the partnership
for water sustainability in bc

Ecological Accounting Process Initiative

Application of EAP, the *Ecological Accounting Process*, to Shelly Creek for Financial Valuation of Ecological Services and Worth

Opportunities to Enhance and Restore the Shelly Creek Natural Commons on Vancouver Island

FEBRUARY 2020

Note to Reader:

Under the umbrella of the Georgia Basin Inter-Regional Education Initiative, this publication is the 4th in a series about demonstration applications for the *"Ecological Accounting Process (EAP) - 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.

To download a PDF copy of this Shelly Creek EAP Demonstration Application, 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 the following link:

https://waterbucket.ca/gi/wp-content/uploads/sites/6/2020/03/Shelly-Creek-in-Parksville_Report-on-EAP-Application_as-posted.pdf

ACKNOWLEDGMENTS: This EAP Demonstration Application was undertaken in collaboration with the Mid Vancouver Island Habitat Enhancement Society (MVIHES); and was jointly funded by UBCM, the provincial government, and the Partnership for Water Sustainability in BC.

UBCM funding was provided through the Asset Management Planning Grant Program, which is largely funded by the BC Ministry of Municipal Affairs & Housing. UBCM and Ministry financial support is gratefully acknowledged.

The Partnership also gratefully acknowledges the material support provided by the Mount Arrowsmith Biosphere Region Research Institute and the Master of Community Planning Program at Vancouver Island University. They made it possible to involve three graduate students (Ariel Verhoeks, Sarah Holden and Casandra Twiname) in undertaking applied research.

In addition, the Partnership is especially appreciative of the timely contributions by Julie Pisani, Regional District of Nanaimo, at various points in the research process; and in particular, during final editing.

Shelly Creek Natural Commons

What the Reader Will Learn

The Ecological Accounting Process (EAP) considers use and conservation of land to be equally important values. Historically, land use and property development in our communities have been given priority over ecological systems such as streams. Too often the result has been remnant ecological services that fall far short of the benefits that these natural commons can provide.

This study of Shelly Creek addresses the condition of a typical 1st order stream on the east coast of Vancouver Island. Some notable conclusions emerged.

One non-regulatory and two non-governmental initiatives lead current study and community interest in Shelly Creekshed as an ecological system and a natural commons. Their work assists local government to consider the entire creekshed. Local government may set policy and codify land use regulations, but its' work must respond to proposals for subdivision and/or development of specific parcels or sites. The three community agencies address the stream, riparian ecosystem and creekshed.

As a result of alterations to the hydrology of the creekshed, the Shelly Creek 'riparian ecosystem' has been reduced to a number of 'riparian zones' as defined in regulations.

The research findings suggest that the diminution of stream functions gradually will draw the attention of property owners and the community to the "no harm" rule in land appraisal. *To over simplify, in the case of a stream (natural commons) adjacent property owners expect its ecological services to have a positive effect on parcel values. The community may rely on the stream system being in good functioning condition as a feature in parks, a natural area, etc. Adjacent property owners have an obligation to recognize these values and avoid activities on their property that might harm the stream and have a negative impact on parcel values.*

Tim Pringle, Chair
Ecological Accounting Process (EAP) Initiative
February 2020

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

Georgia Basin Inter-Regional Educational Initiative (IREI):

The Partnership for Water Sustainability in British Columbia gratefully acknowledges the ongoing financial support of the Province of British Columbia through the Ministry of Municipal Affairs and Housing

The Partnership also gratefully acknowledges the Board Resolutions of support by our regional district partners for the *Georgia Basin Inter-Regional Education Initiative*.

BRITISH COLUMBIA

Supported by the Province of British Columbia

Educational Goal: Provide local governments with tools and understanding that will help them to implement the whole-system, water balance approach branded as ***Sustainable Watershed Systems, through Asset Management***.

Mandate: Provide a mechanism for local governments to collaborate across boundaries and cross-pollinate their experience; as well as undertake demonstration applications that test, refine and mainstream new ideas and approaches.

Program Focus: Streams in the built environment, and 1st order tributaries, defined as 'creeksheds'.

Regional Districts supporting the IREI

CVRD

Comox Valley Regional District

Regional District of Nanaimo

CRD

Making a difference...together

METRO VANCOUVER

About the Partnership for Water Sustainability

The Partnership for Water Sustainability in BC is a non-profit society that delivers services in collaboration with government. It originated as an inter-governmental partnership, formed in 2002 to fund and develop the Water Balance Model as a web-based decision support tool.

When the **Water Sustainability Action Plan for British Columbia** *(Action Plan) was released in 2004, the Water Balance Model for BC was the centrepiece initiative. Action Plan experience informed development of* **Living Water Smart, British Columbia's Water Plan***, released in 2008, as well as the parallel* **Green Communities Initiative***.*

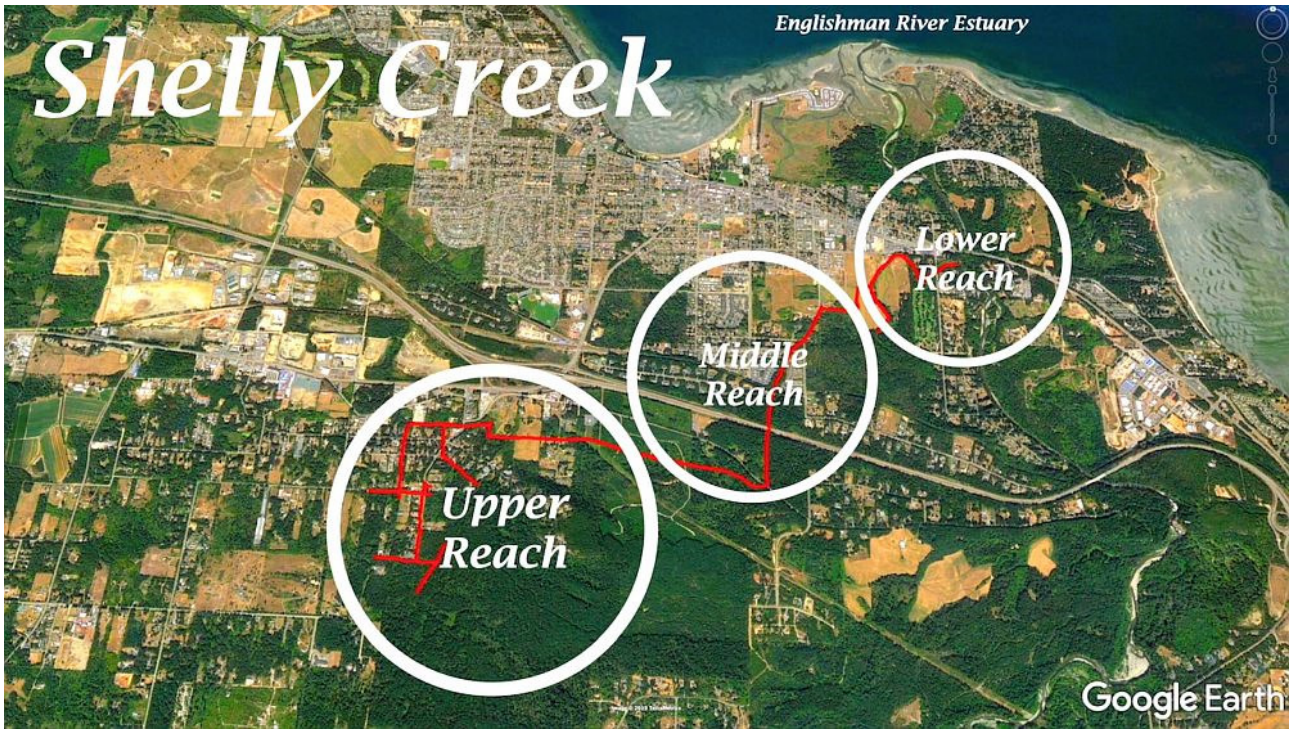
The Partnership for Water Sustainability embraces shared responsibility. It is the hub for a "convening for action" network in the local government setting, and delivers Action Plan initiatives and programs such as the IREI through partnerships and collaboration.

The Partnership for Water Sustainability plays a bridging role among the provincial government, local government and community stewardship sectors. As steward for **Stormwater Planning: A Guidebook for British Columbia***, released in 2002, the Partnership builds on this foundation document through the Beyond the Guidebook initiative.*

Shelly Creek as a Natural Commons – An Overview

The Collaborators: The Partnership for Water Sustainability in British Columbia (PWSBC), Mid Vancouver Island Habitat Enhancement Society (MVIHES), Mount Arrowsmith Biosphere Reserve Research Institute (MABRRI), and Regional District of Nanaimo *Drinking Water & Watershed Protection* program (DWWP) collaborated to apply the Ecological Accounting Process (EAP) to Shelly Creek.

The stream, which lies in the Regional District of Nanaimo and the City of Parksville, is a short tributary of the Englishman River, a watershed in the Nanaimo Lowland Eco-region.



The Opportunity: Shelly Creek presents an opportunity to delve into the community's growing appreciation of the worth of this small (1st order) stream. The EAP analyses investigate the understanding that the community (property owners, residents, local government, NGOs and others) have of the stream as a natural commons.

Does awareness of the stream as a natural commons lead to taking action to protect it? Moreover, do purchasers and owners of residential parcels near the stream think that it provides positive influence on property values and other benefits?

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A Stream is an Ecosystem: Throughout this report, the "stream" is an ecosystem of portion thereof as defined in the *Riparian Areas Protection Regulation Act* (BC Regulation 178, 2019). The report uses the definitions of "riparian area" and "stream side protection and enhancement area" as defined in Division 1, Sections 8 & 9 of the Riparian Area Regulations (RAR) set out in the Act.

Valuation of Ecological Services: A stream is an ecological system. A common history of land uses on Vancouver Island and other BC regions illustrates how stream systems have been altered in urbanizing areas and settled rural landscapes. **Over decades of disturbance, riparian ecosystems have become reduced to riparian zones shown on the maps of today**.

Riparian Ecosystem Defined	Riparian Zone Defined
A riparian ecosystem is a natural stream where rainfall is intercepted in upland and wetland areas, detained by vegetation and soils, infiltrated through surface and sub-soils, gradually moving to the stream and to ground water. The entire creekshed forms the ecological system.	A riparian zone occurs in developed areas where land uses have reduced the stream to a nominal width plus the regulated setback (usually 15 metres) on each side. The wider riparian area may or may not exist.

EAP presents a study of this diminution as a loss of ecological services that such natural commons provide for nature as well as for residents, property owners and others in the community.

The analyses also describe the actions that intervenors undertake to improve **'maintenance and management'** (M&M) of streams systems and riparian zones. EAP defines maintenance as *preventing degradation*; and management means *enhancement*.

Worth of the Creekshed: The concept of worth refers to the uses the community draws from the creekshed. This perspective leads to a fuller understanding of the social, ecological and financial values associated with those uses.

The stream does more than provide services to the community. It is part of the hydrology of the creekshed. In proper functioning condition the stream underpins intrinsic natural services such as environments for aquatic and terrestrial life.

Channel in the Middle Reach of Shelly Creek

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Three Categories of Commons: Communities rely on **natural, constructed** and **institutional** commons for services that support quality of life and property enjoyment.

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

Wetland in the Lower Reach of Shelly Creek

Regional Fisheries Context: Map 1 provides a 'watershed context' for this EAP demonstration application. Shelly Creek is one of five streams tributary to the Englishman River, a major watershed system on the east coast of Vancouver Island.

Shelly Creek plays an important role in sustaining healthy salmonid populations because it provides habitat for spawning, rearing and overwintering. It is the City of Parksville's last fish-bearing stream.

In 1999 the Englishman River was first declared to be one of the most endangered rivers in BC. Extinction of the fisheries resource was viewed as a very real possibility.

This was the catalyst for action. It resulted in two transformational outcomes: implementation of the **Englishman River Watershed Recovery Plan** (2001); and creation of **MVIHES** (Mid Vancouver Island Habitat Enhancement Society).

Over time, MVIHES has morphed from *Stewards of the Plan* to *Stewards of the Watershed*. Since 2011, the MVIHES action plan has concentrated on Shelly Creek.

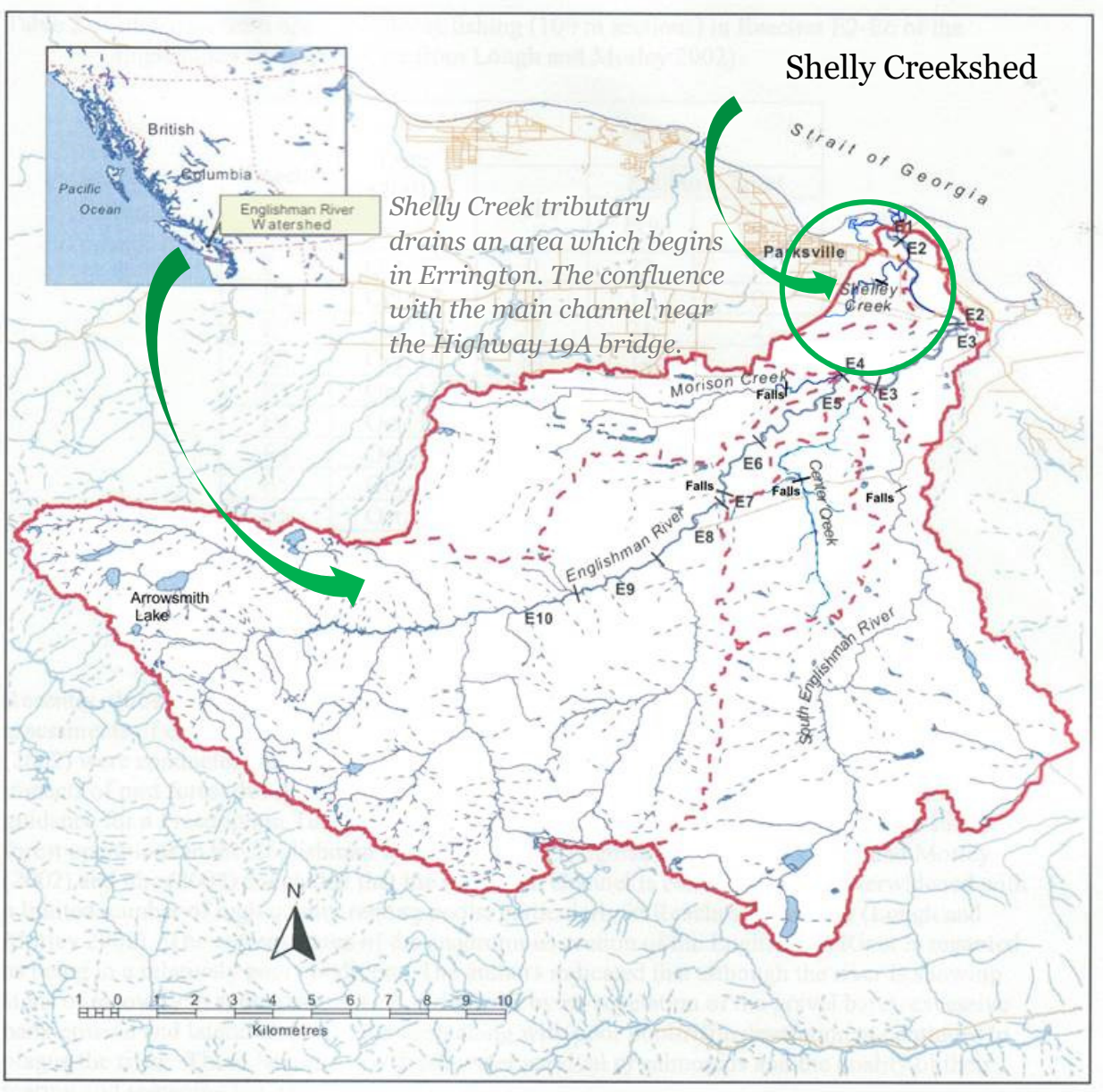
Leadership and Initiative: The MVIHES mission is to connect people to their landscape through education. Public events raise the level of awareness. MVIHES experience demonstrates that positive outcomes are a result of strong community support for protection of small streams and their tributaries.

In 2016-2017, for example, MVIHES demonstrated bottom-up leadership and established a provincially significant precedent when it took the initiative to secure funding from a consortium of organizations so that it could undertake the *Shelly Creek Water Balance & Sediment Reduction Plan*. Now, this Shelly Creek EAP demonstration application has provided the opportunity to 'connect the dots' to the Shelly Creek Plan, and illustrate what a whole-systems approach looks like.

There are other examples of MVIHES demonstrating leadership and initiative in a regional context. Most recently, MVIHES co-hosted the **Parksville 2019 Symposium**, the second in the *Vancouver Island Water Stewardship in a Changing Climate Symposia Series*[1].

[1] https://waterbucket.ca/viw/category/vancouver-island-symposia-series/

Map 1



Englishman River Watershed, Vancouver Island

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MVIHES – Stewards of the Creekshed

As stewards of regional streams, the Mid Vancouver Island Habitat Enhancement Society (MVIHES) leads community engagement in Shelly Creek by recruiting and supporting local volunteers to help with projects.

MVIHES helps residents and the community to understand that the Shelly Creek they see today is a riparian system that has been altered by decades of land use activities.

The Shifting Baseline and the Concept of the Natural Commons

Several realities about Shelly Creekshed became apparent from the EAP analysis. The first is that for several decades the stream's capacity to support populations of trout and provide sheltering habitat for salmon has declined.

Secondly, the riparian ecosystem has become fragmented; now, the stream is a series of riparian zones. And, urbanization has moved into the creekshed in the neighbourhood around Shelly Creek Park South, which was developed for residential use in the period 1998 to 2004.

Residential Subdivision: The development site was annexed into the City of Parksville from the Regional District of Nanaimo (RDN) to provide infrastructure services when the new building was permitted. Eighty-four new homes were constructed in the area shown on **Map 2** on the next page. **Shelly Creek Park South** (in the Middle Reach) **is the principal area of focus for application of EAP**.

It is only in the last decade that new residents began to appreciate the stream and its focal point in Shelly Creek Park South. Today these properties owners and the larger community are gaining appreciation of the stream system as a natural commons.

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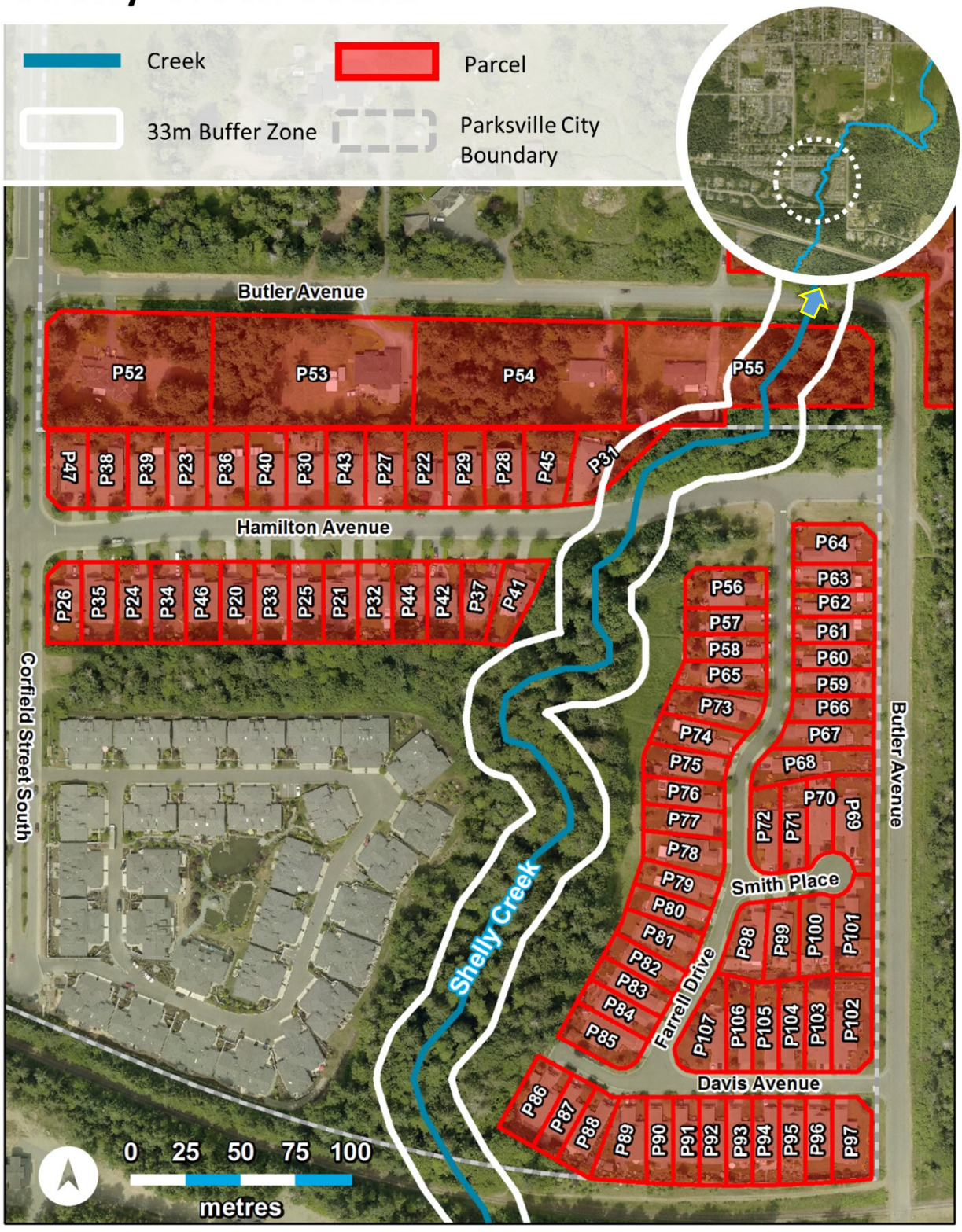
Map 2

Shelly Creek South



Contains information gathered from the City of Parksville. Cartographer: Ariel Verhoeks 2020

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Shelly Creek Park South: Residents and property owners enjoy the accessible riparian areas of Shelly Creek, especially Shelly Creek Park South where the stream defines the neighbourhood park and creates a landmark. Here, users meet stream stewards and each other.

Shelly Creek Park South

Community interest in the stream focuses on Shelly Creek Park South. The City of Parksville created the park in 1998 in the context of surrounding residential development. Increasingly, residents and visitors use the park ("voting with their feet" as it were). As a result, the City Parks Department has budgeted $100,000 in its current capital plan for management (enhancement) of trails and construction of water crossings.

Gradually they learn that this natural commons is a stream system which requires maintenance and management. More importantly, the growing use (enjoying the riparian zone features) confirms the social importance of the stream. From a human settlement point of view, this is the essence of a natural commons.

For several decades concern about survival of fish and loss of riparian habitat has drawn research and stewardship activities to Shelly Creek. MVIHES has secured funding from the Pacific Salmon Foundation and other sources for this work. Their volunteers and educational activities continue to promote community awareness of the condition of the stream.

The Research Question

Shelly Creek is the fourth in a series of ten demonstration applications of the Ecologial Accounting Process (EAP).Each case study is unique. In previous cases the collaborating partners framed the specific questions about the creekshed that were to be addressed.

Categories of Land Use in Shelly Creekshed

Urban Development = 11%

Agricultural and Rural Residential Lands = 42%

Forest Land (upper reaches) = 47%

Impacts of Land Use Activities: In the case of Shelly Creek, the EAP research team has focused on concerns about land use practices in the creekshed that have degraded the riparian eco-systems, riparian zones and the underlying hydrology (water balance pathways)

Research undertaken during the past decade by both MVIHES and the RDN's Drinking Water & Watershed Protection (DWWP) program has underlined the importance of this line of enquiry.

The research question regarding the EAP analyses of Shelly Creek was framed in two parts as follows:

> ***First, how does Shelly Creek exhibit the historic impacts of land uses; and secondly, does the stream influence the financial value of parcels that are adjacent?***

Numerous research investigations concerning the Englishman River (4th order stream) watershed have addressed the condition of the river and its tributaries as habitat for salmonoid species. Similar conclusions from this body of work identify on-going degradation of Shelly Creek.

Results of the Analyses

Budget for M&M

A suggested baseline annual expenditure for M&M would be $17,700.

This amount compares with an actual annual investment of $10,000 over the past decade.

The EAP analyses consider Shelly Creek from two primary points of view:

- **It is a riparian ecosystem.** Various land uses have reduced more than half of the stream's length to series of riparian zones whose hydrology has been altered; and
- **It is a natural commons.** Shelly Creek Park South has become the focus for understanding the ecological services of the stream and its need for maintenance and management.

Foundation for Creekshed Understanding: In order to understand the general functioning condition of the creekshed, the EAP analyses referred to several previous research findings (refer to the sidebar for a partial list) concerning hydrology, land use activities and assessments of the riparian zones.

Specific observations about the influence of the stream on adjacent property values and community understanding of Shelly Creek as a natural commons were drawn from a sample of 148 parcels lying in four catchments of the creekshed.

The specific focus on community use and stewardship activities in and about Shelly Creek Park South describes a decade of improved maintenance and critical enhancement. Nevertheless, the riparian condition of the stream has continued to decline for most of its length.

Land Use Category	Number of Properties
Agricultural Zoning	12 (8%)
Rural Residential	52 (57%)
Urban Residential	84 (35%)
TOTAL SAMPLE	**148 (100%)**
Adjacent to Creek	85 (57%)
Non-Adjacent	63 (43%)

KEY REFERENCES

Barlak, R. et al. (no date) Water Quality Assessment and Objectives in the Englishman River Community Watershed: BC Ministry of Environment.

Hilsen, W. (2014) Shelly Creek Overview and Conceptual Level Habitat Enhancement Program Development: Mid Vancouver Island Habitat Enhancement Society (MVIHES).

Law, P. (2016) Shelly Creek Stream Assessment and Fish Habitat Survey: MVIHES.

Dumont, J. (2017) Shelly Creek Water Balance and Sediment Reduction Plan – Technical Summary and Phase 1 and Phase 2 reports: MVIHES.

Bocking, R. and Gaboury, L. (2001) Englishman River Watershed Recovery Plan: Pacific Salmon Endowment Fund Society.

Value Synopsis – Worth of Parcels: The analysis established that, in the urbanized area of the creekshed, the financial value of parcels adjacent to the riparian area were influenced positively. Adjacent parcels were on average 17% smaller than non-adjacent parcels; yet purchasers paid as much or more than they would have for a larger non-adjacent parcel.

What Influences Purchasers: There appear to be several reasons for this decision about parcel worth. Purchasers got, among other things:

A location in the neighbourhood as did any purchaser.

Privacy – no neighbour at the rear of the parcel.

Natural landscape backdrop.

Quiet, fewer man-made sounds.

Bird and animal activity in their "backyard'.

An opportunity to express active and/or supportive care for the riparian environment

(Note: *this last finding is based on views gathered from interviews of residents by researchers and personal communication*).

Similar data about rural residential and agricultural parcels could not be obtained. The stream was rerouted on some parcels. In many cases the riparian areas were altered or removed. Many parcels lost advantages of riparian ecological services. Those parcels adjacent to the stream appeared to have values that were the same per square metre as non-adjacent parcels.

Summary of Average Values for Parcels in the Urbanized Area of the Creekshed

Those abutting the stream:

- *702 m² area*
- *$241,691 /parcel*
- *or $345 per m²*

Those which are non-abutting:

- *848 m² area*
- *$262,655 /parcel*
- *or $310 per m²*

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Application of the 'No Harm' Principle: Use of Shelly Creek Park South by the community and adjacent property owners indicates expectations that its ecological services will continue. Users should not harm the condition of the stream.

The 'no harm' principle derives from two sources.

One is the process that appraisers, or valuers, use to determine the financial value of a parcel.

Where natural commons services influence the parcel, the valuer will look for both negative (restrictions on use as in the case of regulatory set-backs, damage caused by nearby parcel owners) and positive impacts (waterfront, aesthetic qualities of adjacency to a natural area).

The condition of nearby properties sharing adjacency will be taken into account.

The second source of the 'no harm' principle is regulation. For natural commons such as streams, the Riparian Areas Regulations as well as local government bylaws apply.

The stream and riparian zones are widely used and enjoyed by the community. This expression of worth focuses especially on Shelly Creek South Park. Examples are listed in the sidebar.

Examples of Community Use and Enjoyment

Having the stream as a focal amenity of the park.

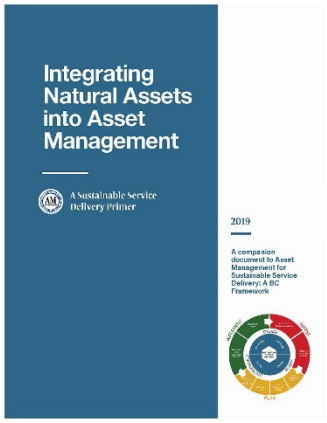
Enjoying the riparian environment.

Using the riparian corridor as part of the trails system.

Conveyance of stormwater from the local municipal drainage system.

Background / EAP Context

Provincial Context



Asset Management BC is co-chaired by UBCM (Union of BC Municipalities), and the BC Ministry of Municipal Affairs and Housing. In September 2019, Asset Management BC released the *Primer on Integrating Natural Assets with Asset Management*[2]. The Primer opens with this context and then introduces **EAP, the Ecological Accounting Process**:

> *"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."*

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."

Capsule Summary of What the Reader Needs to Know: EAP uses the parallel concepts of the NATURAL COMMONS and the CONSTRUCTED COMMONS to enable elected persons, local government staff, practitioners and residents to consider ecological services and use of land (development) as EQUALLY IMPORTANT.

EAP places emphasis on having a solid basis for budgeting expenditures for maintenance and management (M&M) of ecological assets, such as water pathways in local creeksheds. MAINTENANCE means 'prevent or avoid degradation'. MANAGEMENT means 'improve the condition of ecological assets'.

EAP provides local governments with a methodology and metrics that have not previously been available for establishing the FINANCIAL VALUE of the Natural Commons, in order to RECONNECT HYDROLOGY AND ECOLOGY. **Refer to Table 1 for context.**

3-Stage Program for Testing, Refining and Mainstreaming: Shellly Creek is one of two demonstration applications undertaken in Stage 2 to refine the EAP methodology. By the end of 2021, Stage 3 mainstreaming would comprise six more EAP applications for a grand total of ten. Each case study is unique. Partner communities frame creekshed-specific questions to be addressed by the EAP application.

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

TABLE 1 - RECONNECT HYDROLOGY & 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.

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Local Context / Social Lens – MVIHES is a Voice for the Community

Faye Smith
(1937-2017), project coordinator, was the 'face' of MVIHES from the time of its inception

"MVIHES experience demonstrates that positive outcomes are a result of strong community support for protection of small streams and their tributaries."

MVIHES represented the community in the Watershed Recovery Plan implementation process during the period 2001 through 2008. There were substantial financial investments in stream restoration projects to enhance salmon and steelhead habitat. MVIHES has been described as the community voice, and its eyes and ears.

As time moved on, priorities changed, and the role of MVIHES was refocussed into 'monitoring streams' to ensure watershed health. This meant getting the community involved by connecting people to their landscape through the *Watershed Health and You* initiative.

Watershed Health and You: The initiative aims to engage the local community in recognizing the importance of the watershed. This is the prelude to involving community members in activities that would help to protect their own watersheds. MVIHES:

- coordinates projects and community discussions about management of the watershed;
- disseminates information regarding the status of aquatic habitat in the watershed; and
- provides opportunities for the community to participate in hands-on care for the watershed, estuary and shorelines.

The MVIHES mission is to **connect people to their landscape through education**. Public events raise the level of awareness.

Watershed Recovery Goal

Restore the whole watershed to a healthy state and thereby benefit all wildlife and residents, including the recovery of Coho and steelhead populations.

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Framework for Application of EAP to Decision Process for Shelly Creek Natural Commons

EAP involves a five-step process, with each step being a deliverable. The set of five deliverables for the Shelly EAP Demonstration Application are detailed in Table 2 on the next page.

Community Expectations

This EAP analysis describes the evolution of the community's appreciation of Shelly Creek as a natural commons. The process requires measures to identify how social, environmental financial expectations may be linked to the stream.

Social, Economic and Environment Options: For two decades, MVIHES has invested in the maintenance and management (M&M) of Shelly Creek. The society's efforts initially focused on fish habitat and now include programs to inform the community about the stream as an ecological system and the need to improve its functioning condition.

The creekshed remained entirely rural until 1998 when urban development began in an area annexed from the Regional District of Nanaimo (RDN) by the City of Parksville. Residents of this neighbourhood, which focuses on Shelly Creek Park South, are learning to value the stream as a natural commons. Their expectations that the stream will continue to provide a central amenity in the park as well as privacy and nearby, accessible nature imply that the stream will be maintained and managed as a riparian system.

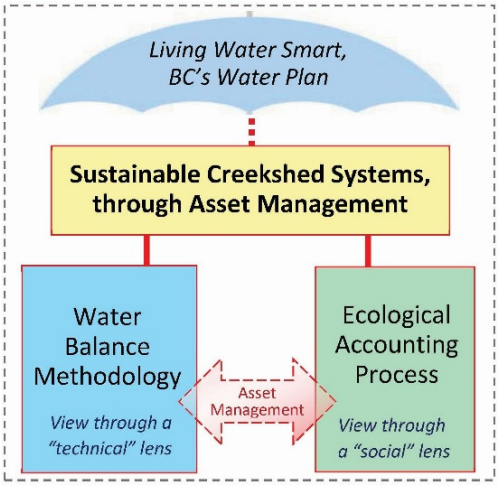
Context for Asset Management

Creekshed systems are 'infrastructure assets'; and they provide water balance services. Thus, hydrologic integrity is a driver for maintenance (prevent degradation) and management (enhancement) of nature's water balance services in the same way that engineered assets (and services) are managed.

Sustainable Creekshed Systems: As illustrated below, the twin pillars of the *whole-system, water balance approach* to land development are EAP and the Water Balance Methodology (WBM).

Shelly 'twin pillar' experience provides working examples of how to apply both to *reconnect hydrology and ecology* in the built environment.

In 2017, the WBM was applied to Shelly Creek as a demonstration application undertaken by MVIHES to develop watershed-based performance targets for drainage system design.



Hydrology is the Engine that Powers Ecological Services

TABLE 2: **The Set of Five Deliverables**	
Step One	**Creekshed Profile** The key question is: *how have historic land uses altered the riparian quality of the creekshed?* This information is based largely on previous research/studies noting risks and opportunities for maintenance and management of the ecological services provided by the stream.
Step Two	**Creekshed Hydrology** The key question is: *what are the primary changes in the creekshed hydrology and how have water pathways changed?* Several previous research projects address this question.
Step Three	**Worth of the Creekshed as a Natural Commons** The key question is: *how does the community use and enjoy the creekshed?* 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.
Step Four	**Financial Value of the Natural Commons** 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). This calculation of 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	**Impact of the Stream on Property Values** The key question is: *how much are assessed values of residential properties influenced by proximity to the stream*. The extent to which the stream influences property values either positively or negatively is not known. The difference between urban parcels and rural parcels will be investigated.

Foundational concepts that underpin EAP are introduced below:

Constructed Commons

*Communities rely on a range of services such as roads, underground utilities and parks to support life-style and property enjoyment. These are **commons**. Through taxation, they are maintained and managed in order to ensure the availability of desired services.*

Institutional Commons

Services such as fire protection and schools are a related kind of constructed commons.

Natural Commons

As defined by the EAP, a natural commons is an ecological system that provides ecological services used by nature and the community.

How Communities Decide How Much to Invest in Creekshed Restoration

Local governments have existing tools in the form of policies and legislation for 'maintenance and management' (M&M) of ecological assets, which are used for infrastructure services. What they lack are a pragmatic methodology and meaningful metrics for effective decision-making and implementation.

EAP provides local governments with a methodology and metrics that have not previously been available.

This part of the report is intended to provide the reader with a basic understanding of EAP. Refer to Table 3 on the next page for a synopsis of the approach; and to Table 4 for ten key messages.

The Commons Concept: Natural assets provide ecological services that human communities draw on to support quality of life and property enjoyment. EAP uses the parallel concepts of the **natural commons** and the **constructed commons** as a way for residents, elected persons, and practitioners to understand that ecological services deserve equal consideration.

Package of Ecological Services: EAP focuses on the worth of ecological services to residents. In the Stage 1 program, this led to the breakthrough concept which is named the *package of ecological services*. 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.

What a 'Package of Ecological Services' Means

A creek comprises the stream corridor and the riparian zone. Both support ecological systems. The creek itself is a hydrologic system.

The surrounding zone and interrelated ecological systems work with the hydrology to provide a range of ecological services and aesthetic uses.

***From a human settlement point of view**, a creek is an amenity that can be enjoyed in association with parks, greenways and trails.*

A creek supports salmon and trout; it is a landscape feature; it is part of the urban woodlands, harbours heritage trees and nesting sites; and it is the focal point of outdoor classroom activities, walking, jogging, cycling, wildlife viewing, etc.

A creek zone adds value to nearby properties and attracts visitors from other areas. Also, the creek channel is used for drainage conveyance.

TABLE 3 - **Synopsis of EAP Approach**

PHILOSOPHY
EAP, the Ecological Accounting Process, provides metrics that enable communities to appreciate the worth of natural assets in order to improve 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"
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 services. 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. 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) 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 Regulation (RAR*) Calculate the financial investment made (if any) in the creekshed or reaches. Assess condition of the hydrology by applying **Water Balance Methodology**
Acknowledge TEV (Total Economic Value); reference and use concepts of worth applied to the both natural commons and constructed commons.
Analysis based on entire creekshed ecological system – because lasting management (enhancement) would not be successful unless based on a whole system perspective and strategy.
DELIVERABLES
Creekshed profile, includes perceptions of risks and opportunities Water Balance Methodology analysis of the condition of the hydrology Calculation of the worth of the creekshed based on community investment Statement of the value of the land in the commons asset zone

A Creekshed Perspective

The EAP approach looks at the entire system at the catchment or creekshed scale. A creekshed is a 1st order stream. EAP reviews historical land use impacts and ascribes changes to the overall hydrology.

***The technical focus** of EAP is on creekshed hydrological conditions and the dependent ecological (water balance) services thus provided. These services sustain natural systems and human settlement. The Water Balance Methodology is the analytical tool.*

***The social focus** of EAP observes the uses that residents and community make of local ecological services which are drawn from the natural commons assets. EAP looks at the history of intervenor initiatives. This helps understand human nature: "what is this worth to me / us?" Taking action ultimately depends on what the community thinks a creekshed is worth (i.e. value in use).*

Application of EAP to Shelly Creek Natural Commons

The Partnership for Water Sustainability and MVIHES collaborated to review the extent to which the community recognizes Shelly creekshed as a natural commons and evidence that residents, property owners, NGOs, businesses and local governments consider it worth investment of volunteer time, funding and pursuit of a long range strategy for enhancement.

Primary Analytical Question: EAP considers how the **worth** of Shelly Creek as an ecological system or natural commons may be affected by land use activities within the drainage area that is tributary to the creek channel. The primary analytical question is this:

> ***What evidence is there that the community recognizes the inseparable connection between land use activities and the condition of the Shelly creekshed?***

The results of the EAP research and analyses are presented in the next five sections.

Understanding the 'Worth' of Shelly Creek: Worth is both a social and financial concept. The realities of ecological uses, social contract, fiduciary duty of institutions and the assessed value of residential parcels contribute to a more complete understanding of the importance of the stream as a natural asset.

The analysis recognizes the critical roles of non-governmental organizations who supply science, research, maintenance and management regarding Shelly Creekshed.

All of these variables are considered in the process of the EAP analyses reported herein.

Ten Key Messages: Refer to Table 4 on the next page. The ten key messages provide a cascading logic to guide the reader. Looking ahead, this report concludes with a summary of foundational concepts that underpin an understanding of EAP.

How Much to Invest?

EAP focuses on worth rather than dollar value specifically.

EAP emphasizes social rather than 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 4

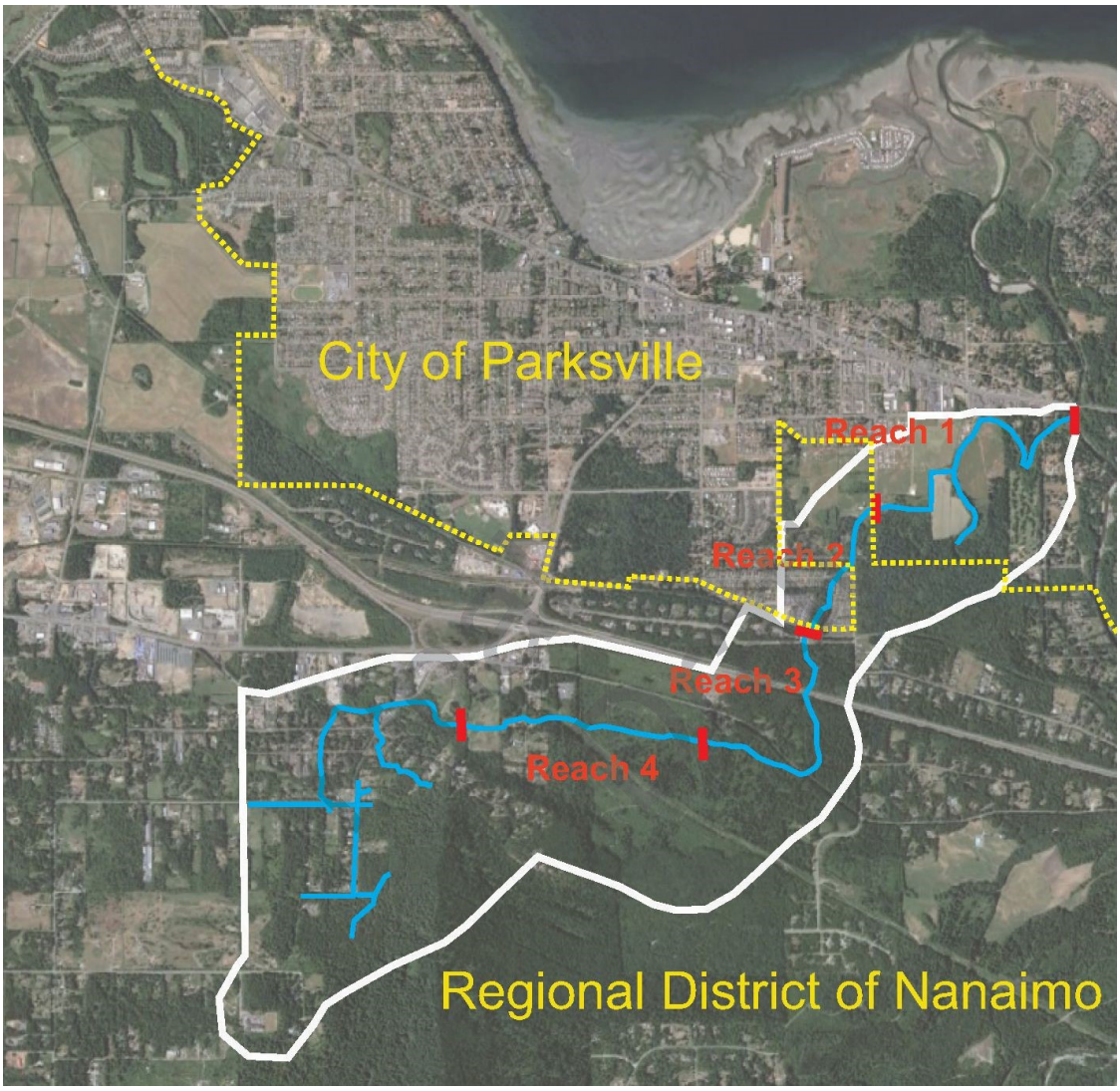
10 Key Messages to Remember about EAP

1. Every urban creekshed 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 hydrology** 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 creekshed 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 financial 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 creekshed 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.

Step One: Creekshed Profile

Scope of Step One

Application of EAP involves five steps. In Step One, **Creekshed Profile**, we describe the urbanized and non-urbanized reaches of Shelly Creek. The map below illustrates the various proportions of each. Shelly Creek exhibits the characteristics of many small (1st order) streams that lie on the settled east coast of Vancouver Island. It is a tributary of the Englishman River (4th order stream), a watershed in the Nanaimo Lowland Eco-region.



Fisheries Importance

A Smolt is a stage of a salmon life cycle that is getting ready to go out to sea.

"The large number of Smolts found indicates that Shelly Creek offers spawning and rearing habitat within its lower reach.

"It also indicated that it is heavily used as overwintering habitat during high water by migrating fish in the Englishman River."

Source: 2011 Smolt Trapping Report for DFO

Why Shelley Creek is Important

Approximately 6.5 km long, the Shelly Creek stream channel drains a watershed area of 5 km². **The survival of Coho salmon in the Englishman River depends on a healthy Shelly Creek.**

"Shelly Creek was the subject of a habitat assessment 18 years ago, when challenges to fish and fish habitat were first identified," recalls Peter Law. "In 2011, MVIHES volunteer streamkeepers installed a downstream smolt trap to quantify the importance of this small stream, to Coho populations in the river."

"We were pleasantly surprised when we counted thousands of smolts as they migrated downstream to the river/ocean. This project helped us understand the important role Shelly Creek plays in sustaining healthy Coho salmon populations in the Englishman River."

What the *Community Watershed Monitoring Network* has revealed

In 2011, the Regional District of Nanaimo (RDN) *Drinking Water and Watershed Protection* program (DWWP) partnered with the Ministry of Environment, MVIHES and nine other stewardship groups to implement the Community Watershed Monitoring Network.

Erosion is the Issue: "The network expands on the provincial data base, collecting enough data to see watershed trends and raise watershed health awareness in local communities," explains Julie Pisani, RDN Program Coordinator. "Data are collected for turbidity, dissolved oxygen, temperature and conductivity."

"The Shelly Creek turbidity measurements were two times higher than the value established for acceptable sediment runoff in the Englishman River," reports Peter Law. "In fact, Shelly Creek's turbidity numbers were the highest in the region (as reported in 2013). **This was the alarm bell that alerted us to a serious problem** with watershed health. By 2014, efforts to identify sediment sources and their causes, and then develop solutions, were underway."

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Shelly Creek Statistics

"The Shelly Creek watershed is the most developed sub basin in the Englishman River watershed (Clough, 2013). A high proportion of the watershed is privately owned (84.5%) and is dominated by residential and farm activities that have impacted the creek through ditching, stormwater, loss of riparian cover, low flows, barriers to fish migration and poor water quality (Bocking & Gaboury 2001, Walshe 1999). Despite these impacts to fish and fish habitat, the creek continues to be a major contributor to Coho smolt production for the Englishman River watershed -Clough 2013, Riordan 2016)."

(Law, P 2016).

Historic Changes in Landscapes and Land Uses

Shelly Creek originates at the foot of Little Mountain south of Parksville and flows about 6.5 kilometres to its confluence with the Englishman River, which is about 200 metres upstream from Highway 19A.

More than 125 years ago, settlement by non-indigenous peoples began in this region. Early economic activity focused on logging, coal mining and fishing. Settlements established around the locations of these enterprises, and roads and utility routes soon crossed the landscape.

Based on locations within 200 metres of the stream, present day land uses within the creekshed are tabulated below:

Land Use Category	Proportion
Forest Lands	~47%
Agricultural and Rural Parcels	~42%
Urban Development	~11%

Disruption and Degradation: As agriculture became established, further disruption of riparian ecosystems occurred. Finally, rural subdivision and urban expansion brought additional degradation of the hydrology of streams. In summary, land alterations over the past 80 years have included:

- Clearing and ditching for farming
- Ditching for road development and land subdivision
- Logging
- Linear developments (highway, railway, hydro transmission r/w)
- Residential and industrial developments.

Expansion of the Drainage Area: Significantly, the creekshed tributary drainage has, over time, increased in area from 5.21 km^2 to 5.75 km^2. This is due to ditching and diversions within both the Regional District of Nanaimo and the City of Parksville. (Reference: Dumont, 2017. Shelly Creek Water Balance Report Technical Summary).

What Current Land Use Conditions Tell Us

The most urbanized portion of the creekshed harbours 84 residential parcels (average area about 560 m²) arranged around Shelly Creek Park South, an amenity of the City of Parksville. All of the residences in the neighbourhood were built between 1998 and 2004. All were included in the sample of parcels reviewed by EAP.

An additional small urbanized portion of the creekshed, also within the City of Parksville, consists of commercial parcels along Highway 19A and business frontage streets near the crossing of the Englishman River. These parcels were not included in the analysis.

Interesting Facts about 64 Rural Properties

Of the 64 parcels in the sample, 7 have no structures and half of the remaining 57 have buildings erected prior to 1985.

All but 13 parcels have residences built prior to 2000.

Rural residential and agricultural parcels make up nearly half of the creekshed area. Typically, the 64 parcels sampled in the EAP analyses are large.

Current RDN zoning for rural residential land uses requires lots or parcels to be at least 1 hectare. There are a few parcels that were subdivided prior to current minimum lot sizes; these may have an area of less than 1 hectare.

Future Considerations: The data confirms several realities about future land use activities in the creekshed:

- Existing parcel uses may change due to proposed development or redevelopment which would have to meet the regulations of the Electoral Area G Official Community Plan;
- Proposals, including subdivision, might invoke RDN policy objectives concerning riparian areas and other ecological systems;
- Proposals, including subdivision, for parcels within designated Development Permit Areas (DPAs) would invoke current regulations and policies for environmentally sensitive areas;
- Proposals for rezoning and conversion of land use from one category or another would require RDN involvement together with other authorities.

The challenges and opportunities associated with past and current zoning and land uses are discussed in more detail in Step Three, *Description of the Worth of the Natural Co*mmons.

An Illustration of Rezoning and Conversion of Land Use

Couverdon (Timber West's real estate company) has achieved such re-zonings, in the vicinity of various Island communities, including a parcel currently for sale at Coombs near the headwaters of Shelly Creek.

Step Two: Creekshed Hydrology

Scope of Step Two

Application of EAP involves five steps. In Step Two, **Creekshed Hydrology**, we present a synthesis of research and other initiatives that describe the condition of Shelly Creek (refer to sidebar for a listing). These works include technical and scientific studies as well as observations stemming from M&M activity. This knowledge would not be available without the work of MVIHES, RDN DWWP and MABRRI.

Shelly Creek Documents

Dumont J. 2017 Shelly Creek Water Balance and Sediment Reduction Plan - Technical Summary

Dumont J. 2017 Shelly Creek Water Balance and Sediment Reduction Plan - Phase 1 Physical and Environmental Investigations

Dumont J. 2017 Shelly Creek Water Balance and Sediment Reduction Plan - Phase 2 Computer Modeling and Assessment

Law, P. 2016 Shelly Creek Stream Assessment and Fish Habitat Survey (2014, 2015) Report

Barlak, R. and L. Fegan. 2014. RDN Community Watershed Monitoring 2013 Data Summary

Hilsen, W. 2014. Shelly Creek Geomorphic Overview and Conceptual Level Habitat Enhancement Program Development.

Stream Morphology: Shelly Creek flows from its source area at the foot of Little Mountain to its confluence with the Englishman River. The maximum elevation of the stream is 240 metres. The headwaters area has little elevation change. As a result the soils detain water and release it over time to the stream. As land uses have altered soils, the upland interception and detention of rainwater has declined.

Moving upstream from the Englishman River, the first 1350 metres of Shelly Creek has a gradient of less than 1%. The next 1200 metres from Blower Road to the E&N alignment becomes steeper, much of the stream course has an average slope of 3% to 4 %. South of E&N alignment (Wildgreen Way) the stream gradually becomes a gradient of less than 1% and flows slowly through forest lands and rural parcels for about 4 kms (Hilsen 2014).

The riparian areas of the stream have survived in much of the stream course above Butler Avenue, while only remnants remain in the lower reaches. It is evident that loss of the riparian environment indicates diminished capacity of the surface hydrology (water pathways) to intercept, detain, infiltrate, and release rainwater to interflow dynamics and eventually to groundwater and the stream.

Land development utilizes ditching and drainage infrastructure to take away rainwater from buildings, roads and paved areas. Storm drains convey runoff to the stream. There are six or more large storm drain outfalls to Shelly Creek from adjacent roads and infrastructure drainage. These storm drains release rainwater quickly and accelerate the flows in the stream. The quality of this water depends on the types of surfaces that collect it and send it to the storm drains.

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Shelly Creek Documents (cont'd)

Judson, B.2019. Population demographics and diet content analysis of a resident population of Coastal Cutthroat Trout (Oncorhynchus clarkii clarkii) in upper Shelly Creek, Parksville, British Columbia

Stephens, C. M. 2015 Lower Englishman River Watershed Wetlands Study

City of Parksville, Parks, Trails and Open Spaces Master Plan: Action Plan, 2019.

Official Community Plan, Electoral Area G of the Regional District of Nanaimo, 2008.

Plan Parksville: A Vision for Our Future, Official Community Plan, 2013.

Creekshed Analysis & Planning Framework

Reports listed in the sidebar, plus those listed on the previous page, address the hydrological and ecological conditions of Shelly Creek.

Much of the technical and scientific work has been produced through the efforts of MVIHES; and with funding secured from Department of Fisheries and Oceans, Pacific Salmon Foundation, local government, the Real Estate Foundation and other agencies.

What Researches and Plans tell us about the Hydrology of Shelly Creek: The earliest research concerning the condition of the stream was indicated in studies (early 1990s) regarding salmon habitat. Map 3 illustrates how the landscape has changed noticeably and substantially over the past five decades.

Since the early 1990s, researchers have reviewed hydrology and riparian function. And, the Official Community Plans for Parksville and Electoral Area G now include policies and regulations for protection of the natural environment - *"environmentally sensitive ecosystems, freshwater and groundwater"*.

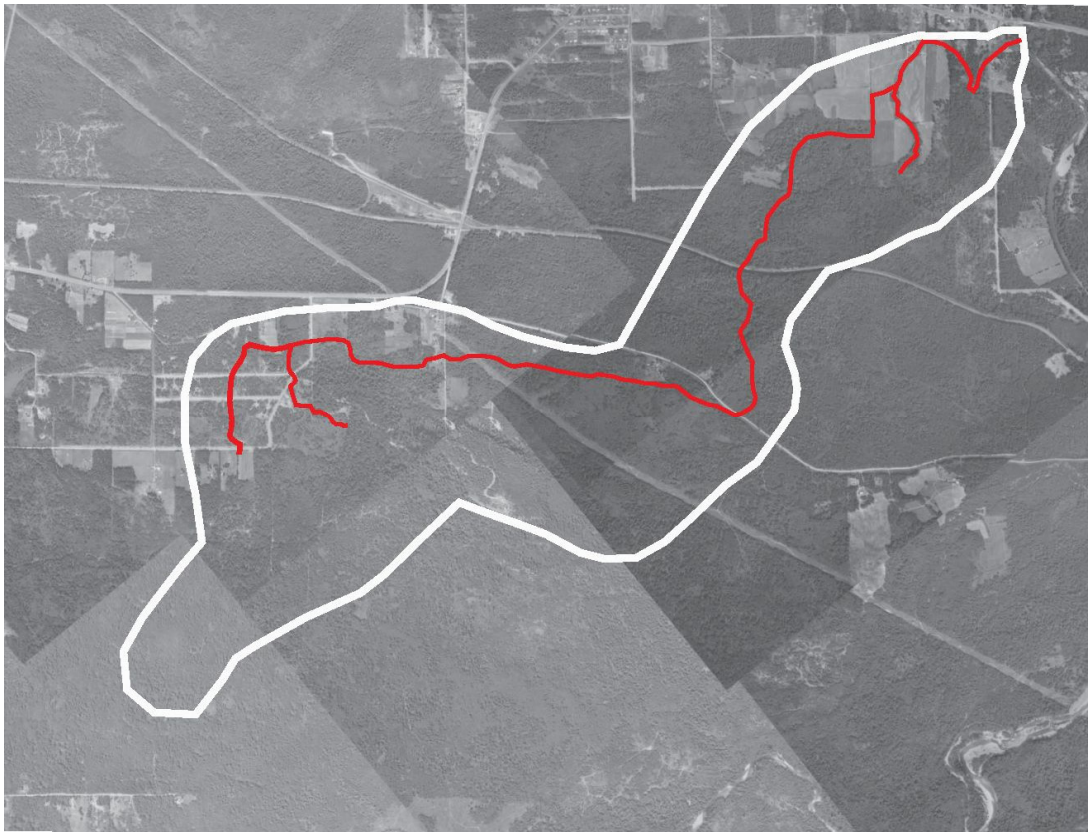
The broad conclusions that can be drawn from these references concerning Shelly Creek are:

- Land use activities have altered riparian areas and influenced hydrology.
- The Shelly Creek riparian ecosystem has become a series of riparian zones.
- Other than forest lands, rural land uses (zoning) dominate the creekshed.
- Enhancement and/or restoration of riparian functions and hydrology will be driven in two ways:

Incrementally, as subdivision and development or redevelopment may be permitted.	Through initiatives undertaken by non-regulatory Intervenors such as the work of MVIHES, RDN DWWP and MABBRI.

The research and field work concerning the hydrology and riparian conditions of Shelly Creek identified various impacts on the stream. Highlights from several reports are presented next.

Map 3



Map source: Phase 1 Technical Report, Jim Dumont, 2017

Changes in the landscape between 1968 (above) **and 2019** (below)

In the 2017 report titled *Shelly Creek Water Balance and Sediment Reduction Plan*, Dumont identified activities that have altered the landscape in the Shelly creekshed over time:

- Clearing and ditching for farming
- Ditching for road development and land subdivision
- Logging
- Linear developments (highway, railway, hydro r/w)
- Residential and industrial developments.

In the 2014 report titled *Shelly Creek Geomorphic Overview and Conceptual Level Habitat Enhancement Program Development*, Hilsen stated that "urbanization over the past several decades has resulted in:

- Draining of wetlands in the upper watershed.
- Covering of natural ground surfaces with impervious materials.
- Installation of drainage systems that convey stormwater directly into the stream.
- Agricultural practices such as:
  - Clearing of riparian areas,
  - Realignment of the channel into linear ditches, and
  - Withdrawal of water for irrigation purposes."

Hilsen also noted that "a water license was issued in 1955 for irrigation purposes and permits a maximum withdrawal of 18,500 m²/year, though the actual rate is unknown. According to the Englishman River Water Allocation Plan (ERWAP), extractive demands in the ERWAP are allowed only in the period November to April inclusive when mean monthly flow is greater than 60% of MAD (Bryden, 1994)."

In the 2014 report titled *Shelly Creek Stream Assessment and Fish Habitat Survey*, Law stated that: "The Shelly Creek watershed is the most developed sub basin in the Englishman River watershed (Clough 2013). A high proportion of the watershed is privately owned (84.5%) and is dominated by residential and farm activities that have impacted the creek through ditching, stormwater, loss of riparian cover, low flows, barriers to fish migration and poor water quality (Blocking & Gaboury 2001, Walshe 1999)."

Cowichan Valley Regional Water Balance Analysis, 2013

Comox Valley Regional Water Balance Analysis, 2015

Shelly Creek (Nanaimo Region) Water Balance Analysis, 2017

Creekshed Assessment

"Existing standards of practice have resulted in negative impacts to Shelly Creek.

"Continuing to use the accepted standard of practice as applied to design of human activities which include municipal engineering and land development will result in further environmental degradation of the watershed and loss of stream productivity."

Source:
Shelly Creek Water Balance and Sediment Reduction Plan – Technical Summary, June 2017

Impact of Future Land Use Activities

In 2002, the provincial government released *Stormwater Planning: A Guidebook for British Columbia*. This established a new direction for urban hydrology and drainage engineering. Introduction of the *Water Balance Methodology* enabled the setting of performance targets for rainfall capture, runoff control and groundwater recharge:

> ***If we manage the runoff volume, and if we mimic the natural flow pattern in streams, then we can… prevent increased stream erosion, prevent increased risk of flooding, and protect aquatic habitat.***

The east coast of Vancouver Island is a demonstration region for showcasing how to apply the *Water Balance Methodology* at a regional scale, and then downscale water balance performance targets to the site scale. During the period 2013-2017, Shelly Creek was one of three demonstration applications undertaken by the Partnership for Water Sustainability.[3]

Research Questions: The Water Balance Analysis drilled down to tackle two questions that define the issues in any creekshed undergoing development:

- What is causing the stream channel to fill with sediment?
- How can community action restore the stream's health?

The Shelly Creek case study created an opportunity to make this distinction: without **restoration** of the hydrology of the creekshed, channel **remediation** measures by themselves are not likely to be successful in restoring the fisheries productivity of Shelly Creek.

Research Finding: Interweaving of creekshed hydrology and stream dynamics boils complexity down to this measure: ***how many hours each year is the discharge flow rate in the creek larger than a specific erosion-causing flow rate***. Most stream erosion is caused by flow rates that range between the *mean annual flood* and the *2-year flood* event.

Under potential future development conditions, the analysis showed that Shelly Creek would experience a **14-fold** increase in the duration of erosion-causing discharge rates.

[3] https://waterbucket.ca/rm/wp-content/uploads/sites/5/2018/01/Water-Balance-Approach-on-Vancouver-Island_Jan2018.pdf

Step Three: Worth of Shelly Creek as a Natural Commons

Scope of Step Three

Application of EAP involves five steps. In Step Three, **Worth of Shelly Creek as a Natural Commons**, we elaborate on the 'commons concept' and why it is the lynch-pin for EAP analyses. This sets the stage for the related concept of 'worth', how it is measured, and how it is determined for the creekshed.

The Commons Concept: As defined in the *Riparian Areas Regulation Act,* a stream system such as Shelly Creek is a **natural commons**. A natural commons has a corollary, the **constructed commons**. Ecological services are described in the sidebar.

EAP uses the concept of the commons to refer to those assets and services which all residents and property owners jointly may access. Here, 'use' refers to the services drawn from the natural (ecological) asset and enjoyed.

Communities rely on streams to intercept, detain and infiltrate rainfall, to convey discharges from storm sewers, and to recharge aquifers. Streams may be aesthetic features in parks, or provide alignments for trails and greenways. Streams also provide privacy, noise reduction and beauty for nearby properties. The ecological and topographical qualities impacting private parcels may uplift land values.

The ecological services of streams support the intrinsic needs of nature including aquatic and terrestrial life. Streams are a key part of natural drainage or water pathways.

Natural Commons and Ecological Services

Natural assets can support climate change adaptation strategies - "measures that increase the resilience of communities to the impacts of climate change" (Primer on Climate Change and Asset Management, 2019).

Small stream systems, which are part of urban and suburban land use, may be maintained and managed to avoid costly remediation as more frequent storms increase volumes of surface water flows.

These and many other uses depend on a stream having adequate functioning condition as an ecological system.

In short, the community uses the ecological services of streams and expects the services to be available in the future to support community well-being and property enjoyment.

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Constructed Commons

Constructed commons assets and services are familiar as roads, drainage systems, potable water systems, sanitary sewers, and so on.

Institutional commons such as fire protection services and schools are a related kind of commons.

Expenditures required for maintenance and management of constructed and institutional commons assets and services appear in local government budgets and financial statements as well as those of institutions.

The financial value of constructed assets themselves is based on purchase cost and subsequent appreciation or depreciation. These changes apply to the assets and take account of expenditures for maintenance and management. Similar financial records for natural assets rarely are available. There is no line on a property tax bill identifying expenditures for ecological services, nor is there a description of those services.

Similarly, the constructed commons is familiar as roads, storm drainage systems, potable water systems; infrastructure or core services that residents and property owners access and expect to have in the future. Streams are used as part of local government drainage systems, as aesthetic features in parks, as part of the hydrology that recharges aquifers, and so on. The range of uses of these ecological services implies that the community considers them to be core services.

Urban Shelly Creek

The images below show the stream alignment and channel conditions at Shelly Creek Park South. At the time of the surrounding development (1998 to 2004) the park was created as a required amenity of the proposed subdivision. The dedication also met policy and regulatory –protection of the natural environment – requirements set out in Parksville's OCP.

How is Worth Measured?

The EAP Methodology provides two measures of the worth of a *natural commons* such as a stream. These are:

- Investment made by the community in M&M; and
- The financial value of the natural commons asset which is the assessed value of the portion of the land underlying the stream corridor. This land in the set-back area plus the width of the stream itself.

These are collective measures because the ecological services of the stream are available to all residents and property owners in the community. Worth of land refers to more than *financial value* (see Royal Institute of Chartered Surveyors Handbook).

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.

Recognition of Worth, Or Not: Most of the development in the Shelly creekshed took place prior to 1990. This rural subdivision comprises agricultural lands and about 120 rural residential parcels throughout the drainage. As noted earlier in this report, the riparian areas of the stream often were removed partially or entirely. In some cases the stream was moved into a channel or ditch to get it out of the way of land use on the site.

In contrast, the stream with its riparian qualities remains intact on some properties. The stream will not provide ecological services other than conveyance if the riparian area has been removed.

The most significant demonstration of the community's view of the worth of the stream is the urban enclave around Shelly Creek Park South. This is an impressive example of a parkland dedication made under OCP policies and bylaws that became recognized by the residents and community as a valuable ecosystem and natural asset. The site of this development was annexed into the City of Parksville in 1998 to accommodate the density and provide the infrastructure to support 84 residential parcels.

Calculating the Worth of Shelly Creekshed

Thus far, the EAP analysis has arrived at some key perspectives about the Shelly creekshed:

- Historic land uses have degraded its riparian ecosystem to a series of riparian zones.
- There are valid concerns about the condition of the stream as an irreplaceable element (ecological system) of regional watersheds (references: Community watershed monitoring results from the RDN DWWP; and wetlands research by MABRRI).
- Research to identify and action to remediate loss of fish habitat in the stream (MVIHES).
- Engagement of the community and local residents in understanding the stream as an ecological system (MVIHES).
- City of Parksville action (1998) to establish the park reserve area now known as **Shelly Creek Park South** and to support enhancement and public education work by MVIHES.

As the largest park on the southern boundary of the City of Parksville, Shelly Creek Park South receives regular use by the local residents and the wider community. The park is a landmark and neighbourhood amenity.

The park also draws visitors because it is located adjacent to the Trans Canada Trail and on the Corfield alignment of the City trail system. In short, residents and property owners recognize the park and stream as a natural commons and institutional commons (i.e. a public park).

M&M Defined

'Maintenance' means prevent or avoid degradation.

'Management' means improve the condition of ecological assets.

Holistic M&M refers to a whole-system, water balance approach that understands how water reaches a stream.

Investment in Maintenance and Management (M&M) of the Creekshed: The local government policies and bylaws pertaining to natural assets and ecological systems provide a regulatory context for protection of ecological assets such as Shelly Creek. However, it is the non-government MVIHES that provide the focus on the stream as an ecological system.

Significantly, MVIHES also collaborates with the RDN DWWP program on strategies and actions to maintain and manage Shelly Creek and other streams in the region.

Step Four follows and provides calculates of the financial value of Shelly Creek as a natural commons.

Step Four: Financial Value of Shelly Creek, a Natural Commons

Scope of Step Four

Application of EAP involves five steps. In Step Four, **Financial Value of Shelly Creek as a Natural Commons**, we build on the concepts of the *natural commons* and the *constructed commons*. The commons are assets that provide services which support quality of life and property enjoyment; some of these are core or 'essential' services expected by residents and property owners.

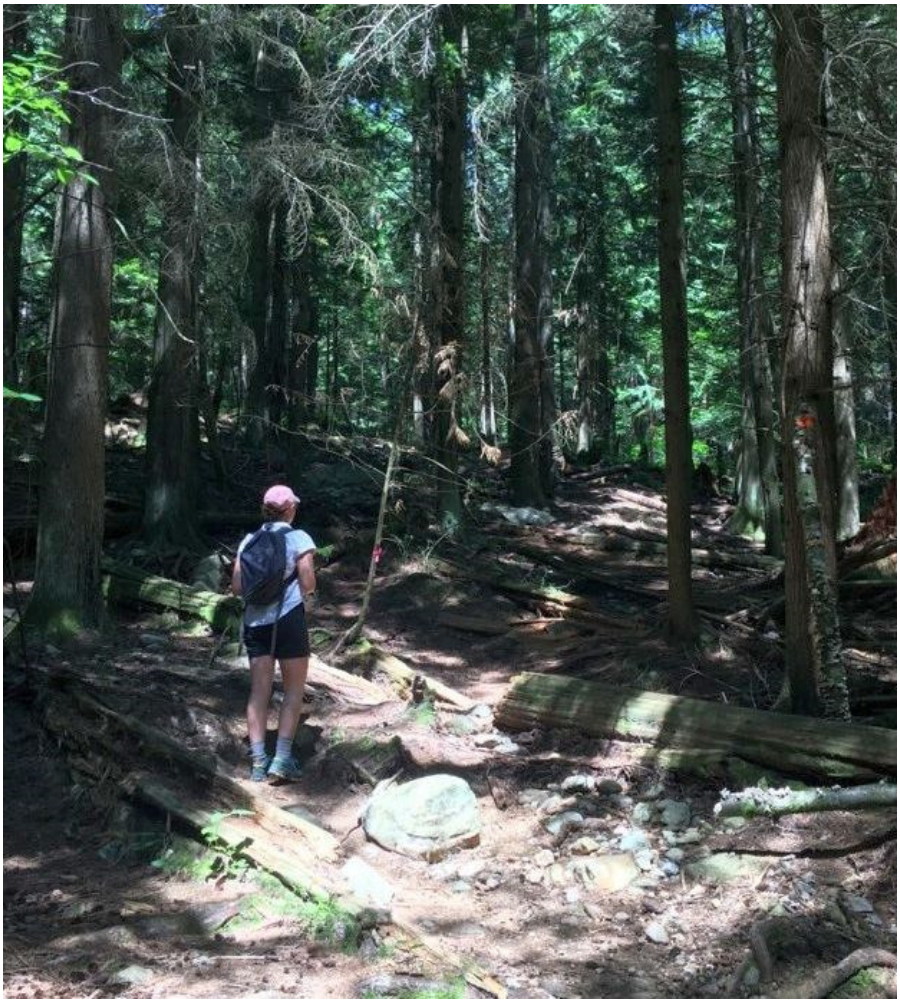
The bottom-line is that the community (including residents, institutions and corporations) expects *core commons services* to be available to secure quality of life and property enjoyment.

A Social Contract

The quality and desirability of neighbourhoods are influenced considerably by the commons services available.

An implied social contract exists.

The terms are that core services would be supplied through commons systems; and, maintenance and management (M&M) would take place.



An Illustrative Example of the 'No Harm Rule' in Land Appraisal

For example, one of the influences on the potential value of a lake front parcel will be the foreshore condition on the subject parcel and on neighbouring parcels (properties). As a shared amenity, the lake front generally is a natural commons. In the context of regulations that govern property development, owners should not degrade the lake front.

No Harm' Rule for Land Appraisal: Expectations that commons ecological services will continue are indicated in the "no harm" principle. When appraisers consider a site made up of one or more parcels, the potential value should reflect the utility of the site in the context of "highest and best use."

Through the work of MVIHES, RDN DWWP and MABRRI, the ecological system aspects of streams such as Shelly Creek are becoming evident to property owners and the community.

Gradually, owners and potential purchasers of parcels abutting and near the stream, will refer to the "no harm" principle to estimate the worth of a parcel. They will want to know that the ecological services of the stream will be protected as land use changes occur in the creekshed.

How Does the Community Use the Services of Shelly Creek?

EAP researchers reviewed expenditures made to maintain and manage Shelly Creekshed for the past decade. The calculation of amounts is not precise, but provides an estimate of investment of time, effort and dollars.

The information pertains to the non-urban or rural (89%) portion of the creekshed and the urban area (9%) around Shelly Creek Park South. There is another small urban area (2%) near the confluence of Shelly Creek and the Englishman River, which is not included.

About half of the length of the non-urban portion of the creekshed flows through forest lands. The actions owners of these lands to maintain the creekshed hydrology were not reviewed.

As described earlier in the report, where the stream flows through rural residential and agricultural parcels, it has been altered and degraded. Several MVIHES research and assessment projects provide details. However, there are indications that this history of neglect will change.

Ecological Functions of the Stream Support Land Use Infrastructure

In the future, it is anticipated that property owners in the creekshed would propose subdivision and development. Local government would then have opportunities to apply current policies and bylaws (regulations) to protect ecological features on a case by case basis.

How the 'No Harm Rule' Could Be Applied: The approval processes would require proponents of land use changes to clarify how work on their sites would maintain or improve the condition of Shelly Creek as an ecological system. In this context, the **'no harm rule'** would encourage persons with property interests to ensure that they understand how land use decisions may harm or help the stream.

Uses and Expectations: By understanding the stream as an ecological system, the community would ensure that several uses of the stream's ecological services to support nature and the constructed commons (land use infrastructure) would continue. These uses and expectations include:

- Protection of the hydrology that provides drinking water supplies (aquifer recharge) to wells and municipal systems.
- Protection of fish habitat.
- Conveyance of stormwater from local government drainage systems and local ditches.
- Continuation of the ecological aesthetics provided by the stream to Shellly Creek Park South and the surrounding neighbourhood.
- Protection of the stream as an amenity and providing riparian interest for users of the regional (Trans Canada) and City of Parksville trail systems.
- Protection and enhancement of the stream's riparian areas to maintain hydrology, attenuate flooding and aid climate change adaptation.

The Urban Portion of Shelly Creekshed

For many residents, Shelly Creek Park South is the landmark identity of their neighbourhood. Based on its growing use by pedestrians, dog walkers, hikers, and others, it seems to becoming a jewel in the regional trail system.

The EAP research process included interviews of local residents to obtain their views about the stream. Responses indicated expectations that the stream would be maintained (kept clean). For some respondents, the stream was a positive factor in their decision to purchase a home in the neighbourhood.

Use of the Creekshed in Shelly Creek Park South

Having the stream as a focal amenity of the park;

Enjoying the riparian environment and natural landscape for owners of abutting parcels;

Using the riparian corridor as part of the trails system;

Conveyance of stormwater from the local municipal drainage system; and

Provision of privacy and natural landscaping for parcel owners whose homes back onto the riparian area.

Middle Reach - View Looking Downstream

Community Investment in the Creekshed During the Past Decade (2010 through 2019)

The following summary is far from complete because some expenditures made by local government to maintain and/or manage the condition of the stream or assets affected by the stream are not specifically identified. Nor does it include expenditures by property owners, especially forest companies, which may benefit the condition of the stream and riparian zone.

Research	▪ Dumont J. 2017. Shelly Creek Water Balance and Sediment Reduction Plan - Technical Summary ▪ Dumont J. 2017. Shelly Creek Water Balance and Sediment Reduction Plan - Phase 1 Physical and Environmental Investigations ▪ Dumont J. 2017. Shelly Creek Water Balance and Sediment Reduction Plan - Phase 2 Computer Modeling and Assessment ▪ Hilsen W. 2014. Shelly Creek Geomorphic Overview and Conceptual Level Habitat Enhancement Program Development ▪ Stephens C. 2015. Lower Englishman River Wetlands Study ▪ Law P. 2016. Shelly Creek Stream Assessment and Fish Habitat Survey.
Public Processes and Plans	▪ City of Parksville Parks, Trails and Open Spaces Master Plan: Action Plan, 2019. ▪ Official Community Plan, Electoral G of the Regional District of Nanaimo, 2008. ▪ Plan Parksville: A Vision for Our Future, Official Community Plan, 2013. NOTE: *Some expenditures for these plans involved research and public consultation pertinent to streams in the region and City of Parksville.*
Remediation, maintenance, enhancement (operations)	▪ MOTI replacement of culverts and ditching ▪ MOTI protecting roads from stream undercutting ▪ City of Parksville Pubic Works, tree work at Shelly Creek Park South ▪ Parks, City of Parksville signage at Shelly Creek Park South and support of MVIHES to maintain riparian zone (see 2018 Climate Action Revenue Incentive Public Report) amount unknown ▪ Parks, City of Parksville planned trail work and installation of water crossings to protect riparian environment a Shelly Creek South ($100,000 budgeted for 2020 work) ▪ Stream maintenance by MVIHES $90,000 (based on Pacific Salmon Foundation rates: $20.00 labour (volunteer) and $25.00 supervisory hours. ▪ Stream management (enhancement) by MVIHES $110,000.

Total Creekshed Investment (2010-2020): The rough estimate of expenditures related to maintenance (or remediation) and management (or enhancement) of the Shelly creekshed during the past decade, including work currently in the Parks budget (City of Parksville) is $300,000.

Investment in the creekshed by type of expenditure:

Type of Expenditure	Proportion	Amount
Enhancement & Research	37%	$110,000
Maintenance	30%	$ 90,000
Parks Trail & Bridge Work	33%	$100,000
TOTAL INVESTMENT	**100%**	**$300,000**
Average Annual Investment		$ 30,000

Budgeting for Annual M&M of Shelly Creekshed

As an ecological system altered by historical land use, Shelly Creek requires maintenance and management.

Previous EAP research projects suggest that as a rule of thumb, at least 1% of the value of the natural commons of the stream should be expended annually.

In the case of Shelly Creek, parcels are worth (per lineal metre):

600 m at $1374/m = $824,400; and 1970m at $479/m = $943,360.

*Thus, a baseline annual expenditure for M&M would be about **$17,700**.*

*This amount compares with an actual annual investment of ~**$10,000** over the past decade.*

Calculation of the Financial Value of Shelly Creekshed as a Natural Commons

The following values were calculated for the length of Shelly Creek from the Englishman River confluence to the E&N railway alignment (Wildgreen Way), a total length of 2570 metres. Of that length:

- about 600 metres is urban; and
- 1970 metres is rural residential and agricultural.

Only the urbanized area of the stream has intact, although altered, continuous riparian area. In this reach the value of the *natural commons asset* is:

$1374per lineal metre and $173 per square metre

Estimate for Rural and Agricultural Parcels: Of 64 rural residential and agricultural parcels sampled, 30 included a portion of natural commons. A rough estimate of the value of *the natural commons asset* at these parcels is: $479 per lineal metre and $18 per square metre.

Natural Commons Asset: Application of the EAP methodology to determine the dollar values for the *natural commons asset* follows later in this section (on page 41). This methodology applies to streams with riparian area and some or normal functioning condition.

Social Contract Expectation: Most uses of natural and constructed commons are core services. Thus, there is a social contract expectation that maintenance and management (M&M) will take place to ensure that commons services will be available in the future. This implies that the assets are valued both socially and financially.

Valuation of Natural Assets

The Public Sector Accounting Handbook states that the "costs, benefits and economic value of such items cannot be reasonably and verifiably quantified using existing methods."

- Municipal Natural Assets Initiative

Valuation of Natural Assets: Local governments are able to demonstrate maintenance and management of constructed commons assets and services in annual budgets and records of departmental expenditures.

Residents and property owners get some information from their tax bills and property assessments about these financial outlays.

In the case of natural assets, on the other hand, there is scant information about financial outlays to maintain ecological services and protect the financial value of natural commons assets.

In fact, the Public Sector Accounting Handbook does not presently allow natural resources to be counted as 'real' assets.

BC Assessment Database

BC Assessment values are not appraisals.

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

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.

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 methodology used by BC Assessment separates land values from the worth of improvements.

Financial Value of the Natural Commons Asset: The EAP methodology defines the stream corridor as a land use and determines its financial value.

The stream corridor is comprised of the creek itself plus the required set-back area on each side of the stream. This is illustrated by means of a diagram on the next page.

The financial value of the corridor (i.e. natural commons asset) is based on the assessed land value of residential parcels which abut the stream. The methodology implies that if the stream did not exist, the land would be used for residential development.

Calculation of the financial value of the *natural commons asset* requires information on several variables. These are:

- a sample of parcels which abut the stream;
- land value of the parcels abutting the stream;
- the area of these parcels in m^2; and
- the area of the Natural Commons Asset as it occurs on the sample parcels: that is the stream at 3 metres plus the required set-back of 15 metres on each side.

For the urban portion of Shelly Creek, the calculations to describe the financial value of the *natural commons asset* follow in **Table 4** on the next page.

Financial Value of Non-Urban Lands: For comparison purposes the values of the rural residential and agricultural parcels in all samples of the non-urban parcels were:

	Average Value for the Whole Parcel	Average Value of Natural Commons Only
Agricultural	$24.82 per m^2	$12.41 per m^2
Rural Residential	$61 per m^2	$21.38 per m^2

These calculations reflect large parcel sizes and relatively small portions (areas of a parcel) within the *natural commons zone* (i.e. 15 metres from the high point of the stream bank).

Definition of the Natural Commons Asset

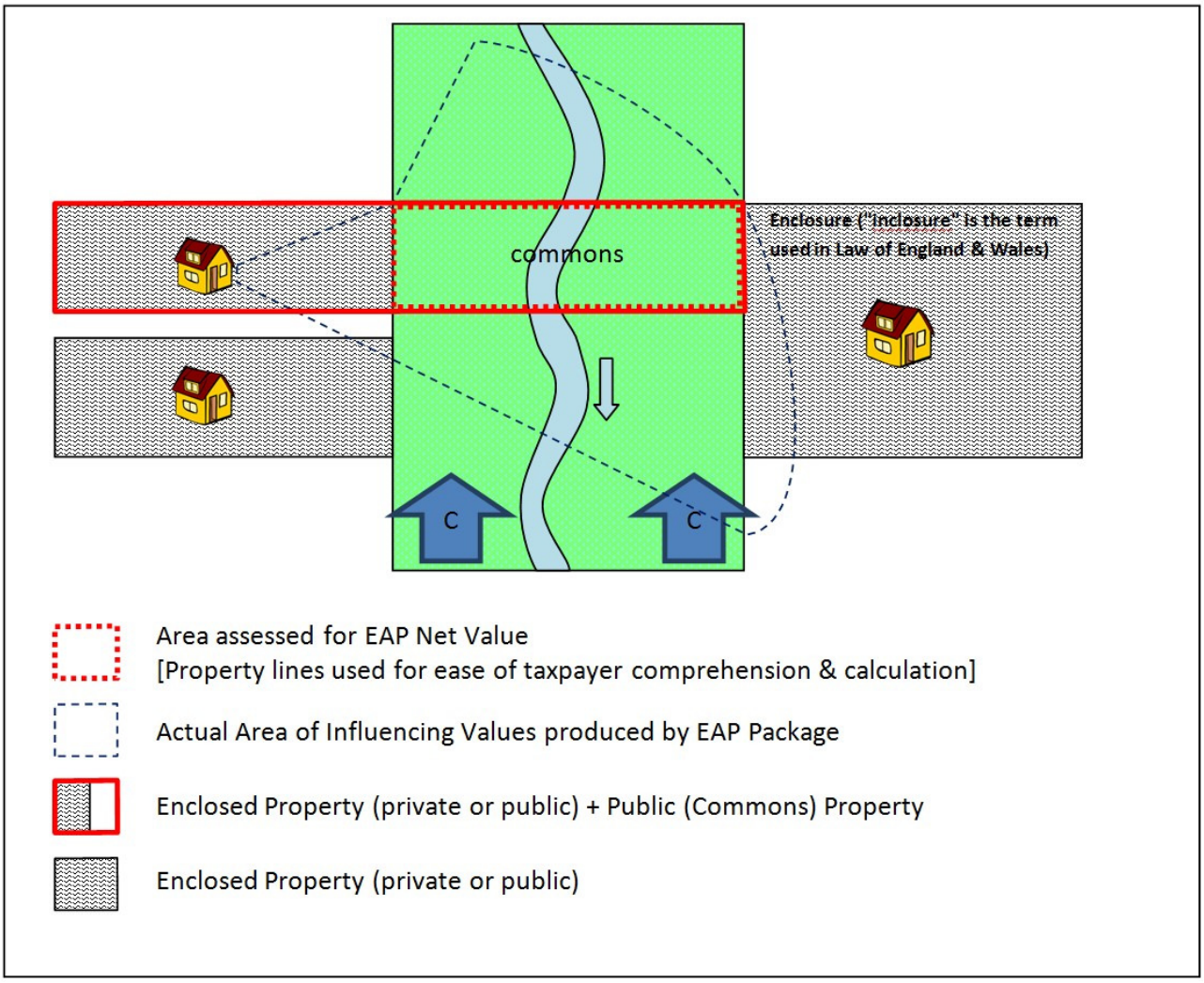
The natural commons asset is the area occupied by the stream, which is the creek at a nominal 3 metres wide plus required set-back areas of 15 metres on each side of the creek.

Stream Corridor is a Land Use

It is a land use since it can be measured in m^2 and has definition under various legislation (Riparian Areas Regulation Act, Water Sustainability Act, and local government bylaws).

This definition applies to the natural commons area asset only, not to the type of stream.

TABLE 4 - **Financial Value of the Natural Commons**



The financial value of the 'natural commons asset' in Urban Shelly Creekshed is ~$1374 per lineal metre and ~$173 per square metre. The calculation of each is:

Variables	Calculated Values
Total value (TV) of the abutting properties	= $13,293,000 (N=55 properties)
Total area (TA) of abutting properties	= 38,552m²
Value of abutting properties per m²	= $345 per m²
Area of properties (n=55) in the NCA	= 4775 m²
Percentage of TA (m²) that is in the NCA (m²) (4775 / 38,552) (N=55 properties)	= 12.4%
Value of NCA is $13,293,000 (12.4%) / 2	= 1,648,332 / 2 = $824,166
Value of NCA per m² ($824,166 / 4775)	= $172.60 per m²
Value of NCA per lineal m ($824,166 / 600 m length)	= $1374 per metre

Step Five: Impact of the Stream on Property Values

Scope of Step Five

Application of EAP involves five steps. In Step Five, **Impact of the Stream on Property Values**, we comment further on what we learned from the financial analysis in Step Four.

Our observations are limited to the parcels in the urbanized area of the creekshed. The research was unable to establish with any accuracy the portion of rural residential and agricultural parcels with in the riparian zone. Too often, the riparian qualities of the stream were severely compromised.

In this analysis of Shelly Creek, and in previous EAP research for three other creeksheds, the following conclusions emerge:

Variables that Influence Property Value

Area of the parcel.

Parcel morphology – steepness and vegetation.

Location of the stream.

Neighbourhood.

Where there is a functioning riparian zone, the stream has a positive influence on parcel values.
Where there is no functioning riparian zone, parcels adjacent to the stream exhibit assessed land values which differ very little from nearby parcels not adjacent to the stream.
In rural areas large parcels and agricultural acreages dominate. There is little research to describe the quality and extent of the riparian zone. Without information about the riparian zone, analysis of potential financial influences is not feasible.

Shelly Creek by the Numbers: On the next page, the information summarized in the table describes the samples used in the analysis of parcel values in Shelly Creekshed. To set the stage, the reader will recall that there were 148 parcels in the entire sample.

Abutting the stream....

The 55 parcels described as "adjacent to the stream" in the table were so defined because:

- *A portion of the parcel was within the riparian set-back area (15 metres from the stream measured from the "middle" of the stream as a 1 metre wide channel); or*
- *The parcel was adjacent to the continuous riparian area stretching from the stream to the boundary of the parcel; the distance had to be less than 100 metres; and*
- *Parcels adjacent to the extended riparian area rather than the stream itself were deemed to have 10% of the parcel area adjacent.*

The riparian zone has exerted a positive influence on parcel value in Shelly Creek.

The adjacent parcels are smaller in area (i.e. 17% less area), but have slightly higher parcel values per m² (i.e. 11%).

Portion of Creekshed	Number of Parcels	Defining Characteristics
Urbanized parcels around Shelly Creek Park South – 9% of the creekshed area	84	Where the subdivision occurred between 1998 and 2004
Rural and agricultural parcels – 89% of the creekshed area	64	Where most buildings (development) were constructed prior to 1990.

An additional 2% of the sample parcels were in the City of Parksville commercial area vicinity of Hwy. 19a and the Englishman River. These parcels (an additional 19) were not included in the analysis.

How the Variables Influence Property Values

Key data for the urban properties in the area surrounding Shelly Creek Park South (as shown on Map 2) are summarized as follows:

	Adjacent to the Stream	Not Adjacent to the Stream
Number of Parcels	55	29
Average Value	$241, 518	$262,655
Average Area (m^2)	702m^2	848 m^2
Average Value per m^2	$345 per m^2	$310 per m^2

Interpreting the uplift on property values for parcels adjacent to the park, green space and or riparian zone: These data tell us that purchasers have paid more per square metre to be near the riparian zone than those not adjacent.

One interpretation is that the developer could locate more lots near the riparian zone and obtain prices equal to or greater than those for parcels not adjacent. That is, lots might have been narrower in order to locate more per hectare. The data to examine this possibility was not assembled. **In any case, purchasers appear to have paid more to be adjacent to the stream**.

Map 2 (was introduced on page 7)

Contains information gathered from the City of Parksville. Cartographer: Ariel Verhoeks 2020

Questions posed by MVIHES define the issues for M&M of the Shelly Natural Commons:

What is causing the stream channel to erode and fill with sediment?

How can community action restore the stream's health?

From Awareness to Action Means:

"We recognize that there is a problem."

"This is what we will do about it."

Transition from Stop-Gap to Long-Term:

A goal is to "get it right" in the stream channel.

The challenge in "getting it right" is to move from stop-gap remediation of problems to long-term restoration of a properly functioning creekshed.

What Purchasers Were Buying: As in other case studies, the EAP found that purchasers of parcels which include set-back areas or abut ecological and park areas have paid more for their parcel that would have been the case for a nearby parcel not affected by proximity.

Purchasers of adjacent parcels at South Shelly Creek Park got 17% less land on average for prices similar to larger non-abutting parcels. What were they buying?

Like most buyers, those choosing adjacent parcels wanted to be in the neighbourhood. Unlike some buyers, they "paid more" (obtained less land) in exchange for amenities such as privacy, natural landscape, having birds and animals nearby, quiet, and so on.

A final word on the advantages of maintaining and managing riparian areas: The fate or condition of Shelly Creekshed will improve in important ways due to the work of MVIHES and MABRRI (non-government organizations) and RDN DWWP (non-regulatory initiative). Fortunately, other Vancouver Island streams also are in the care of stewardship groups. The EAP analysis of Shelly Creek and other streams has reached key observations about these cases.

Non-profits attract considerable expertise (among their volunteers and collaborators) and funding for the work they do. Typically, they are very strong collaborators and willing partners with local government.

Their focus on streams considers its importance as an eco-system. An ideal outcome of their efforts would be to knit together again into a riparian ecosystem streams that typically have become a series of riparian zones. These zones are a result of historic ignorance about the impacts of land use modification of soils, vegetation, stream alignments and the very hydrology that powers ecological services.

A Look Ahead: As this stewardship work is recognized for its practical and research values, the eco-system perspective will gain understanding. The purpose of the EAP is to present the social, financial and ecological arguments to maintain and manage streams and other natural commons assets.

Finally, it is worth observing that as members of the community appreciate that streams are an ecosystem, concern will grow about how land owners near the stream are causing harm or avoiding harm. The stream is a commons and it has shared values. **Causing harm creates a financial liability for other property owners and the community at large.**

Summary of What the Reader has Learned About EAP

Foundational Concepts for Maintenance & Management (M&M) of Ecological Assets

Six foundational and cascading concepts underpinning the EAP methodology are summarized below, and provide a mind-map:

Maintenance, Management and Worth

The starting point for application of EAP is recognition that local governments have existing tools in the form of policies and legislation for 'maintenance and management' (M&M) of ecological assets within riparian corridors.

Until now, however, what local governments have lacked are a pragmatic methodology for financial valuation, and meaningful metrics that go to the heart of sustainable service delivery. EAP provides metrics that enable communities to appreciate the worth of ecological assets.

Maintenance versus Management – Maintenance is about preventing or avoiding degradation, whereas management is about improving the condition of the ecological asset. This is an important distinction. The M&M acronym is a starting point for encouraging practitioners to think holistically about the relationship between hydrology and ecology.

Whole-System Approach – We are looking at a system. Without an ecological system, there are no ecological services. Therefore, it is imperative to understand the system as a whole. Everything is connected.

Natural Commons and Constructed Commons – It is not yet well-understood that these are parallel concepts and of equal importance. Every urban creekshed comprises a constructed commons (roads, utilities, etc.) and a natural commons (streams, riparian corridors, etc.) Each commons is a system. The commons concept is the lynch-pin for EAP.

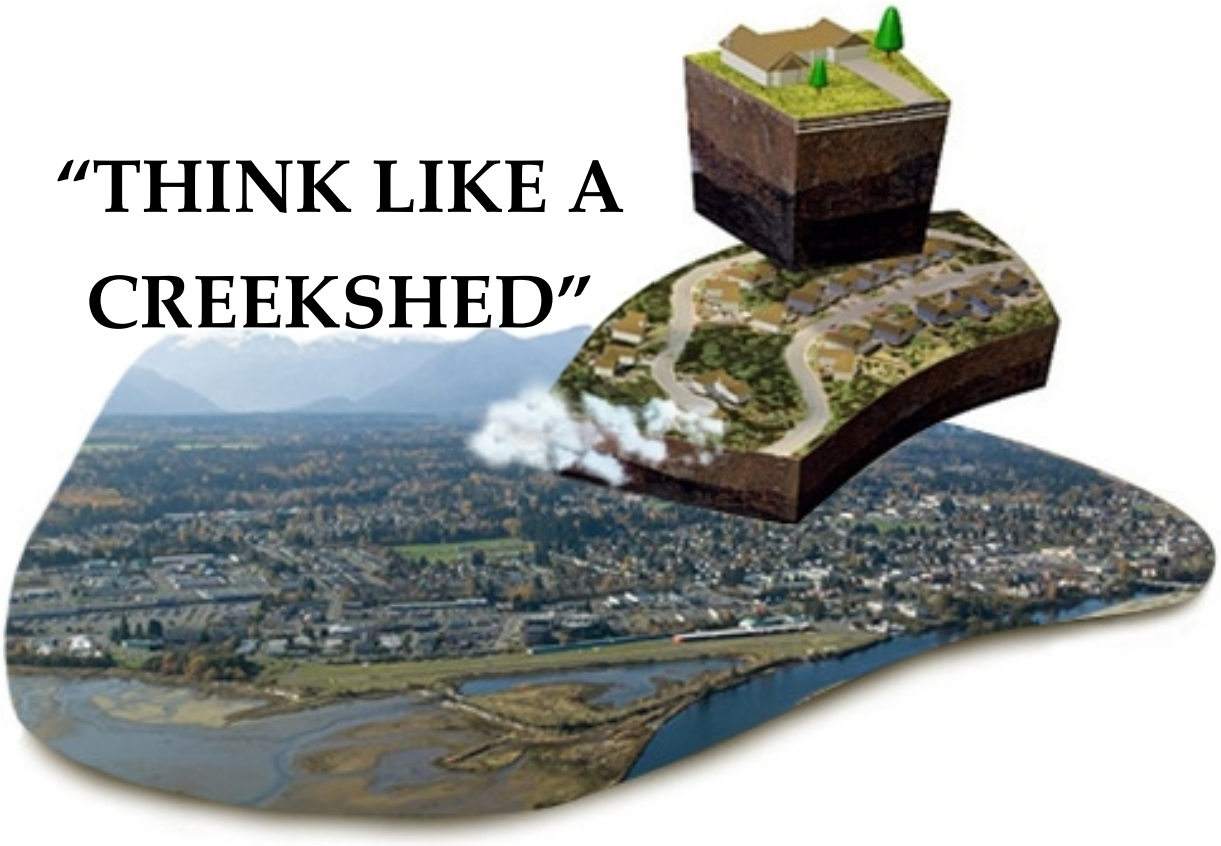
Package of Ecological Services – This concept refers to the combined range of uses desired by the community. Three key words capture the essence of what we mean by 'range of uses' – **drainage, recreation** and **habitat**. These three words immediately conjure a word picture in the reader's mind. They are visual. They make real what is an abstract concept to most people. Thus, a strategic plan that supports this diversity within the natural commons will appear worthwhile to the greatest number of interested parties.

A Stream is a Land Use – This is a novel yet intuitively obvious way of characterizing a stream and its riparian corridor because streams in settled areas meet this litmus test for a 'land use', and that is: they have a defined area in legislation; and measurement of their financial value can be calculated using BC Assessment data.

Dollar Value of the Natural Commons – The extent of use and investment in M&M indicates what neighbouring residents and the community as a whole think ecological assets are worth – which is defined as 'value in use'. Looking through the 'worth' lens, and utilizing financial information supplied by BC Assessment as a proxy, the EAP methodology assigns a dollar value to the land occupied by the natural commons (stream corridor).

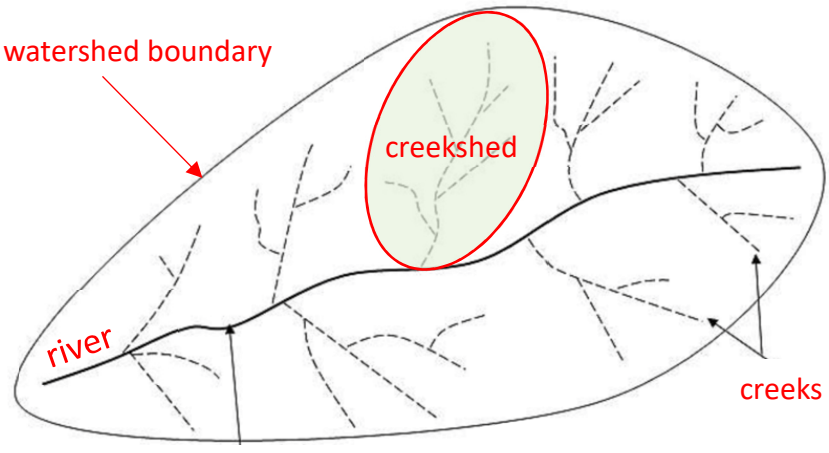
A program deliverable for *Sustainable Watershed Systems, through Asset Management.*
Implemented under the umbrella of the Georgia Basin Inter-Regional Education Initiative

"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
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