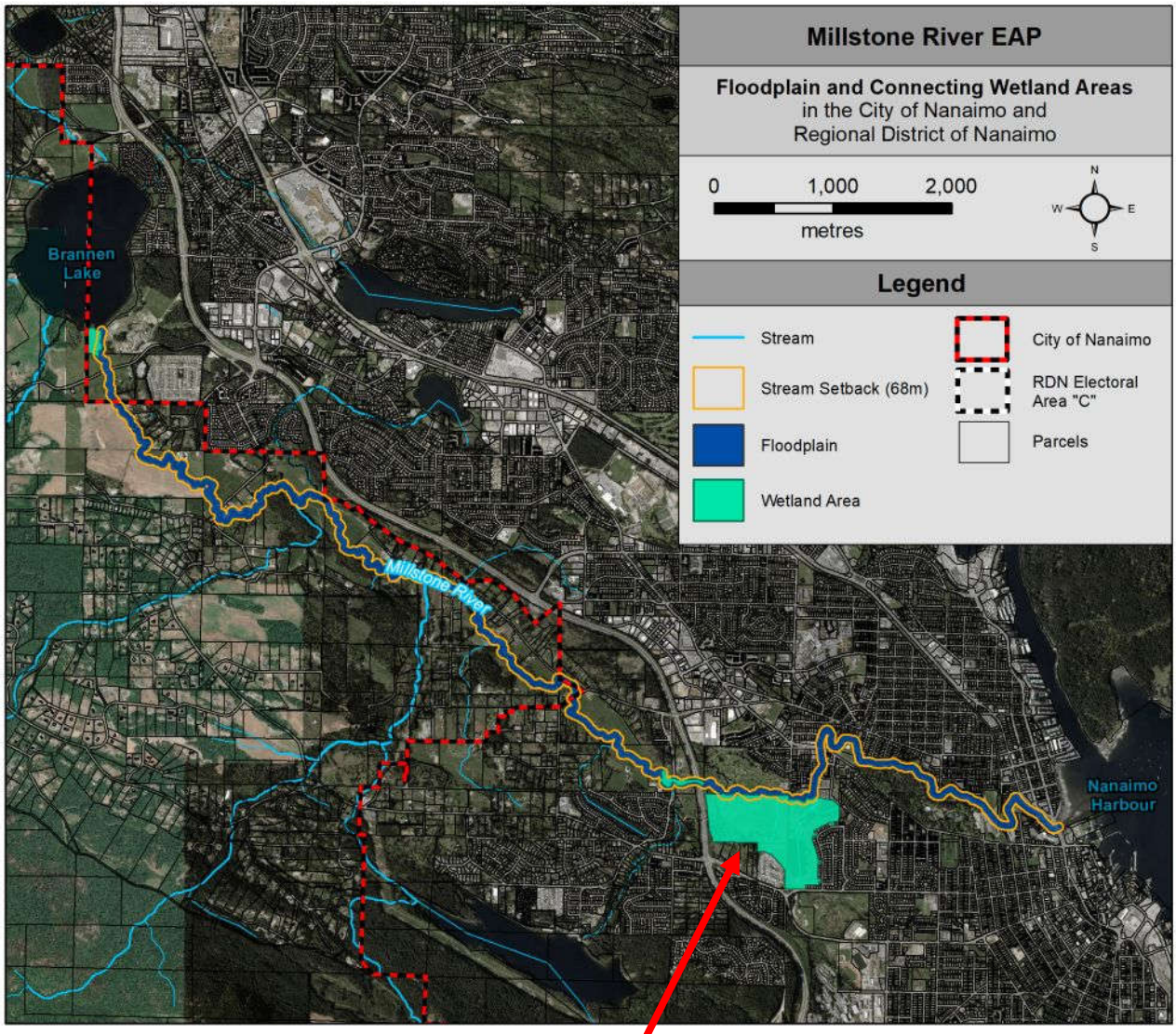
- **A near-term goal might be:** Minimum set-back vegetation will be 15 metres for the entire channel length.
- **The associated target would then be:** Restore ~8 km of channel length to improve the riparian quality rating from POOR to FAIR.

| RATING OF REGULATED RIPARIAN SPEA ZONE | | | | |
|---|---|---|---|---|
| | **DISTANCE** km | **POOR** < 5m | **FAIR** Up to 15m | **GOOD** > 30m |
| **Within RDN** | ~8 | 62% | 25% | 13% |
| **Within City** | ~7 | 49% | 20% | 31% |
| **Combined** | ~15 | 56% | 23% | 21% |

Some advantages and limitations of a potential restoration strategy are listed in **Table 10**.

| TABLE 9 – **Detailed Breakdown for Millstone River SPEA Zone** | | | | | | |
|---|---|---|---|---|---|---|
| **Stream Reach** | **Reach Length** (m) | **Which Side of Creek?** | **RATING OF WOODLANDS & TALL VEGETATION IN ZONE** | | | **Total Length x 2** (m) |
| | | | **POOR** | **FAIR** | **GOOD** | |
| **Within Electoral Area C of the Regional District of Nanaimo** | | | | | | |
| Brannen Lake to Biggs Rd | 350 | Right | 350 | 0 | 0 | 700 |
| | | Left | 300 | 50 | 0 | |
| Biggs Rd to Jinglepot Rd | 2465 | Right | 2035 | 305 | 125 | 4930 |
| | | Left | 1580 | 190 | 695 | |
| Jinglepot Rd to e. side Anders and Durrit Park | 600 | Right | 300 | 300 | 0 | 1200 |
| | | Left | 300 | 300 | 0 | |
| Anders and Durrit Park to Maxey Rd | 2235 | Right | 800 | 1435 | 0 | 4470 |
| | | Left | 2085 | 150 | 0 | |
| Maxey Road to Pirapet | 1310 | Right | 805 | 350 | 155 | 2620 |
| | | Left | 1155 | 155 | 0 | |
| Pirapet to East Wellington | 1100 | Right | 0 | 730 | 370 | 2200 |
| | | Left | 560 | 320 | 220 | |
| **GRAND TOTALS WITHIN THE RDN** | **8060** | | **9970 62%** | **3985 25%** | **2165 13%** | **16,120** 100% |
| **Within the City of Nanaimo** | | | | | | |
| East Wellington to Westwod Rd | 1495 | Right | 1055 | 50 | 390 | 2990 |
| | | Left | 1445 | 0 | 50 | |
| Westwood Rd to Pryde Ave | 1170 | Right | 825 | 345 | 0 | 2340 |
| | | Left | 470 | 700 | 0 | |
| Pryde Ave to Bowen Rd | 490 | Right | 145 | 0 | 345 | 980 |
| | | Left | 145 | 0 | 345 | |
| Bowen Rd to Millstone Ave | 1700 | Right | 250 | 305 | 1145 | 3400 |
| | | Left | 525 | 540 | 635 | |
| Bowen Rd to Millstone: Fish Bypass | 775 | Right | 0 | 375 | 400 | 1550 |
| | | Left | 0 | 375 | 400 | |
| Millstone Ave to harbour | 1440 | Right | 1040 | 100 | 300 | 1440 |
| | | Left | 1040 | 100 | 300 | |
| **GRAND TOTALS WITHIN THE CITY** | **7070** | | **6940 49%** | **2890 20%** | **4310 31%** | **14,140 100%** |
| **Combined Ratings for RDN and City of Nanaimo** | | | | | | |
| **GRAND TOTALS** | 15,130 | | **16,960 56%** | **6875 23%** | **6475 21%** | **30,260 100%** |

## Figure 9




*The City of Nanaimo has acquired additional riparian assets, which have added 17.5% to the set-back zone*

## **Table 10 –** Considerations in Developing a Strategy for Restoring Riparian Vegetation Within the SPEA Zone

| Advantages | Limitations |
|---|---|
| ▪ The regulatory set-back zone for Streamside Protection and Enhancement Area (SPEA) is well-defined in law and its quality for the Millstone from Brannen Lake to the harbour is supported by research and field experience.<br>▪ Local government has authority to regulate proposed development and subdivision where parcels abut or are near (within 30 metres) of the stream.<br>▪ Both local governments have and continue to involve the community in supporting stream maintenance and enhancement projects as well as research / monitoring.<br>▪ Local governments have the ability to provide incentives.<br>▪ Public support for management of the stream condition and ecological services generally is positive as indicated in surveys.<br>▪ Maintenance and enhancement projects to date have generated information about the kind of interest property owner might have in improving the riparian areas on their parcels.<br>▪ The RDN Drinking Water Watershed Protection Program includes representatives of forestry and other land uses in its Technical Advisory group. | ▪ The influence of the Millstone flood plain on surface water, ground water and the stream is unclear. For example, how important for stream conditions are the riparian areas on the fringes of the floodplain?<br>▪ The influence of upland urban development and drainage infrastructure on the Millstone system has not been quantified. Where does captured runoff go?<br>▪ Some land uses that affect the stream condition are exempted from RAR. These include forestry, mining, farming, some kinds of utilities, as well as other land uses.<br>▪ Local government has no authority to compel landowners with existing, non-conforming land use conditions in the stream set-back zone to make changes. This applies to parcels developed prior to pre-streamside protection regulations.<br>▪ The City already has acquired assets to increase the riparian capacity of the Millstone. Further increases that would benefit the City likely would have to occur in the RDN area of the stream system. |

# Step Three: Worth of Millstone River As a Natural Commons

## Scope of Step Three

Worth is one of four foundational concepts introduced at the beginning of this report. In Step Three, we look at the **investment made by the community over time** in the maintenance and management (M&M) of the Millstone stream corridor. This metric provides a measure of the worth of the Millstone River as a Natural Commons Asset (NCA).

A second measure of worth is the **financial value of the NCA**; and this is addressed separately in Step Four. In the EAP methodology, *financial value* refers to the assessed value of the portion of the land underlying the stream corridor. This land is the NCA and comprises the stream channel width plus the setback zone on each side. Worth of land refers to more than financial value.

**Financial Value versus Worth:** Financial value is the price paid at a point in time; whereas worth is the individual's or community's perception of the utility (personal and collective) of a property or several properties - for example, the community finds it worthwhile to acquire land for parks, schools, conservation of natural areas and other collective uses. Typically, the acquisition of the land is priced at current market rates or these rates are used to calculate discounts or other financial variables.

### *Illustration of Worth in Millstone Natural Commons Context:*

Worth is defined as the social, ecological and financial values residents and property owners attribute to the stream. The community's appreciation of worth is illustrated by the following examples.

Residents and property owners "vote with their feet". They use parks, trails, greenways and appreciate conservation areas; they consistently (last two decades) place a priority on these assets in the context of strategic plans and budget allocations.

Significant investment has been made in projects to enhance aquatic habitat in the Millstone. The sidebar provides perspective on the scope of regional initiatives.

### Regional Initiatives Recognize Worth

*The Millstone Greenway has been achieved over 20 years through inter-departmental cooperation within the City of Nanaimo, enhancement projects in collaboration with others, and opportune property acquisitions.*

*Now entering its second decade, the RDN's DWWP program has produced baseline research, engaged citizen science, and put essential monitoring of stream conditions in place.*



A program deliverable for *Sustainable Creekshed Systems, through Asset Management.*
Implemented under the umbrella of the Georgia Basin Inter-Regional Education Initiative

## Investment by the City of Nanaimo

The total expenditure by the City over the past decade is some $5.0 million and averages about $500,000 per year as detailed in Table 5. Looking ahead to the calculation of the Financial Value of the Natural Commons Asset in Step Four, this actual annual average expenditure compares with a suggested annual budget of $680,000.

It is worth noting that almost none of the $5.0 million outlay was for remediation. This compares with two previous EAP case studies where substantial expenditures were necessary for remediation of flood and erosion problems caused by surface water volumes due to changes in hydrology in the surrounding landscape.

***An Effective and Efficient Investment Strategy:*** Four factors as identified below have made the City's long-term investment in the Millstone River stream corridor system particularly efficient:

> The long-range strategy to complete the Millstone Greenway, completed over 20 years. Maintenance activities occurred "regularly" as departmental budget expenditures and periodic initiatives / projects.
>
> Collaborating with community organizations, external funders, the RDN, and other entities to complete projects.
>
> Purchasing, as the opportunities arose, key properties to complete the land holdings for the greenway corridor.
>
> Planning and public involvement in Greenway facilities and conservation areas.
>
> Committing to protecting the riparian areas of the Millstone when work was required to upgrade major constructed infrastructure.

**Investment Categories:** Over time, the City has invested in five areas of work related to the Millstone River Natural Commons Asset:

- Maintenance
- Enhancement
- Property Acquisition
- Public Processes and Parks Planning
- Research

**Table 11** lists the investment breakdown by category of work.

## Table 11 – Investment in Millstone Natural Commons by the City

| Investment Category | Description of Work | Investment Amount |
|---|---|---|
| **Maintenance** | The Parks budget is one of the city's three larget expenditure categories since 2010.<br>Regular department outlays include the non-constructed facilities of Bowen Park and other sites along the Millstone Greenway.<br>Annual budget estimate is **$52,000** for work in the Millstone corridor.<br>Community involvement in removal of invasive plants, planting native species, public education, and events. **$12,000 per year** (estimated) | $640,000<br>(decade total) |
| **Enhancement** | Millstone Gravel Placement for Coho (BC Conservation Foundation) - 2011. **$19,400**.<br>Millstone Bypass Channel (multiple partners) **$500,000**<br>Northfield Road culvert upsizing at Millstone. Improvements to the river channel (20% of $1,969,161) **$390,000**.<br>Millstone River Flow Augmentation 2008, Pacific Salmon Commission, DFO, City of Nanaimo, BC Conservation Foundation. **$50,100**.<br>Westwood Farm inventory and assessment**: $10,000**<br>Rehabilitation of the Millstone Sanitary Trunk Sewer and Laterals. The pipe bursting method employed at the time was very innovative. It was chosen to protect (avoid clearing & excavation) the riparian ecology of the Millstone. For the $4.8 million total capital cost, **the avoided cost and hence infrastructure saving of $1 million is attributed to Millstone enhancement.** | $1,974,500<br>(decade total) |
| **Property Acquisition** | 2191 E. Wellington (2011) 31.5 acres. Assessed value t (2019) $1.1 million. City outlay to acquire **$200,000**.<br>2191 E. Wellington legal costs $20,000.<br>175 Pryde Ave. (2012) 65 acres. Buttertubs Marsh. Assessed value **$1.1 million**.<br>Buttertubs Management Agreement with DUC? | $2,220,000<br>(decade total) |
| **Public Processes & Parks Planning** | | Amounts are not known |
| **Research** | Environmental Assessment of 51 Barsby Ave. Estimated **$15,000**<br>Municipal Natural Assets Initiative. Estimated **$35,000**<br>Biophysical Assessment and User Group Land Review for 2191 East Wellington (Park) Estimated**. $18,000**<br>Draft Management and Action Plan for East Wellington Park (City Planning Dept.) Estimated **$8000**<br>Buttertubs Marsh Conservation Plan Review. Estimated **$5000**<br>Millstone River Bank Protection (2017) Newcastle Engineering. Estimated **$25,000** | $116,000<br>(decade total) |
| | **GRAND TOTAL**<br>Average per year | **$4,945,500**<br>**~**$500,000 |

## Investment by the RDN

The total expenditure by the RDN over the past decade is close to $0.6 million and averages about $60,000 per year as detailed in **Table 12.** Looking ahead to the calculation of the Financial Value of the Natural Commons Asset in Step Four, this actual annual average expenditure compares with a suggested annual budget of $115,000.

Managers at RDN find themselves dealing with big picture challenges concerning water resources. Not the least of these is managing demands for increased rural residential development with infrastructure service levels that conflict with protection of natural assets.

The RDN, like the City of Nanaimo, embraces strategies that include the maintenance and management needs of the entire system. The Drinking Water & Watershed Protection Program is an important long-term strategy employed by RDN to address water sustainability and watershed protection in the region. Now starting its second decade of operation, the DWWP deals with solutions both regionally and in local watersheds.

## Reflections on What the Numbers Tell Us

The calculations of worth in financial terms for both RDN and the City of Nanaimo provide ballpark estimates that are appropriate for this overview-type assessment. The available information does not include in-kind contributions. Thus, the calculations of worth are likely underestimated.

Nevertheless, the calculations do underscore that the two local governments and their collaborators reocgnize that investment in the worth of the Millstone system is important and should be based on a long-term strategy. Both jurisdictions have secured and or supported M&M projects and investments on that basis.

Two factors are apparent. Collaborative projects may be managed by others and the kind of reporting provided focuses on deliverables. The framework to define M&M investment does not exist.

## Table 12 – Investment in Millstone Natural Commons by the RDN

| Investment Category | Description of Work | Investment Amount |
|---|---|---|
| **Maintenance** | Nearly all of these projects involve collaborators. Many rely on citizen science.<br>Community Watershed Monitoring Network – since 2013. The Millstone is one of the streams in the program for sampling water quality. The program involves many volunteers. Estimated annual expenditure related to the Millstone is $**5500.**<br>Millstone Stream Bank Restoration - since 2017. Includes "stewardship seed funding". Estimated annual expenditure in the Millstone is $**2000**. | $125,000<br>(decade total) |
| **Enhancement** | Most projects are collaborations. | |
| **Property Acquisition** | Anders and Dorrit's Community Park – gift to RDN. 6.3 acres. Estimated value at farmland market prices is $365,000. For info:<br>https://www.rdn.bc.ca/anders-and-dorrits-community-park | $365,000<br>(decade total) |
| **Public Processes & Parks Planning** | Parks planning and public consultation $10,000.<br>Reports to the community about DWWP program. Estimated annual expenditures $**5000**. | $15,000 |
| **Research** | Flow and Fish Habitat Assessment, BC Conservation Foundation and DFO. Estimated cost **$20,000**.<br>Water Quality and Stream Invertebrate Assessment for the Millstone River, Vancouver Island University-2011. Estimated cost **$6000.**<br>Water Storage Feasibility on the East Coast of Vancouver Island – 2013. BC Conservation Foundation and collaborators. Estimated cost-share for Millstone is **$6000**.<br>Water Budget Project, 2013. Estimated cost-share $**4000**.<br>Millstone River Habitat Survey, 2016. RDN. Estimated $**25,000**.<br>Ecological Accounting Process Analysis, RDN, 2020. **$32,500**. | $93,500<br>(decade total) |
| | **GRAND TOTAL**<br>Average per year | **$593,500**<br>~$60,000 |

# Step Four: Financial Value of Millstone River As a Natural Commons

## Scope of Step Four

Next, we determine the financial value of the **Natural Commons Asset (NCA)**, a foundational concept introduced at the beginning of this report. The EAP analysis draws on the BC Assessment database to determine the NCA value.

While there is an impressive history of investing in the worth of the Millstone River system, the financial value of the stream corridor remains obscure. EAP brings clarity by defining the stream setback zone as a land use - because it can be measured and has definition under various pieces of legislation.

***Natural Commons Asset Defined:*** **Figure 10** illustrates the NCA and associated terms. It is a useful visual guide for the discussion that follows. The NCA is the specific area of a stream that lies in the regulatory setback zone. The EAP methodology adds the width of the stream itself to the regulatory setback zone. Stream width is either nominal or taken from previous research.

### Natural Commons Perspective

*The Natural Commons is a broad term referring to a natural asset recognized by the community. Recognition includes legislation, regulation, and common usage.*

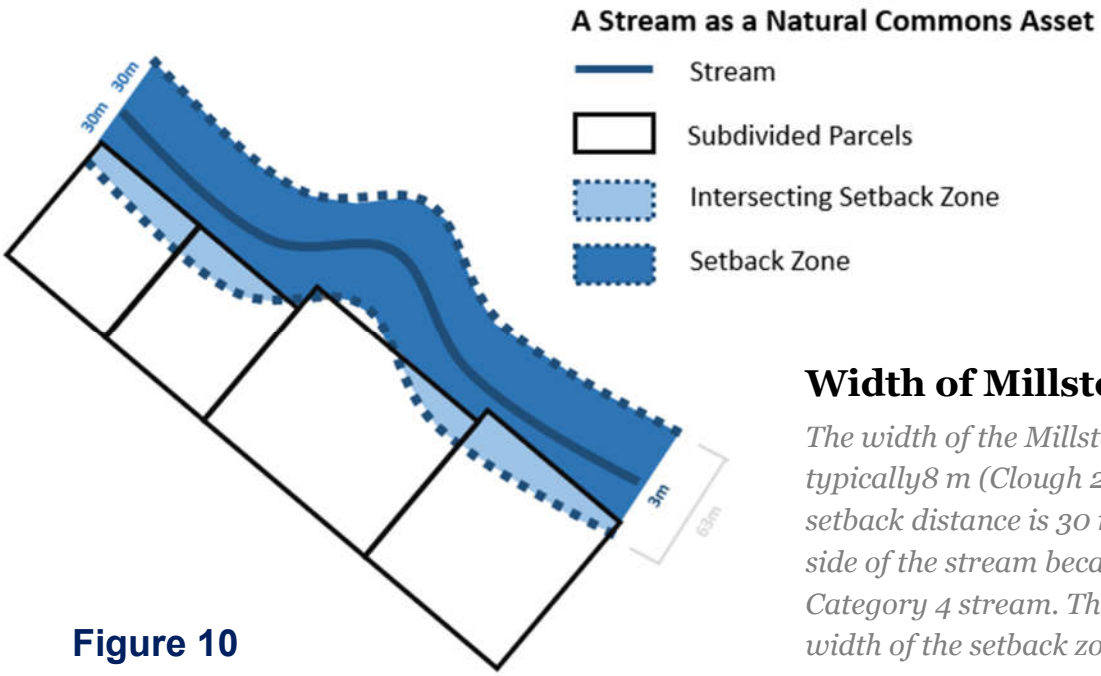



**Figure 10**

### Width of Millstone NCA

*The width of the Millstone is typically8 m (Clough 2016). The setback distance is 30 m on both side of the stream because it is a Category 4 stream. Thus, the total width of the setback zone is 68 m.*



A program deliverable for *Sustainable Creekshed Systems, through Asset Management.*
Implemented under the umbrella of the Georgia Basin Inter-Regional Education Initiative

## BC Assessment Database

*BC Assessment values are not appraisals.*

*Assessments relate to property prices reflected in market trends for property sales over time.*

*Assessments may differ considerably from present market prices.*

*Appraisals are current financial valuations related to market conditions for a specific parcel or property.*

***Use of BC Assessment Database:*** The EAP methodology uses property transaction information to describe the financial value of a natural commons such as a stream. The information comes from BC Assessment Authority valuations of land parcels. BC Assessment separates land values from the worth of improvements.

The basis of assessment information is longitudinal data (several decades) collected from completed real estate transactions for classes of property. In the case of residential parcels, the current assessment reflects the financial commitments that buyers make to acquire property in a particular location with or without improvements (buildings, landscaping, etc.).

The EAP methodology implies that if the stream did not exist, the land it occupies would be used for nearby (residential or agricultural) development.

**Categorization of Property Types:** The financial value of the NCA is based on the assessed land value of residential parcels which abut or are adjacent to the stream, where:

- **Abut** means that the parcel has some area within the NCA.
- **Adjacent** means that a parcel is within 200 m of the stream and has no area in the setback zone. Note: *parcels that border a natural area continuous to the stream are considered abutting and 10% of the parcel area is used for calculation.*
- **Distant** means that a parcel is more than 200 m from the stream.

The behaviour of buyers and sellers of parcels that abut or are adjacent to natural commons includes their perception of the premium or discount they might attribute to a parcel (land only) or property (includes improvements). BC Assessment data reflects the influence of this behaviour over time.

***Selection of Parcel Samples for Analysis:*** Listed in **Table 13** are the parcel samples selected for analysis within both the RDN and City jurisdictions. Parcels were grouped based on proximity to the stream. About half of the available parcels were sampled in each jurisdiction.

EAP samples (157) were selected from about 315 parcels situated in the Millstone floodplain area of the RDN. In the City of Nanaimo, 233 parcels were sampled from about 488 parcels in the vicinity of the river.

Agricultural and residential parcels were sampled in the RDN. In the City of Nanaimo only residential parcels were sampled. Other land uses (zoning) were too few to include for analysis.

## Table 13 – Parcel Samples for EAP Analysis

| Within the RDN include | |
|---|---|
| Agricultural parcels abutting or adjacent to the stream | 15 |
| Residential parcels abutting the stream | 22 |
| Residential parcels adjacent to the stream | 38 |
| Residential and agricultural parcels distant (more than 200 metres) from the stream. | 82 |
| **TOTAL NUMBER OF PARCELS** | **157** |
| | |
| **Within the City of Nanaimo** | |
| Buttertubs Marsh – abutting | 31 |
| Millstone in the Bowen Park area – abutting | 35 |
| Buttertubs Marsh - adjacent | 51 |
| Bowen Park area - adjacent | 38 |
| Millstone north of Bowen Park - distant and of the same subdivision era as the abutting and adjacent parcels near Bowen Park | 74 |
| Avonlea subdivision developed in early 2000s – included for comparison to other residential parcels in the city and in the RDN. | 51 |
| Cather Lake subdivision of 1980s era – for comparison to other residential parcels in the city and in the RDN. | 59 |
| **TOTAL NUMBER OF PARCELS** | **339** |

# What the Numbers Tell Us - Calculation of Natural Commons Asset Values

## Premise for NCA Values

*The EAP methodology integrates financial, ecological and social factors.*

*The NCA value factors in the social dimension by means of this premise – and that is, responsibility for the stream corridor setback zone and the financial value of the land it occupies is shared with adjacent landowners.*

*The EAP calculation as represented in the table reflects this sharing by reporting the NCA value at 50% of the Assessed Value as determined from BC Assessment records.*

*The social factor is discussed later.*

**Figure 11** on the next page shows the locations of the parcel samples selected for analysis. Below, **Table 14** distils and synthesizes the results of the EAP analyses into a simplified summary for ease of review and reference at a glance:

**Table 14**

| Section of Millstone Corridor | Stream Length (km) | Natural Commons Asset Values | | |
|---|---|---|---|---|
| | | Total $ | $ per m | $ per $m^2$ |
| City[1] | 7 | $68.2M | $9535 | $139 |
| RDN[2] | 8 | $11.5M[3] | $1420 | $21 |
| Combined | 15 | $79.2M | $5480 | $143 |

Notes:

[1] Based on 66 residential parcels abutting the stream in the Bowen Park and Buttertubs Marsh (Bird Sanctuary Drive) areas

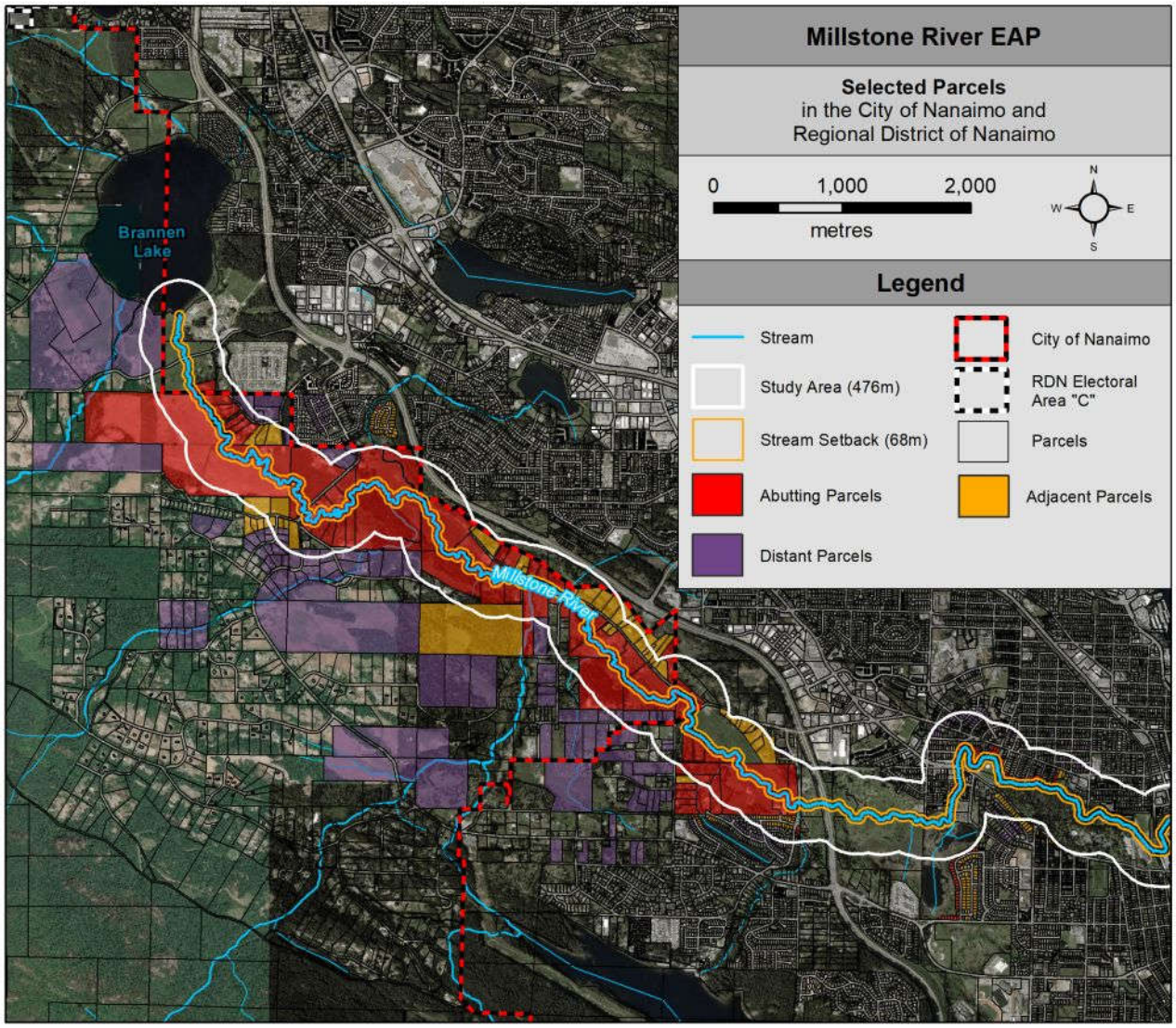
[2] Based on 23 residential parcels and 16 agricultural parcels abutting the stream.

[3] Agricultural parcel values are based on market not assessment values. The rationale is explained on the next page.

**An Overview of the Numbers:** The foregoing measures of NCA values are indicators because a number of variables affect or influence the BC Assessment values. In order of importance these include:

| Order of Importance | Variables Influencing Assessment Values |
|---|---|
| 1 | The average area of parcels |
| 2 | The era of subdivision |
| 3 | Surrounding urban or rural amenities |
| 4 | The frequency of property transactions which allow assessments to be updated |

## Figure 11


Millstone River EAP
Selected Parcels
in the City of Nanaimo and
Regional District of Nanaimo
0
1,000
2,000
metres
N
W
E
S
Legend
Stream
Study Area (476m)
Stream Setback (68m)
Abutting Parcels
Distant Parcels
City of Nanaimo
RDN Electoral Area "C"
Parcels
Adjacent Parcels
Brannen Lake
Millstone River

***Rationale for Farmland Values:*** With reference to NCA values presented in **Table 14**, the agricultural parcel values are based on market rather than assessed values. The reason is that farmland parcels in the RDN have a very low assessed value when considered on a per m² basis. **For the 16 parcels sampled, the per m² value was only $0.43**.

The assessed values of farmland parcels are set at rates determined by the Province, and are not at all close to market values. Rates are set low to support agriculture and farmland protection. Thus, it is necessary for EAP to look to market value for a meaningful metric for analysis.

**Supporting Analysis:** Given the foregoing disconnect, it is necessary to take a deeper dive to determine a reasonable equivalent measure of the NCA for farmland.

Farm Credit Canada in its April 2020 report found that farm sales on Vancouver Island transacted at an average value of $57,500 per acre, up 13% from the previous year. **Based on the market, the value of farmland in the Millstone floodplain is about $14.18 per m².** Thus, the most useful comparison of values for farmland versus residential parcels is summarized below:

| Category for Comparison | Measure |
|---|---|
| Assessed value of residential parcels in the RDN sample | $26.3 per $m^2$ |
| Market value of farmland parcels (2019) | $14.2 per $m^2$ |
| Combined value of farm market values and residential assessed values | $21.0 per $m^2$ |

**Proxy Value for Farmland NCA:** Based on this revision, the value of the NCA in the RDN using the samples of 23 residential parcels (average area is about 19,000 m²) and 16 farmland parcels (average area is almost 118,000 m²) is about **$21 per $m^2$** in terms of significant figures.

## Expansion of Riparian Zone

*The strategy for expanding the riparian zone in the Millstone Greenways supports and improves riparian function and ecological services. It also indicates that financial value (land purchased or valued at market or assessed rates) can be added to the Natural Commons Asset.*

## Social Contract Expectations Arise from Usage

*Bowen Park, for example, is a landmark in the City of Nanaimo and the Millstone is the backbone feature.*

## Application of No Harm Rule in Land Appraisal

*When appraisers consider a site made up of one or more parcels, the potential value reflects the utility of the site in context of "highest and best use". This opens the door to inclusion of ecological services.*

# Relevance of Social Factors

The definition of a natural commons such as the Millstone River is not complete unless the determination of Financial Value takes into account three social factors described below. Here we refer to implied and actual expenditures for maintaining or improving the condition of the stream (riparian areas).

***The first social factor is that some private owners have abutting parcels:*** That is, a portion of their land is within the setback zone. Current regulations prevent them from placing permanent development in that part of their parcel. These parcel owners will contribute passively to the protection of the stream and its nearby riparian zone. They may contribute actively by committing additional area of their parcel to riparian ecology.

The setback zone offers minimum protection of the riparian area of the stream. Communities may add protection and riparian function by acquiring sites to expand the riparian zone, as the City of Nanaimo has done at several locations along the Millstone Greenway.

***The second social factor is the implied social contract:*** Residents and property owners expect the natural commons services of the Millstone to be maintained and enhanced in the same way as constructed commons services are maintained and enhanced.

Residents and property owners volunteer to participate in the maintenance and management efforts of stream keepers. Their work usually involves collaboration with local government. Their frequent presence in the stream system helps prevent harm to its ecology.

***The third social factor is the no harm rule:*** Residents and property owners are expected and required to avoid activities that may harm the stream system and its riparian areas.

These prescriptions are defined in local government bylaws such as Stream Setback regulations and Development Permit Area regulations affecting environmentally sensitive areas. The BC Environmental Management Act also enforces the no harm rule. When intentional harm is proven and prosecuted, financial penalties, including compensation for defined loses of ecological values, may apply.



A program deliverable for *Sustainable Creekshed Systems, through Asset Management.*
Implemented under the umbrella of the Georgia Basin Inter-Regional Education Initiative

## Opportunities to Apply the NCA

The determination of the value of the Natural Commons Asset referring to specific reaches and the entire Millstone system offers several applications. All are pertinent to asset management strategies.

**First Opportunity:** Although the measure of NCA is rough, it can be used immediately for strategy and budget planning.

**Second Opportunity:** Improving the extent of riparian woodlands and vegetation would have a positive effect on certain climate change mitigation strategies. At the same time, it would increase protection for the health of the stream.

The discussion in Step 3 identified the essential link between the condition of riparian areas, including the regulatory setback zone, and the health or functioning condition of the stream. Improving (enhancing) riparian areas can improve the resiliency of water infrastructure, attenuate flooding, protect existing drainage infrastructure, and maintain urban forests and parkland amenities.

**Third Opportunity:** Include natural assets in planning, budgets and departmental operations in a manner similar to that used for constructed commons infrastructure.

***Pertinence to Asset Management Practices:*** Valuation of the NCA allows the Millstone to have a financial value as a permanent asset. The fact that the community expects the stream to be maintained and managed puts it into a strategic planning and management regime that differs little from roads and other traditional infrastructure assets.

**Guideline for an Annual Millstone M&M Budget:** The value of the Millstone NCA within the City of Nanaimo is about $68 million. The annual M&M expenditure based on 1% of capital value would be $680,000 (or approximately $700,000 in terms of significant figures).

Similarly, annual expenditures for M&M of the Millstone NCA within the RDN would be $115,000 per year based on 1% of the $11.5 million capital value of the NCA.

The 1% guideline aligns with commercial real estate maintenance guidelines that use 1% to 2% of the capital value of assets to budget annual expenditures.

# Step Five: Influence of the Stream on Parcel Values

## Scope of Step Five

Lastly, we review the assessed values of residential and agricultural parcels to determine whether and how proximity to the stream has an influence on their financial value.

We also look at other values with financial implications. For example, riparian area added to and beyond the setback zone likely will improve ecological services such as the condition of wetland conservation areas, infiltration, and detention of rainwater, etc.

**Asset Management Implications:** Because EAP defines the stream setback area as a land use and calculates its financial value, **the stream corridor is an asset with capital value**.

As such, it would seem intuitive that this Natural Commons Asset should be included in local government planning and budgeting for maintenance and management. These factors are important elements of an asset management strategy (refer to the sidebar).

### Asset Management Implications

*This approach is market-based. EAP uses assessed values which reflect market prices. EAP also recognizes that by maintaining and/or increasing ecological services, costs will be influenced in several ways, notably by:*

1) *Avoiding the cost to construct works to provide (if possible) the desired service.*
2) *Avoiding replacement costs of constructed works.*
3) *Reducing mitigation and restoration costs.*

(reference: Economics of Valuing Ecosystem Services and Biodiversity, U. Pascual, R. Muradin et al, 2010. Chapter Five.)

## Assessed Parcel Values

**Table 15** consolidates the results of a review of five parcel sample groups within the City of Nanaimo and four within the RDN. This facilitates a review at a glance. The samples are groups based on whether they are abutting, adjacent, or distant locations in the vicinity of the stream.

Current assessed values are influenced by a number of variables and controlling for specific influences is difficult. For these reasons, the following analysis of the parcel samples describes trends rather than indisputable financial characteristics.

## Table 15 – Results of Financial Value Analysis for the Millstone River Natural Commons Asset

| | Category | No. of Parcels | Average Assessed Value | Average Parcel Area in $m^2$ | Average Area in the NCA | Average Assessed Value per $m^2$ | NCA Value per $m^2$ |
|---|---|---|---|---|---|---|---|
| **Parcel Groups within the City of Nanaimo** | | | | | | | |
| **Buttertubs Marsh** (Birdsong Drive) | Abutting | 31 | $258,323 | 758 | 430 | $341 | $171 |
| **Buttertubs Marsh** (Wildlife Place) | Adjacent | 51 | $238,471 | 757 | n/a | $315 | n/a |
| **Bowen Park Area** (1950s subdivision) | Abutting | 35 | $261,397 | 1199 | 566 | $218 | $109 |
| **Bowen Park Area** (1950s subdivision) | Distant | 74 | $252,081 | 892 | n/a | $304 | n/a |
| **Bowen Park Area** (various subdivision periods) | Adjacent | 38 | $212,816 | 822 | n/a | $259 | n/a |
| **Parcel Groups within the Regional District of Nanaimo Electoral Area C** | | | | | | | |
| **Residential Subdivision** | Abutting | 37 | $333,307 | 62,721 | n/a | $33.5 | n/a |
| | Distant | 58 | $442,694 | 12,845 | n/a | $5.3 | n/a |
| **Floodplain Farmland** | Abutting | 16 | $50,240 | 117,629 | n/a | n/a | n/a |
| | | | versus $1.668M based on $57,500 per acre (source: Farm Credit Canada) | | | | |
| | Adjacent | 23 | $85,874 | 96,422 | n/a | n/a | n/a |
| | | | versus $1.369M based on $57,500 per acre (source: Farm Credit Canada) | | | | |

***Parcel Groups within the City of Nanaimo:*** The Bowen Park, Buttertubs and East Wellington conservation areas define the Millstone stream corridor within the City. The results of the data analysis for five parcel sample groups in the Buttertubs Marsh and Bowen Park residential areas are presented in the top half of **Table 15**.

**In the Buttertubs Marsh Area,** two situations are compared – abutting versus adjacent. The key observation is that owners of abutting parcels find their assessments, on average, 8% higher than owners of adjacent parcels - $258,000 versus $238,000. Parcels are the same size.

At the same time, however, owners of parcels abutting the stream have less utility of their land; that is setback requirements limit permanent uses of portions of their parcels.

**In the Bowen Park Area,** three types of situations are compared – abutting, adjacent and distant.

## Influence of Stream Corridor on Parcel Value

*Assessed values for parcels that abut streams in the Bowen Park and Buttertubs Marsh areas are 4% and 8% higher than the assessed values of parcels that are distant from and adjacent to the stream, respectively.*

Parcels abutting the stream have average assessed values about 23% higher than for those that are adjacent - $261,000 versus $212,000. However, the aggregate average area of abutting parcels is about 50% larger than that for the adjacent group – that is, 1199m$^2$ versus 822m².

The parcel group located more than 200 metres from the stream had average values that were only 4% less than for the abutting parcels.

The telling statistic is that the distant parcels average value of $304 m² is 39% higher than the average value of $218 m² for abutting parcels. Yet the parcels in the distant sample are three-quarters of the size - 892m² versus 1199 m² for those abutting the stream.

One interpretation of the difference is that owners of abutting parcels have paid for parcel area that they may not develop. On average, abutting parcels are one-third larger than distant parcels. It would therefore seem that the qualities of the parcel within the setback zone has persuasive worth for some purchasers.

**Conclusions:** The data suggest significantly that the well-defined riparian qualities of the Millstone system in the City of Nanaimo positively influence the assessed values of residential parcels.

These well-defined qualities especially include community recognition of the Millstone Greenway and its landscape context: Bowen Park, Fish Bypass Channel, Buttertubs Marsh, and East Wellington Park.

***Parcel Groups within the RDN:*** Within the RDN, the Millstone River meanders through the flood plain. The setback area and adjoining riparian areas are dominated by farmland parcels which occupy about three quarters of the flood plain area. This is illustrated in **Figure 12**.

Nearly all land in the Millstone system flood plain area is in the Agriculture Land Reserve. The assessed values of these parcels are very low and reflect the community's support of protecting farmlands and supporting producers.

The results of the data analysis for the four parcel sample groups are presented in the bottom half of **Table 15**. Two groups are in farmland areas and the other two groups are in rural residential areas.

**Rural Residential Parcels:** The assessed values for 95 residential parcels in the Millstone flood plain area are inconclusive. One reason is that the use of these parcels varies considerably.

Parcels that abut the stream are on average five times the size of the distant residential parcels – that is, 15.5 acres versus 3.2 acres. The average assessed value per m² of the 58 'distant' residential parcels is 6.5 times higher compared to the average for the 37 'abutting' parcels. This disparity reflects a lower cost per hectare for large parcels.

Likely, the abutting parcels were platted in the early subdivision history of the Millstone flood plain. But there is no apparent reason for their lower value per m².

**Floodplain Farmland:** Data for 39 of 50 farms in the Millstone flood plain were reviewed. Parcels zoned for agriculture dominate the lands adjacent to the Millstone from Biggs Road to East Wellington Road.

The protection of the riparian set-back zone varies considerably on agricultural parcels. Often the minimum required does not exist. However, some farms allow area beyond the set-back zone to remain as riparian area, notwithstanding interpretation of provisions of the Farm Practices Protection (Right to Farm) Act. Farms, especially those abutting the stream, have area that might be used for enhanced riparian cover.

**An Opportunity:** Both the agricultural and residential parcels in the floodplain offer an opportunity to increase and enhance the riparian areas of the Millstone system. The analysis in Step 2 could provide the starting point for developing a target-based strategy for systematically restoring riparian woodlands, to a width of at least 15 metres.

## Benefits of a strategy for restoring woodlands and tall vegetation in the riparian zone

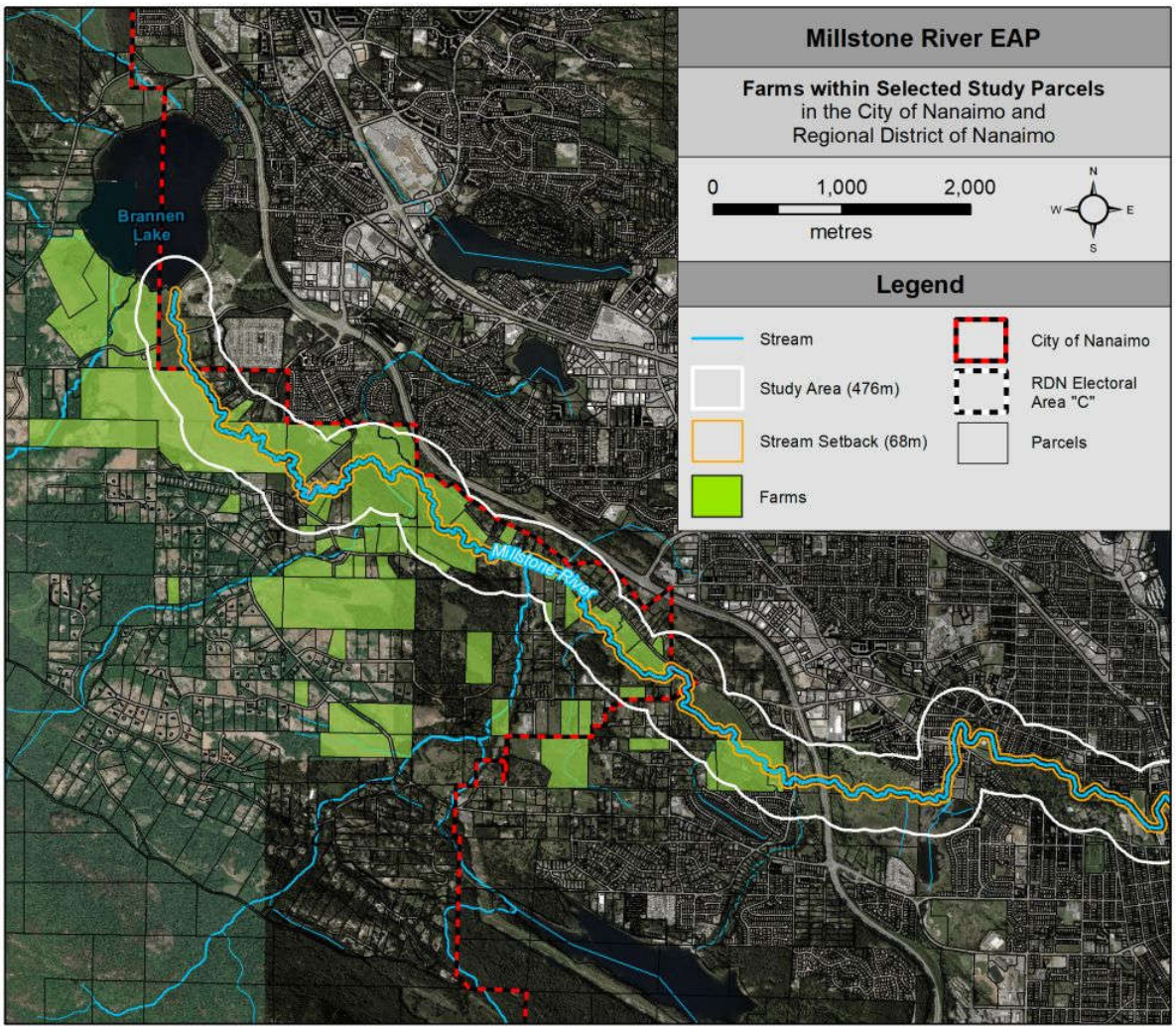
*Increased and enhanced riparian area would have the greatest positive effect on the functioning condition of the stream.*

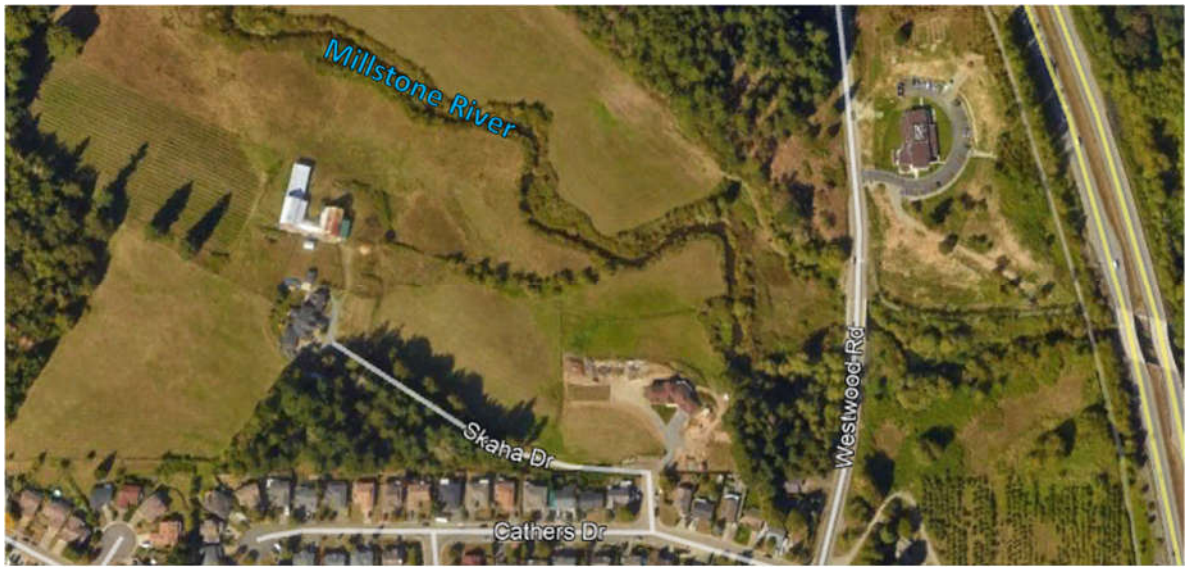
*Increased riparian area support aquifers, attenuation of flooding and climate change adaptation.*

*The Millstone floodplain area has lost most of the tall (trees, woodlands) vegetation that historically formed the backbone of the riparian ecosystem.*

*Restoration of woodlands and tall vegetation along the stream makes sense for riparian function. However, potential impact on farming practices would need to be evaluated.*

## Figure 12

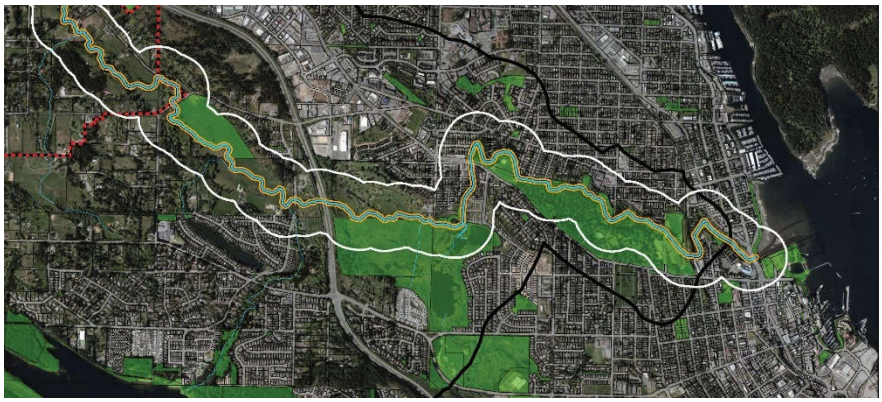

Millstone River EAP
Farms within Selected Study Parcels
in the City of Nanaimo and
Regional District of Nanaimo
0
1,000
2,000
metres
N
W
E
S
Legend
Stream
Study Area (476m)
Stream Setback (68m)
Farms
City of Nanaimo
RDN Electoral Area "C"
Parcels
Brannen Lake
Millstone River


Millstone River
Skaha Dr
Cathers Dr
Westwood Rd

This page left blank intentionally

PART D

# EAP Research



This page left blank intentionally

# List of References

## Legislation and Official Plans


Province of BC, Riparian Areas Protection Regulation, Nov. 1, 2019

Province of BC, Farm Practices Protection Act, current to Feb. 2019

Province of BC. Environmental Management Act, current to Dec. 2020

Regional District of Nanaimo, Strategic Plan 2019-2022

Regional District of Nanaimo, Regional Growth Strategy, 2011

Regional District of Nanaimo, East Wellington – Pleasant Valley Official Community Plan, 2018

Regional District of Nanaimo, Regional Parks and Trails Strategy – Draft Strategy Development, 2020 – 2021

Regional District of Nanaimo, Community Energy and Emissions Plan, 2013

City of Nanaimo, Master Plan, 2005

City of Nanaimo, Trail Implementation Plan, 2007

City of Nanaimo, Official Community Plan, 2008

City of Nanaimo, Reimagine Nanaimo, Bowen Park – Trailway and Utility Upgrades, 2020 – 2021

City of Nanaimo, Draft East Wellington Park Management and Action Plan, 2019

City of Nanaimo, Nature Trust of BC, Ducks Unlimited, Buttertubs Conservation Area Management Plan, 2016

City of Nanaimo, Urban Forestry Management Strategy, 2010


## Research


BC Conservation Foundation and Fisheries and Oceans Canada, Flow and Fish Habitat Assessment of the Millstone River, 2012

*Canadian Consulting Engineer,* October 1, 2000. Pipe Bursting for the Millstone Sanitary Trunk Sewer, Nanaimo

City of Nanaimo and Aquaparian Environmental Consulting Ltd., Biophysical Assessment and User Group Land Review for 2191 East Wellington Road, Nanaimo, 2018

Ducks Unlimited, West Marsh Ecogift Monitoring Report (Buttertubs Marsh West), 2019

Mount Arrowsmith Biosphere Region Research Institute, Westwood Farm Project: Inventory and Assessment, 2019

Municipal Natural Assets Initiative, Final Technical Report (for Buttertubs March Conservation Area), 2018

BC Ministry of Forests, Ministry of Water Land and Air Protection, and Ministry of Sustainable Resource Management. Protocol for Evaluating the Condition of Streams and Riparian Management Areas (2005)

A.A. Brown, Ministry of Environment and Water Management, BC, Preliminary Report on Millstone River Flooding, 1987

U. Pascuali, R. Muradin, L. Bradner, et. al. The Economics of Valuing Ecosystem Services and Biodiversity, Arizona State University, 2010

Regional District of Nanaimo and Metroline Research, RDN Drinking Water and Watershed Protection Plan Update Public Survey, June 2019

Millstone River Ecological Accounting Process
Survey of Property Owners and Residents

# Survey Findings

**Produced for:** The Partnership for Water Sustainability in B.C.
**Developed by:** The Mount Arrowsmith Biosphere Region Research Institute
Vancouver Island University

# Millstone River Ecological Accounting Process Survey of Residents

## Summary

Between November 5th, 2020 to December 10th, 2020, the Mount Arrowsmith Biosphere Region Research Institute at Vancouver Island University (VIU) collaborated with the City of Nanaimo, the Regional District of Nanaimo, and the Partnership for Water Sustainability in B.C. to conduct a survey of local residents. The survey asked participants for their perspective on the Millstone River as a natural asset in the Nanaimo region.

The survey received a total of 57 responses from a total of 356 survey invitations mailed to homeowners and renters living adjacent to the Millstone River within the Regional District of Nanaimo and City of Nanaimo.

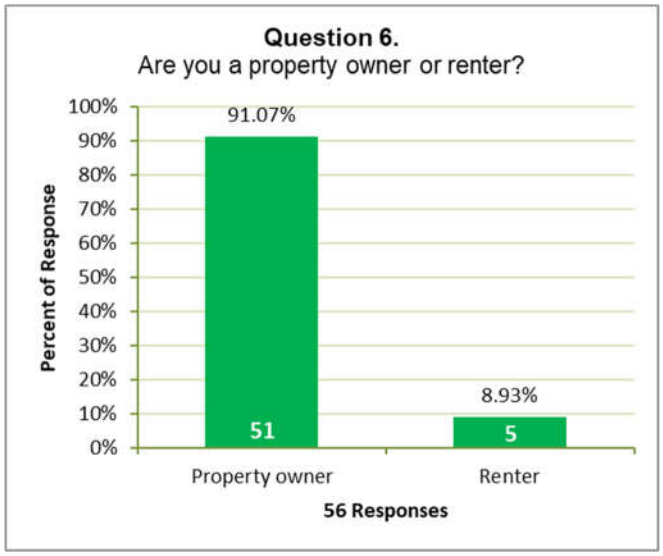
This survey included both quantitative and qualitative data. Respondents were asked closed-ended questions and invited to provide additional comments or descriptions for their answers. These additional or descriptive answers were qualitative, and therefore a qualitative approach was used to analyze them. The comments were analyzed to identify similarities that could be categorized into themes. Any responses that did not directly apply to the question at hand were assigned as 'not applicable'.

The following document provides the results of the survey and brief summaries of the answers for each question. Excluded questions include Questions 1 through 5, which requested consent for the participation in this survey, and therefore are not summarized in this report.

# Survey Results

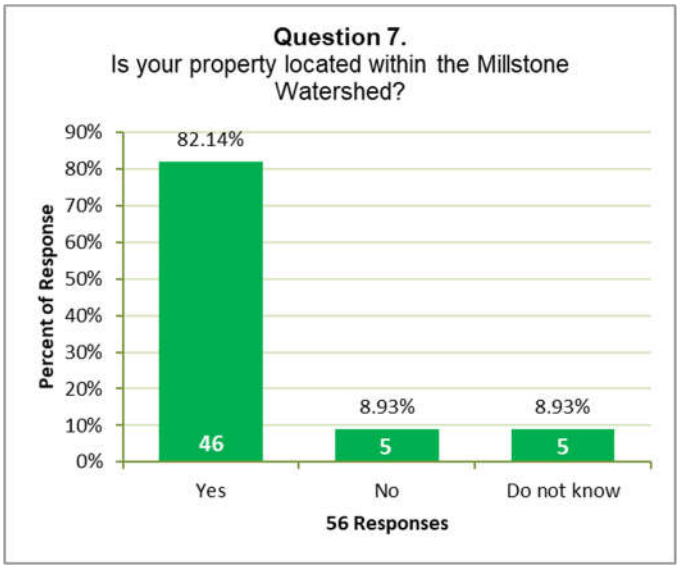
## Question 6: Are you a property owner or renter?

A total of 56 respondents answered this question and one person skipped it. Most respondents (51 or 91%) indicated that they are a property owner. Only 5 people (9%) indicated that they are renters.



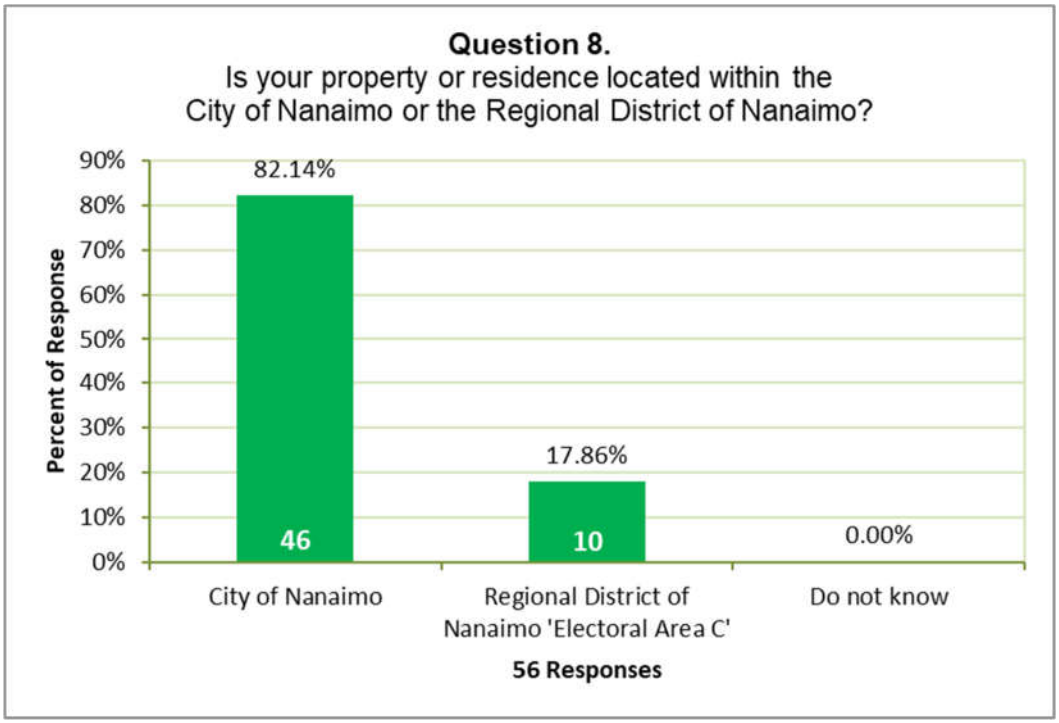

## Question 7: Is your property located within the Millstone Watershed?

A total of 56 respondents answered this question and one person skipped it. Out of the 56 answers to this question, 46 people (82%) said that their property is located within the Millstone Watershed and 5 people (9%) said that their property was not located within the Watershed. The remaining respondents, 5 people (9%), indicated that they did not know if their property was located within the Watershed.



## Question 8: Is your property or residence located within the City of Nanaimo or the Regional District of Nanaimo?

A total of 56 respondents answered this question and one person skipped it. Most respondents (46 people or 82%) live within the City of Nanaimo, while 10 people (18%) live in the Regional District of Nanaimo.

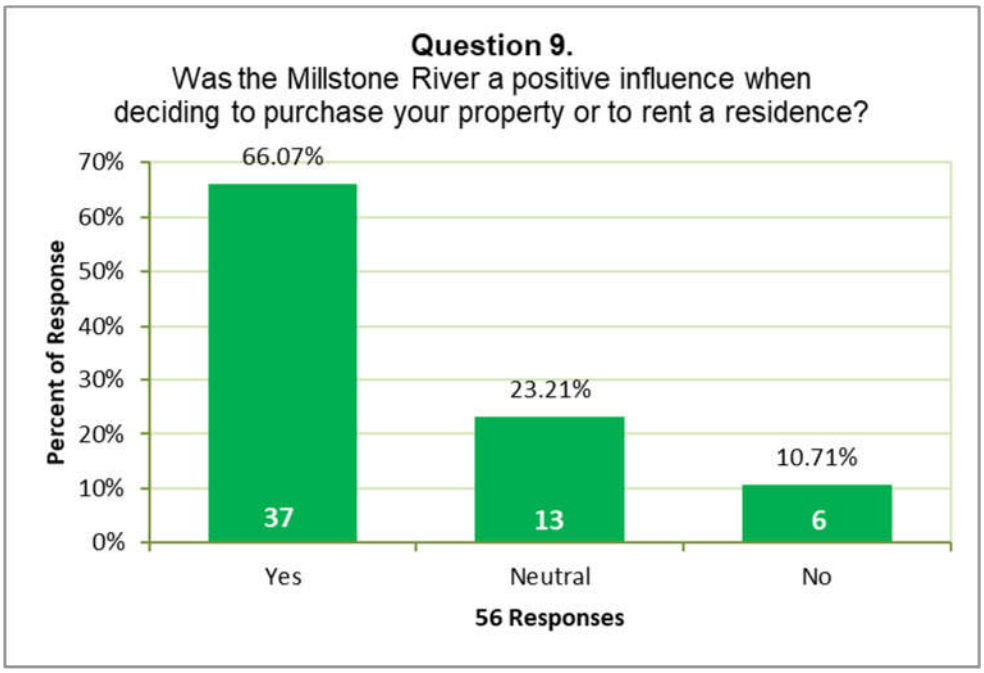



## Question 9: Was the Millstone River a positive influence when deciding to purchase your property or to rent a residence?

A total of 56 respondents answered this question and one person skipped it. Many respondents, 37 people (66%), answered "Yes" to this question. Whereas 6 people (11%) answered "No," and 13 people (23%) indicated "Neutral".

This question also had a comment section to allow participants to explain their response. Thirty people provided a written response, however, 13 of those responses were not applicable as they did not directly relate to the question. The remaining responses were categorized into two themes: "Proximity to nature" and "Primary influence". In summary:

- The most popular theme was the "Proximity to nature," as ten (10) people indicated that they chose to live near the Millstone River because it placed them near nature or green space; and
- Seven (7) responses were categorized under the theme "Primary influence". This theme included responses which mentioned that the Millstone River was one of the primary influences or the main reason they purchased their property.



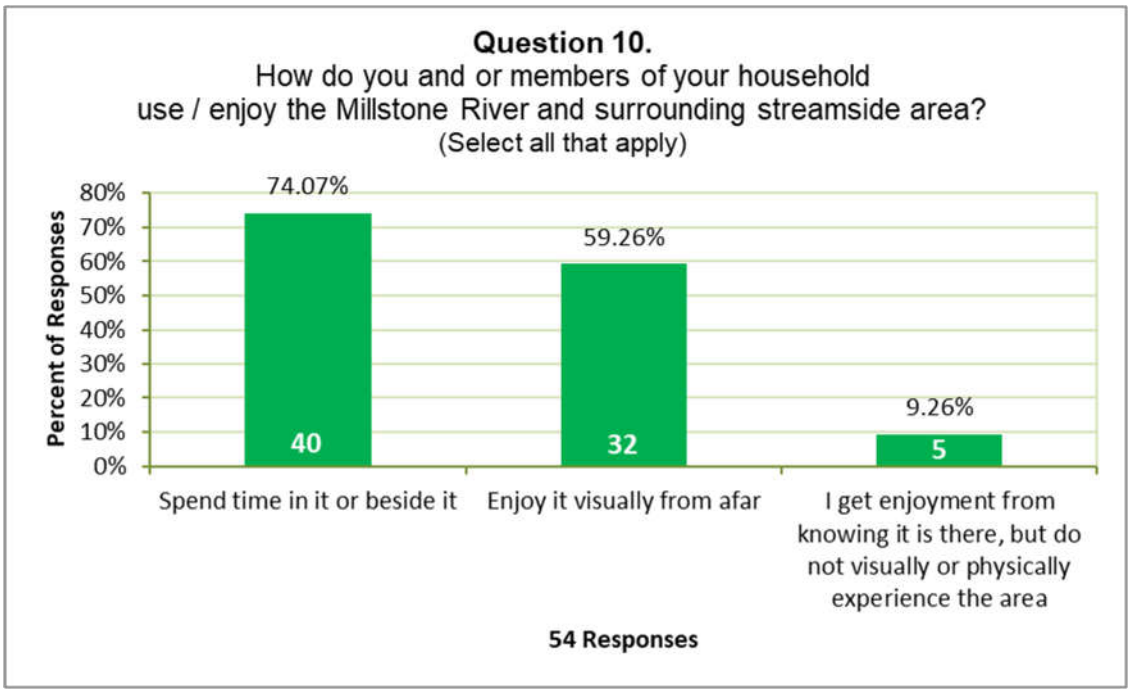

## Question 10: How do you and/or members of your household use/enjoy the Millstone River and surrounding streamside area?

A total of 54 respondents answered this question and three people skipped it. In summary:

- Most of the participants (40 respondents, or 74%) indicated that they enjoy/use the Millstone River by spending time in or beside it;
- 32 (59%) respondents mentioned that they enjoy the River visually from afar; and
- Only 9% (5) of participants indicated that they get enjoyment from knowing it is there without visually or physically experiencing the river.

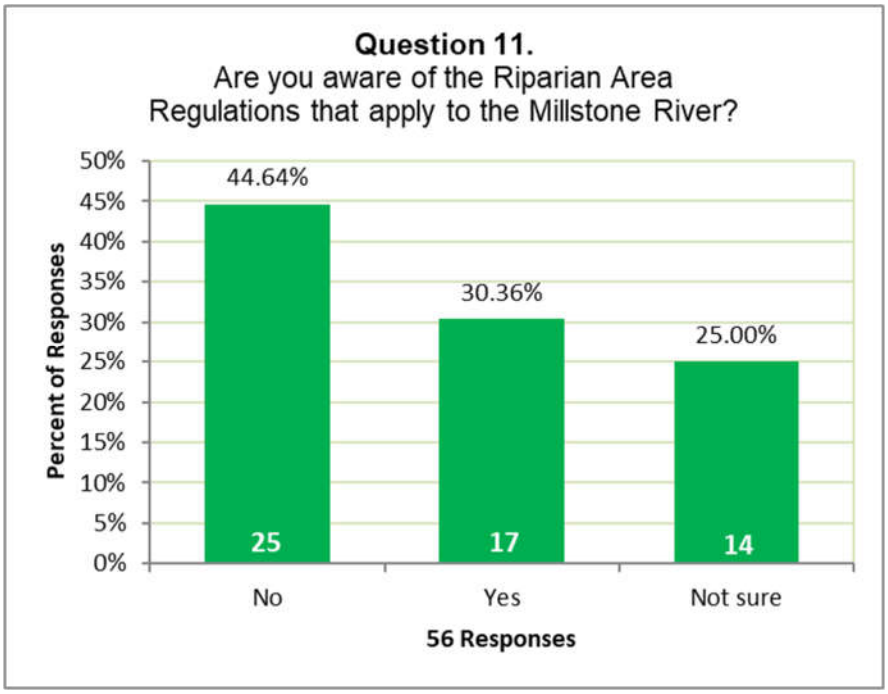
The respondents were offered an opportunity to provide additional comments, 31 people took this opportunity. However, four of those responses were not applicable as they did not relate directly to the question. The remaining responses were categorized into six themes: "Walking", "Bicycling", "Swimming", "Relaxing", "Watching wildlife", and "Picnicking". Overall, respondents engaged in walking more than other any of the other listed pursuits. In summary:

- Thirteen (13) participants said that they spend time walking along the river;
- The second most common activity was wildlife watching, with nine (9) respondents. Additionally, respondents in this theme mentioned that they enjoyed seeing the wildlife around the river, including the ducks, birds, fish, and beavers;
- Three (3) respondents mentioned "Picnicking", "Relaxing", and "Swimming" as preferred activities;
- The least common activity was biking, with only two (2) respondents mentioning that they biked along the river; and
- Many respondents enjoyed the river generally and their answers fell into more than one theme.




## Question 11: Are you aware of the Riparian Area Regulations that apply to the Millstone River?

A total of 56 respondents answered this question and one person skipped it. The responses were evenly distributed across the three possible responses of "Yes", "No", or "Not sure". The distribution was: 25 or 44% of respondents saying no, and 17 or 30% saying "Yes" - they were aware of the riparian area regulations. The remaining 14 (25%) respondents indicated they were "Not sure".



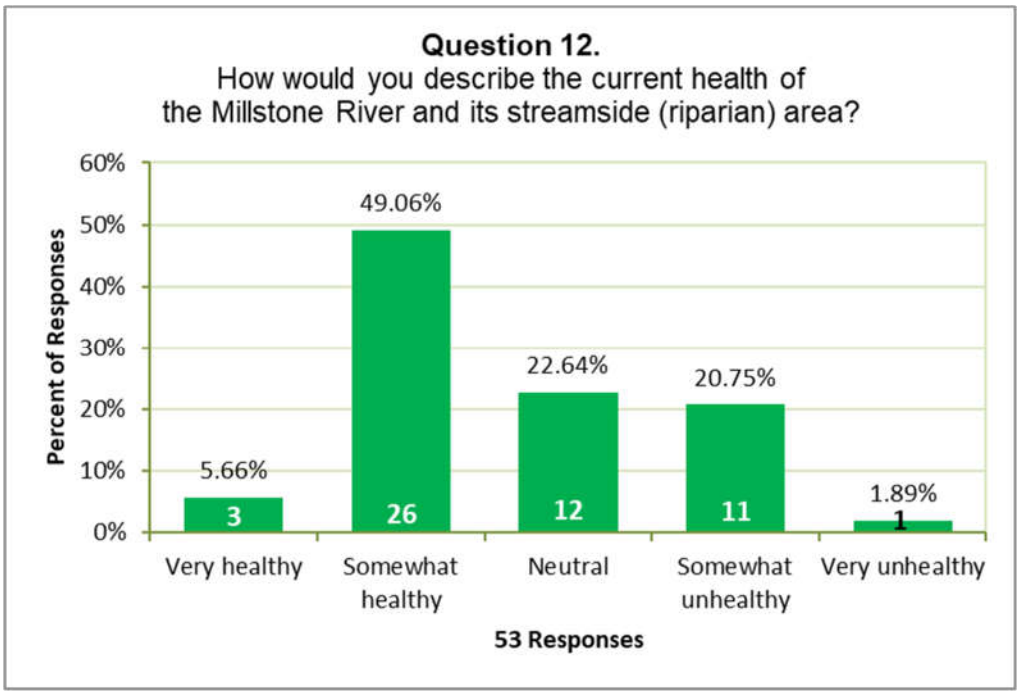
## Question 12: How would you describe the current health of the Millstone River and its streamside (riparian area)?

A total of 53 respondents answered this question and four people skipped it. Most participants (29 or 54%) described the Millstone River and its riparian area as either very healthy or somewhat healthy. In summary:

- Three (3) individuals described the area as very healthy, and 26 described it as somewhat healthy; and
- 26 people described the riparian area as either neutral (12 or 23%), or as either somewhat unhealthy or very unhealthy (12 or 23%). Of the unhealthy descriptions, 11 regarded the riparian area as somewhat unhealthy, and one (1) person described it as very unhealthy.

Additional comments related to the current health of the Millstone River included a total of 31 comments. Of these comments, nine were not applicable as they did not directly relate to the question. The remaining responses were categorized into seven themes, including: "Noticed Improvement", "Pollution", "Disturbances", "Healthy", "Beaver Damage", "Development Impacts", and "Less Fish". In summary:

- The most common comment on the riparian areas current health concerned pollution, including garbage and debris being sighted in the Millstone River or the riparian area, as well as doubts about water quality and clarity due to runoff;
- Comments about beaver damage was second, with five (5) responses mentioning beavers dropping trees or beaver dams contributing to high water levels;
- Both the "Noticed Improvement" and "Disturbances" themes had four (4) comments respectively, commenting on improvements in water flows and efforts in plantings around the riparian area, as well as disturbances from debris causing jams along the river;
- Three (3) participants described the riparian area as healthy, commenting on the riparian area experiencing good growth seasons; and
- Lastly, "Development Impacts" and "Less Fish" tied for the least number of comments with two (2) each, respectively.
    - Comments on development impacts included cited subdivision drainage feeding into pre-existing ditch drainage and differences in standards on riparian areas found on private property, as well as impacts from water diversions from past subdivision and road development. The two comments related to less fish discussed impacts to fish habitat within the Millstone River.



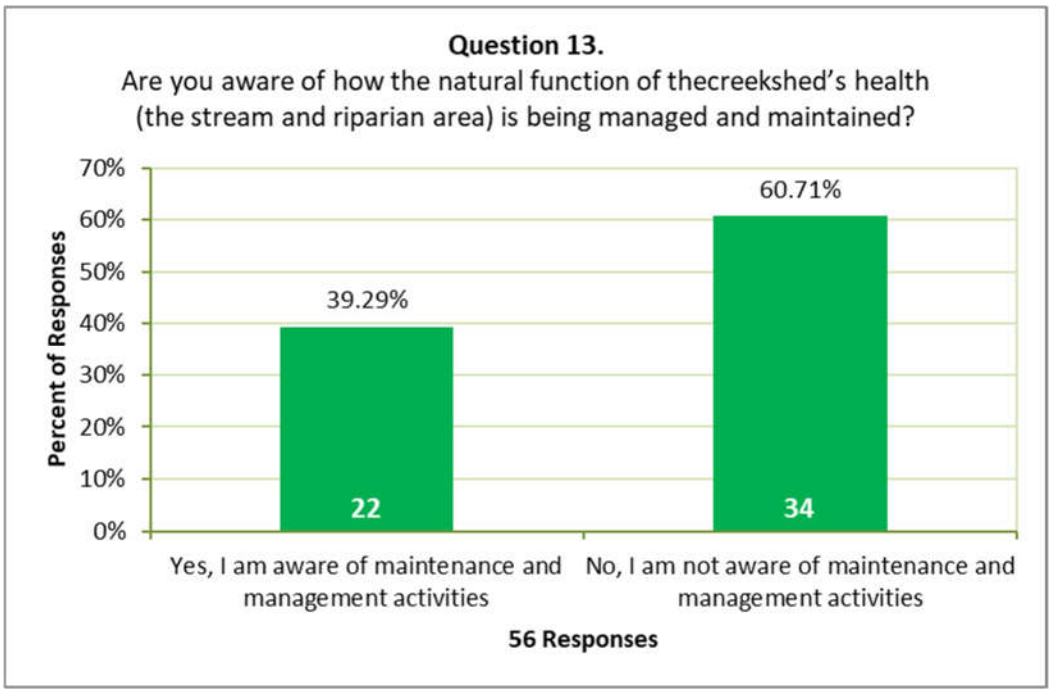

## Question 13: Are you aware of how the natural function of the creekshed's health (the stream and riparian area) is being managed and maintained? (such as removal of invasive plants, planting native species, monitoring water quality, research, park land activities, etc.)?

A total of 56 people responded to this question, with one person opting to skip responding. Of the responses, 22 (39%) said they are aware of management and maintenance on the Millstone River, and 34 (61%) said they are not aware of how the natural functions of the creekshed health is being maintained and managed.

From the responses, 26 people made an additional 34 comments, which have been organized into the following seven themes: "Noticed Results", "Noticed Minimal or No Activity", "Removal of Trees and Invasive Species", "Would like to Know More", "Participated in Activities", "Don't Know All the Details", and "Activities for Fish Population". Four of the total 34 comments were excluded due to not being applicable to the question's topic.

In summary:

- The two most common comments were related to noticing a minimal amount of activity and not knowing all the details, which received a total of 11 and 10 comments, respectively. These comments discuss seeing workers in the riparian area completing work but being unaware of what the work is related to, as well as desires for more information on project work being completed in both the Regional District of Nanaimo and the City of Nanaimo on the Millstone River;
- The next four themes each have two (2) comments, and includes the "Noticed Results", "Removal of Trees and Invasive Species", "Would like to Know More", and "Participated in Activities" themes. These comments discuss how activities are being seen happening around the Millstone River to maintain creekshed health, with some participants assisting with these activities, with the most commented on activity being noticed including removal of invasive species. Respondents desired more information on these activities; and
- Lastly, there was a single (1) comment on improvements made to help maintain health of fish habitat, specifically mentioning the salmon ladder in Bowen Park.



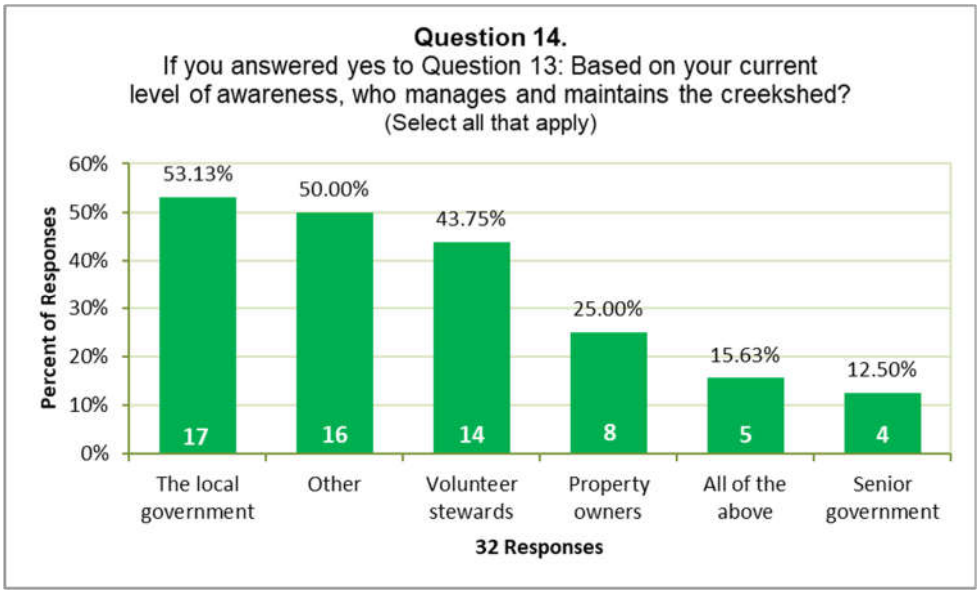
## Question 14: If you answered yes to Question 13: Based on your current level of awareness, who manages and maintains the creekshed?

A total of 32 people responded to this question, with 25 people skipping it. This question was only applicable to respondents who replied that they were aware of maintenance and management activities in the previous question. For this question multiple options were able to be selected. In summary:

- "Senior Government" was selected four (4) times (or 13% of respondents selected this option);
- "All of the above" was selected five (5) times (or 16% of respondents selected this option);
- "Property Owners" was selected eight (8) times (or 25% of respondents selected this option).
- "Volunteer Stewards" was selected 14 times (or 44% of respondents selected this option);
- "Local Government" was selected the most at a total of 17 times (or 53% of respondents selected this option); and
- A total of 16 people also responded with "Other". Several of the responses in the "Other" category were categorized as not applicable as they only listed an answer that was already provided in the multiple-choice part. For example, some respondents indicated that property owners or the local government manages the area, which were already provided as answer options for the question.

Of the additional "Other" responses, nine (9) of the total of 16 responses fell under the not applicable category. The remaining responses were categorized into the following themes: "Not Sure", "Ducks Unlimited", "No one", "VIU Students", and "Would like to know more". In summary:

- The most responses for "Other" was the "No one" category, totalling three (3) responses commenting on a lack of management in the creekshed by any local government bodies; and
- The remaining categories all received a single (1) comment, including one respondent who was unsure of who manages or maintains the area, one who acknowledged work completed by Ducks Unlimited, and another acknowledging efforts by VIU students, as well as a final comment requesting information on who manages the creekshed.

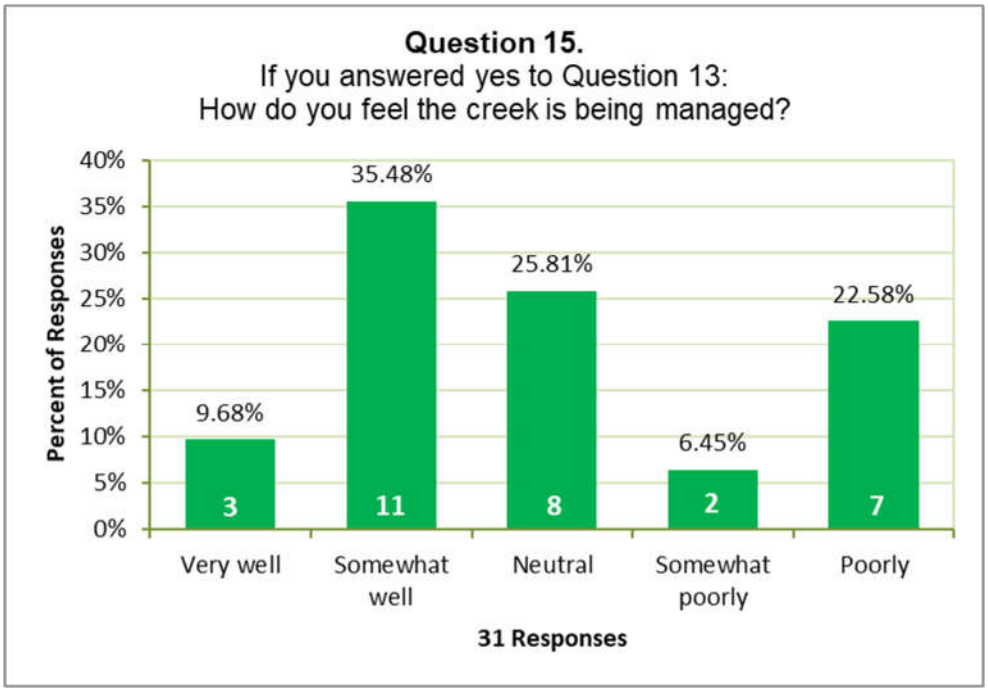


## Question 15: If you answered yes to Question 13: How do you feel the creek is being managed?

A total of 31 people responded to this question and 26 people skipped it. Like question 14, this question was also only applicable to respondents who replied that they were aware of maintenance and management activities in the previous question. In summary:

- Most often respondents selected the "Somewhat well" option (11 or 35% of the responses) regarding how well the creek is being managed;
- Eight (8) respondents were "Neutral" - (26%) of the total responses; and
- A total of seven (7) participants responded "Poorly" (or 23%), three (10%) responded "Very well" and two (6%) responded "Somewhat poor".

Overall, the responses suggest that the participants feel the creek is being managed either well, very well, or are neutral about the management, with these responses making up 71% of the responses. For respondents feeling the creek is being managed either somewhat poorly, or poorly, these responses make up 29% of the total responses, with most in this category falling in the "Poorly" response.

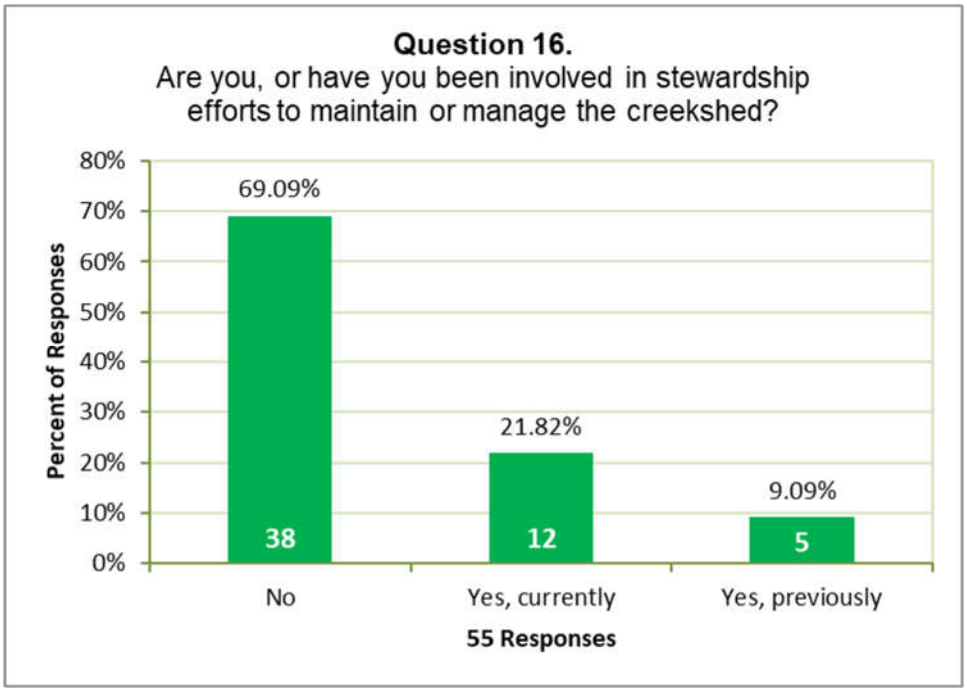


## Question 16: Are you, or have you been involved in stewardship efforts to maintain or manage the creekshed?

A total of 55 people responded to this question and two people skipped it. The option with the most responses regarding personal involvement in stewardship efforts to maintain or manage the creekshed was "No," with a total of 38 (69%) responses. The second highest response was "Yes, currently" with 12 (22%) of responses. Lastly, "Yes, previously" was selected by five (9%) of respondents.

Additional comments were made by 18 participants in order to describe what specific stewardship groups and/or efforts they have participated in. These responses were categorized into eight separate themes, including: "Involved in Stewardship Groups", "Planted Trees", "Litter Removal", "Maintain Natural Ecosystems", "Conscious Land Ownership", "Removal of Trees and Invasive Species", "Public Awareness", and "Removal of Beaver Dams". Of these responses, one has been removed due to it being not applicable to the question. In summary:

- The "Involved in Stewardship Groups" category has the most responses at five (5) separate comments, ranging from participating in the Island Waters Fly Fishers group, to the Hub City Streamkeepers group, and additional responses mentioning water sampling multiple sites per year;
- "Litter Removal," with four (4) responses, is the next response with the most comments, with individuals discussing contributing to Bowen Park cleanups and removing litter from their own property or along the Millstone River;
- "Removal of Trees and Invasive Species" and "Maintain Natural Ecosystems" both obtained three (3) comments, including managing riparian areas on their property and removing invasive species like English Ivy;
- "Removal of Beaver Dams" and "Planted Trees" each received two (2) responses, with mentions of planting trees on personal property along the riparian area, as well as removal of beaver dams after permission was received from the City of Nanaimo; and
- Lastly, "Conscious Land Ownership" and "Public Awareness" received one (1) comment each and included a comment on avoiding use of poisons and maintaining a well on their property. Regarding public awareness, one individual mentioned participating in community and environmental group presentations and events.

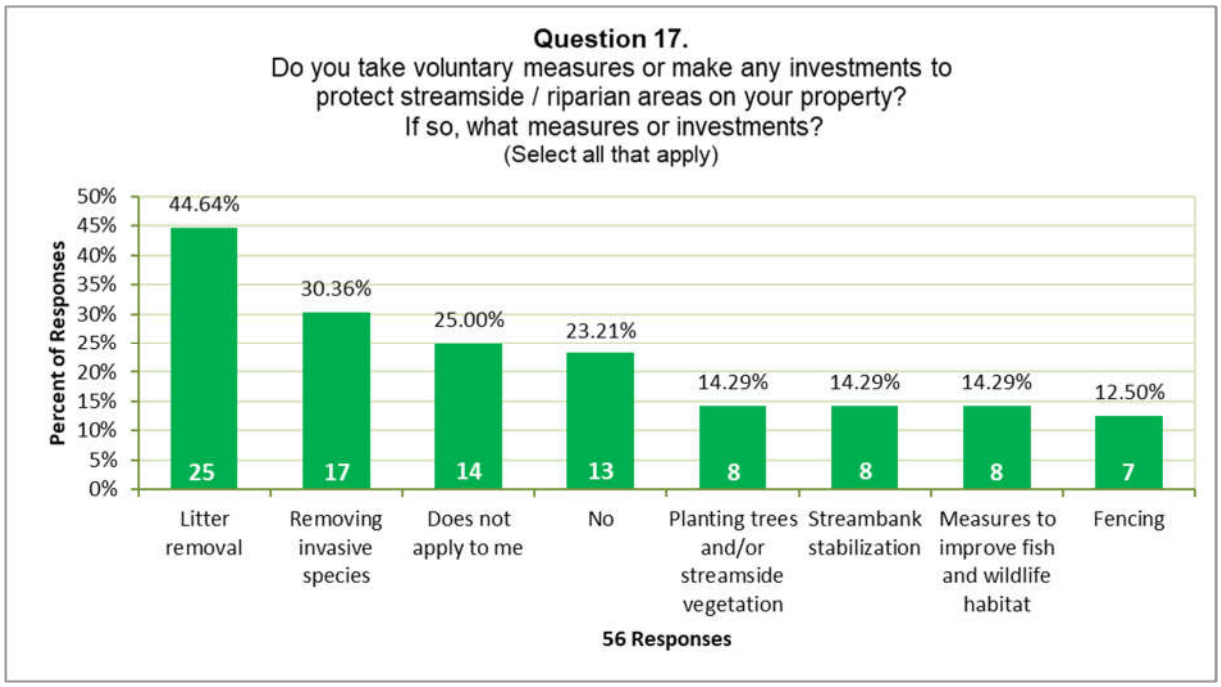



## Question 17: Do you take voluntary measures or make any investments to protect streamside/riparian areas on your property? If so, what measures or investments?

A total of 56 people responded to this question and one person skipped it. Out of these responses 13 (23%) of respondents indicated that they did not take any voluntary measures or make investments to protect the streamside/riparian areas on their properties. Similarly, 14 (25%) of the participants selected the "does not apply to me" answer. The rest of the respondents provided answers on how they take measures or investments to protect the area. The mentioned activities are:

- Litter removal - the most common activity engaged in to protect the streamside or riparian area; 25 (or 45%) of respondents stated they engage in litter removal;
- The second most common activity was removing invasive species with 17 people (30%);
- Planting trees and/or streamside vegetation, streambank stabilization, and measures to improve fish and wildlife habitat, all had a total of eight (8) people (14%) indicate they engaged in those activities; and
- Finally, seven (7) people (13%) indicated that fencing was the method they used to protect the streamside/riparian area.

Respondents were also provided with the opportunity to provide additional comments. Several additional comments reaffirmed the participants involvement in the listed activities from the question. For example, one participant mentioned allowing natural species to repopulate the area around their boardwalk and dock. Another participant mentioned how they remove garbage on a weekly basis. Other respondents mentioned that they are interested in stewardship groups and/or have assisted with volunteer initiatives, such as the Bowen Park By-Pass Channel. Another respondent mentioned that they inform people to keep their dogs on leash.




## Question 18: Please describe (identify) any social, ecological, or financial values that you feel the Millstone River provides for the community:

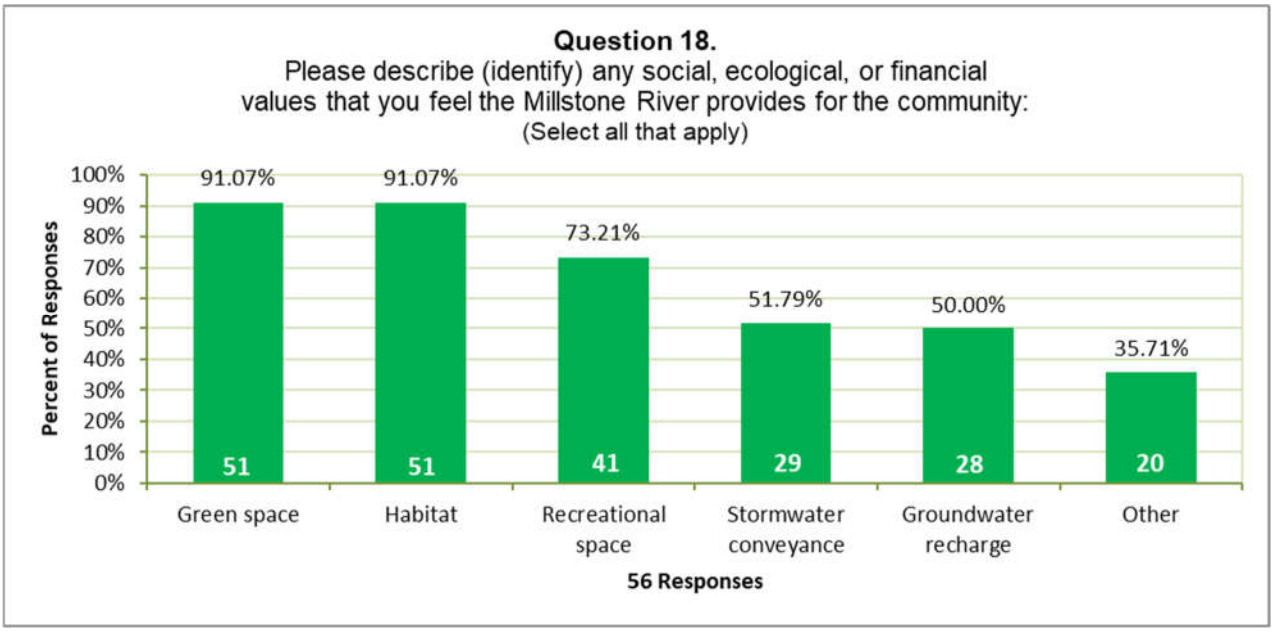
A total of 56 people responded to this question and one person skipped it. For this question, multiple options were able to be selected. Of the 56 people responding to this question:

- 51 (91%) responded with "Green Space" as a value they describe the Millstone River as providing for the community;
- "Habitat" was selected by 51 (91%) of the 56 people;
- "Recreational Space" was the next most selected response, with 41 (73%) of the 56 responses including this choice; and
- "Groundwater Recharge" and "Stormwater Conveyance" received 28 (50%) and 29 (52%) selections from the 56 participants, respectively.

Lastly, 20 participants opted to describe additional values they found the Millstone River provides the community. This resulted in a total of 20 categorized comments, five of which were not applicable to the question. These responses were categorized into seven different themes, "All of the Above", "Nature Corridors", "Tourism", "Education", "Supports a Healthy Environment", "Supports Biodiversity and Species", and "Limits Development".

In summary additional comments were:

- The category with the most responses was the "Supports Biodiversity and Species" theme, which included six (6) responses such as the river providing salmon habitat and other wildlife species.
- The next largest category was "Tourism" with three (3) responses, including comments on the Millstone River providing a tourist space throughout Bowen Park, with specific mentions to the informational signs found throughout the park, and relations of the Millstone River Valley's species to those found in the Mount Arrowsmith Biosphere Region.
- The categories for "Limits Development", "Supports a Healthy Environment", "Education", and "Nature Corridors" all received the same number of responses at two (2) responses each. These responses included these comments:
    - Bowen Park is used as an educational space with information about habitat found along the Millstone River;
    - The Millstone River provides a natural white noise setting within the City and improving air quality with its riparian zone;
    - Stream setbacks limit higher density areas to preserve natural lands and riparian areas around the river;
    - Stream setbacks provide nature corridors for local wildlife, including fish and birds, and lastly;
    - One (1) participant made a comment saying they value "All of the Above" options from the original question, making a point to stress what values they believe the Millstone River provides for the community.



# Survey Comparisons

## Comparison of the Millstone River EAP Survey and the Shelly Creek EAP Survey

In 2019, The Partnership for Water Sustainability in B.C. and the Mount Arrowsmith Biosphere Region Research Institute collaborated on an additional Ecological Accounting Process (EAP) project on Shelly Creek within the Regional District of Nanaimo and the City of Parksville on Vancouver Island. During this project, a survey was conducted by interviewing homeowners door-to-door during the summer of 2019. These results have been compared with the results from the combined mail-out and online survey conducted for the Millstone River EAP project conducted in the winter of 2020.

### Influence on Property Selection

The first comparison between the Shelly Survey and the Millstone Survey are responses to influences participants felt the creekshed had on their decision owning property near or adjacent to the streams or not. Most respondents in each survey responded with yes to the creeksheds being an influence on their decision. A total of 83% of respondents in Shelly, and 66% in the Millstone survey responded with a yes, with an additional 23% responding with a neutral influence response in the Millstone survey.

This left a remaining 17% of participants in the Shelly survey saying they were not influenced by Shelly Creek when moving to their property, and 11% or participants in the Millstone survey said no to being influenced by the Millstone River. Comments on this influence was also similar between the two studies, with comments for both relating to positive perceptions on being located close to a quiet natural area, the privateness of having property near a riparian area that will not be developed, and lastly, being close to areas where wildlife can be found.

### Use of the Creekshed

Comparing the use of the creekshed between Shelly and the Millstone River, there were also similarities in responses between the two surveys. Walking or hiking along the creek or river was one of the most commented on uses of the creek, as well as other activities either alongside or next to the creeksheds. From the Shelly survey, 87% of participants mentioned participating in activities within the creekshed, whereas in the Millstone River survey, 74% of participants said they spent time either in the creekshed or beside it.

In both surveys, there were several participants that responded to participating in maintenance efforts such as stream keeping work, as well as helping keep the stream clean from littering. There were some comments made in the Millstone survey that did not appear in the Shelly survey, which included wildlife viewing, however both had participants mentioning fishing as one activity they participate in within the creeksheds. Lastly, 12% of participants in the Shelly survey said they made no use of the creekshed, whereas 9% of respondents in the Millstone survey said they do not visually or physically experience the creekshed.

### Valuation of the Creekshed

Regarding how the creekshed is valued, the top values for the creekshed mentioned during the Shelly survey were:

- **Aesthetics**: 21% of respondents;
- **Ecological Services**: 17% of respondents; and thirdly
- **Space for Activities:** 10% of respondents.

The Millstone River survey showed that 91% of respondents valued the creekshed for both green space and habitat, followed by recreational space at 73% of respondents selecting this option.

Additional comments on both surveys mentioned the habitat value the creekshed provides, as well as its educational and tourism potentials. Both surveys also have participants discussing valuing the quietness and privateness the creekshed provides due to limiting development around properties adjacent to the creek.

### Creekshed Management and Maintenance

In both the Shelly survey and Millstone survey, some participants shared that they do not know of any specific maintenance or management activities taking place in the creekshed. For example, a participant in the Shelly creekshed mentioned they are aware of management taking place in the creekshed, but not by who, or what was being done specifically. This sentiment is also shared in the Millstone survey, with both surveys receiving responses requesting additional information be provided to the community on management and maintenance efforts taking place within each respective creekshed, as well as expressing interest in opportunities for public involvement. In contrast to the Millstone survey responses listing the local government and volunteers as the groups that respondents are aware of that are maintaining the creekshed, the Shelly survey respondents mainly discussed volunteers and local biologists as groups participating in management of the creekshed.

### Personal Involvement in Maintenance or Management of the Creekshed

Lastly, regarding personal involvement in efforts to maintain or manage the creekshed, both the Shelly survey and Millstone survey found that the majority of respondents are not involved in direct stewardship efforts, with 63% of respondents in the Shelly survey and 69% of respondents in the Millstone survey sharing this response. However, additional comments in the Shelly survey highlighted how some participants maintain the creekshed independently on their own property, despite not participating in group volunteer efforts. This sentiment was also shared in the Millstone survey, where comments were also made expressing a desire to see more funding opportunities for maintenance and management of the riparian area along the Millstone River.

## Additional Surveys

The references listed below provide additional views of residents living in the Regional District of Nanaimo and the local municipalities. The surveys include information about residents' values concerning natural assets. An analysis of these surveys suggests the residents of Nanaimo and the Regional District of Nanaimo have an understanding and appreciation for our watersheds and parks.

For example, 104 residents participated in the RDN Drinking Water Watershed Protection Program public survey, and when asked how they would define a watershed, most residents were able to answer in some form what a watershed was (Metroline Research Group, 2019). Similarly, when asked what watershed they currently lived in, 83% were able to identify it correctly (Metroline Research Group, 2019). Participants were also asked to identify the top environmental issues facing our area, and 56% responded with availability and level of water (Metroline Research Group, 2019).

For the City of Nanaimo Master Plan Update, a public survey was conducted to gain a better understanding of residents' opinions on future parks and recreational services. When participants were asked if their households benefit from parks and recreational services, 62% agreed (City of Nanaimo, 2016). Similarly, participants were asked if parks and recreational services benefit the community and 89% agreed, indicating the importance of parks in Nanaimo (City of Nanaimo, 2016).

A list of the surveys is as follows:


City of Nanaimo (2016). *City of Nanaimo Strategic Plan Update 2016-2019*. Retrieved from https://www.nanaimo.ca/docs/your-government/city-council/initiatives/strategicplan_2016-2019.pdf.

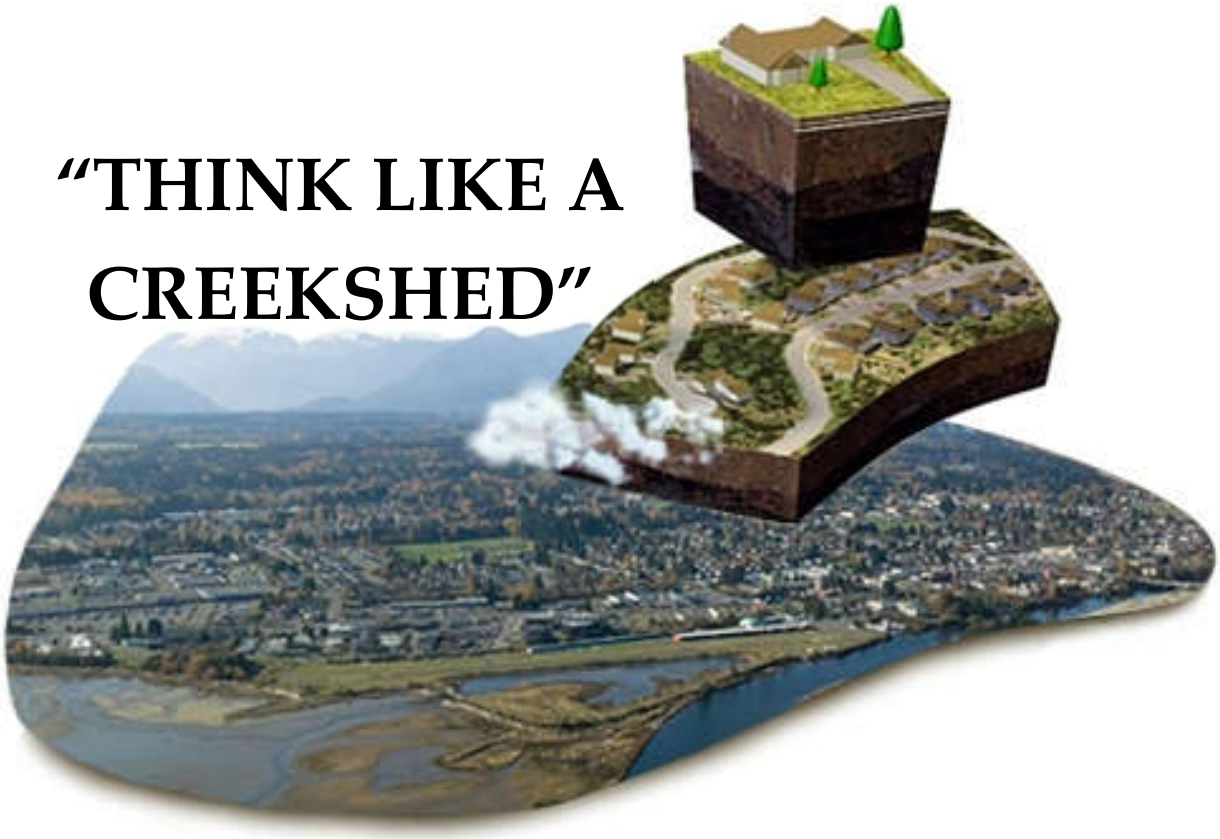
City of Nanaimo (2005, February). *City of Nanaimo Parks, Recreation, and Culture Master Plan Public Survey Information*, (25). Retrieved from https://www.nanaimo.ca/docs/default-document-library/master-plan-report.pdf.

Metroline Research Group (2019, June 27). *RDN Drinking Water Watershed Protection Program Update Public Survey*. Retrieved from https://www.getinvolved.rdn.ca/7834/widgets/29517/documents/17679/download.

Regional District of Nanaimo (2019). *RDN Parks and Trails Strategy Public Survey*. Retrieved from https://www.getinvolved.rdn.ca/rdnparkstrails

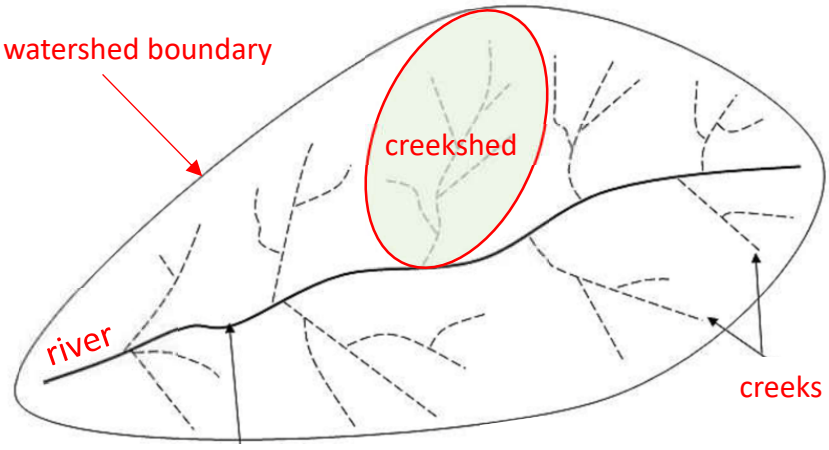
This page left blank intentionally

# "THINK LIKE A CREEKSHED"



## A creekshed is an integrated system:

The need to protect headwater streams and groundwater resources in BC requires that communities expand their view - from one that looks at a site in isolation - to one that considers HOW all sites, the creekshed landscape, streams and foreshores, groundwater aquifers…and PEOPLE….function as a **whole system**.



the partnership
for water sustainability in bc