



the partnership
for water sustainability in bc

Brooklyn Creek,
Comox Valley

Busy Place Creek
(Sh-hwuykwsele),
Cowichan Valley

Primer on the Ecological Accounting Process (EAP)

*A Methodology for Valuing the 'Water Balance
Services' Provided by Nature*

January 2019

Note to Reader:

This publication is the 7th in the Partnership's "Beyond the Guidebook Primer Series".

To download a PDF copy of this Primer, as well as any of the others in the series, visit the Rainwater Management community-of-interest on the waterbucket.ca website at:

https://waterbucket.ca/rm/category/british_columbia_guidance_documents_context/beyond-the-guidebook-primer-series/

Or go directly to the following link:

https://waterbucket.ca/rm/wp-content/uploads/sites/5/2019/01/Primer-on-Ecological-Accounting-Process_Jan-2019_low-res.pdf

Acknowledgement: Cover image is from "Visible Earth, A catalogue of NASA images of animations of our home planet" (Credit: Jeff Schmaltz)

Primer on the Ecological Accounting Process (EAP)

What the Reader Will Learn

Demonstration applications of the Ecological Accounting Process (EAP) for small watersheds (creeksheds) in the Cowichan and Comox valleys have enabled the Partnership for Water Sustainability to achieve this outcome:

Develop a methodology to value the ecological (or ‘water balance’) services provided by nature. Prove a methodology which describes what the community may think specific ecological services are WORTH and calculate the financial value of the land underlying the natural assets (e.g. a stream that provides the desired ecological services).

The EAP demonstration application process has been a fruitful journey for the project team and collaborators. Along the way, our collective thinking evolved. Insights and understanding that we gained are shared herein.

We had conversations with collaborators and stakeholders. We heard what was on their minds about ecological (water balance) services in the study areas. Their views of opportunities and risks led us to key insights:

- *Residents and the community use ecological services to enhance parks and trails, to keep nature accessible; and*
- *They know that these amenities are part of the community, and that it is worthwhile to invest in managing and maintaining them.*

*These insights led us to look at creeksheds differently: View choices through the **worth lens** if one wishes to motivate communities to implement “design with nature” solutions that restore creekshed function.*

We broke new ground with EAP. Traditional approaches and practices are not leading to restoration of creekshed function. EAP is an alternative approach, has potential as a catalyst for action, and is keyed to this way of thinking:

What do we want this place to look like in 50 years?

What steps are necessary to make it happen?

How do we decide how much to invest in restoration?

We landed on the notion of the ‘natural commons’ as the starting point for calculating the financial value of a stream bed and riparian corridor. The EAP valuation methodology uses readily available financial information from BC Assessment, and yields an asset value for the stream corridor that can then be used for budget purposes.



Tim Pringle, Chair
Ecological Accounting Process (EAP) Initiative
January 2019

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About the Partnership for Water Sustainability

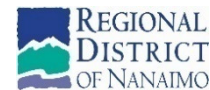
The Partnership for Water Sustainability in BC is a legal entity, incorporated in 2010 as a not-for-profit society, and delivers services on behalf of government. It originated as an inter-governmental partnership, formed in 2002 to fund and develop the Water Balance Model as a web-based decision support 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, is the hub for a "convening for action" network in the local government setting, and is responsible for delivering the Action Plan program through partnerships and collaboration. This program includes the **Georgia Basin Inter-Regional Education Initiative**.*

*The Partnership for Water Sustainability plays a bridging role between Province, local government and community; and is the steward for **Stormwater Planning: A Guidebook for British Columbia**, a provincial guidance document released in 2002.*

Regional Districts supporting the IREI



Educational Goal

Build practitioner capacity within local government to implement a whole-system, water balance approach branded as ***Sustainable Watershed Systems, through Asset Management***.

Inter-governmental collaboration and funding enable the Partnership to develop approaches, tools and resources; as well as provide teaching, training and mentoring.

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The Purpose of EAP – The Why	EAP defines natural assets as the hydrology of a creekshed and the ecological (water balance) services dependent on that hydrology. EAP uses ‘real numbers’ to inform the decision process for asset management.	8
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10 key messages to remember about EAP and how communities decide how much to invest in creekshed restoration

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** – 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.

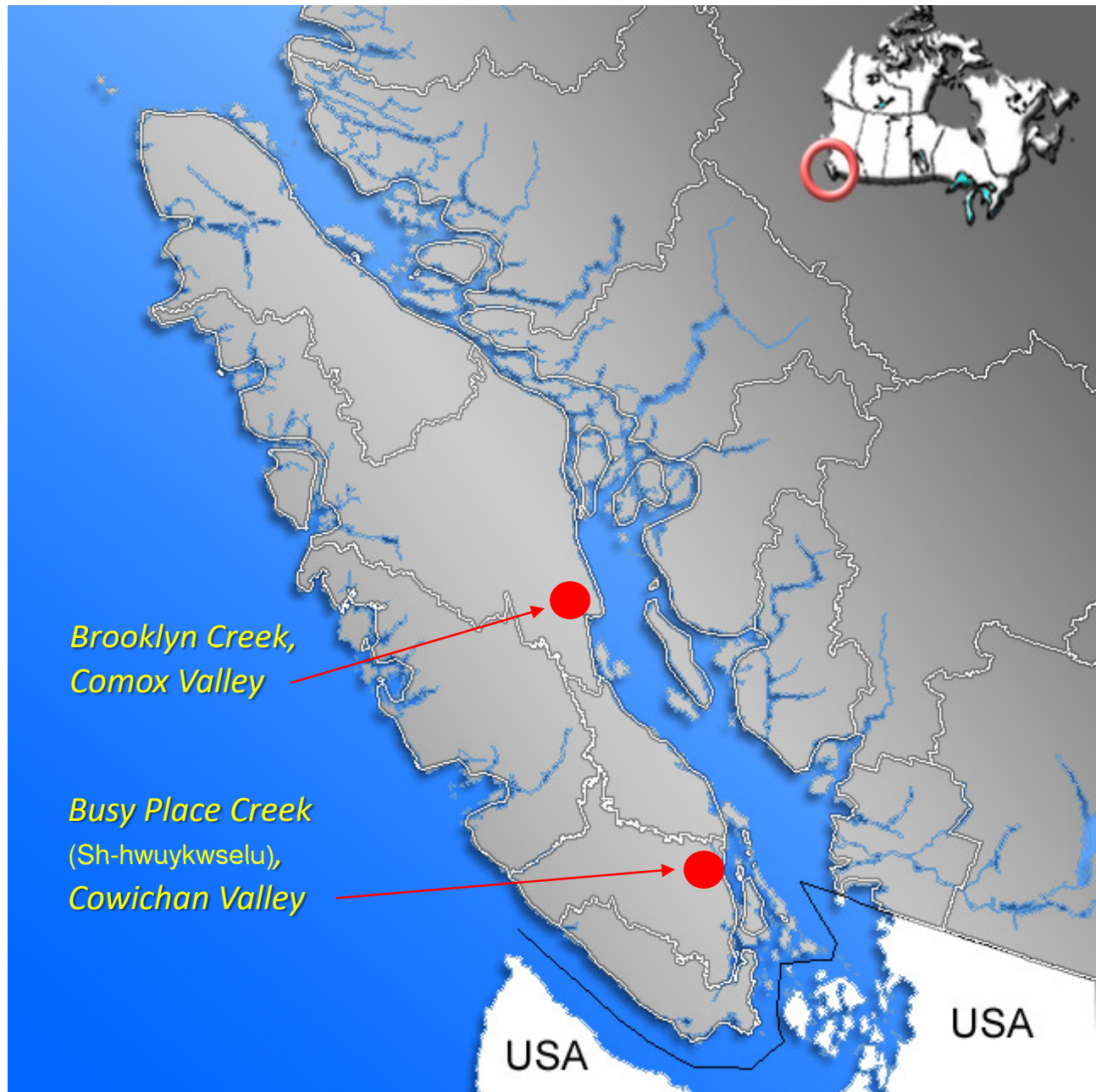


IMAGE SOURCE: https://commons.wikimedia.org/wiki/File:Vancouver_Island_contour_map.png

Vancouver Island Demonstration Region

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

Vancouver Island Demonstration Region

Towards Sustainable Watershed Systems

Call to Action / Context for EAP:

The rhythms of water are changing in British Columbia. What happens on the land in the creekshed matters to streams – thus, the time has come to reconnect hydrology and ecology.

*While BC communities may not be able to restore lost biodiversity, they can certainly halt its decline and consciously direct efforts into bending the trend-line in an upwards direction, that is: “**make where we live better**”.*

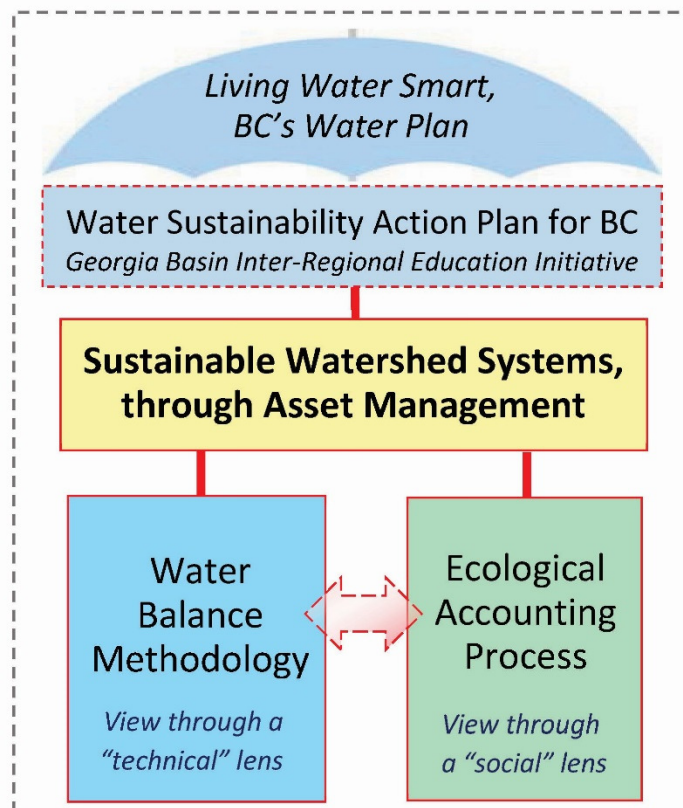
Living Water Smart, BC’s Water Plan:

*In 2008, “Living Water Smart, British Columbia’s Water Plan” was the Province’s call to action, and to this day transcends governments. The vision: **we take care of our water, our water takes care of us.***

Funded by the governments of Canada and BC, the capacity-building program branded as *Sustainable Watershed Systems, through Asset Management* is designed to inform and educate local governments and others about the whole-system, water balance approach. The program has **twin pillars**, and they are interconnected:

- **Water Balance Methodology**
- **Ecological Accounting Process (EAP)**

Demonstration applications for small creeksheds in the Cowichan and Comox valleys have been undertaken by the Partnership to show how local governments would apply EAP to understand what the ‘water balance (ecological) services’ provided by nature are **worth**. These first two applications are Stage 1 of a multi-year effort to test the EAP concept, refine the methodology, and demonstrate transferability.



The Twin Pillars of Sustainable Watershed Systems

Hydrology is the Engine that Powers Ecological Services

Look At Watersheds Differently:

*View choices through the **worth lens** if the goal is to motivate communities to implement ‘design with nature’ solutions that restore creekshed function.*

A Catalyst for Decisive Action:

Traditional approaches and practices are not leading to restoration of creekshed function.

Because it is based on real numbers, EAP has potential to underpin decisions which lead to action that restores ecological (water balance) services.

Mind-Map for Creating a Desired Future:

What do we want this place to look like in 50 years?

What steps are necessary to make it happen?

How do we decide how much to invest in restoration?

The EAP Approach

EAP looks at an entire watershed at the catchment and/or creekshed level. **By reviewing historical land use impacts, it ascribes changes to the overall hydrology.** It applies the **Water Balance Methodology** as the analytical tool to assess the current conditions of the hydrology. This analysis provides information needed to achieve two outcomes:

- understand the current functioning condition of dependent ecosystems; and
- propose maintenance and enhancement strategies.

The technical focus of EAP is on creekshed hydrological conditions and the dependent ecological (water balance) services provided; and which sustain natural systems and human settlement.

The social focus of EAP observes the uses that residents and community make of local ecological services which are drawn from the natural commons.

Why EAP is Useful: The goal of EAP is to establish:

- What the definable benefits of ecological services derived from creekshed hydrology are.
- What they may be worth to residents and the community.
- How they may be maintained and enhanced to function in near optimal condition.

This goal is completely compatible with official plans. Thus, EAP looks at the history of intervenor initiatives because this helps understand this aspect of human nature: “*what is this worth to me / us?*”

Who Would Use EAP: The Ecological Accounting Process would contribute to a range of resident and community interests and needs. In particular, EAP would help managers determine whether or not they should change practices and adopt new strategies regarding the ecological systems in the stream corridor and riparian zone, and throughout the entire creekshed.

Taking action, however, would depend on what they think the creekshed is worth. Participation in a management regime that integrates stakeholder effort in all creekshed areas would be a crucial step in enhancement and maintenance efforts.

The Point of Departure for EAP

Key to the EAP approach is the idea that every urban creekshed comprises a **constructed commons** and a **natural commons**. Moreover, the built and natural environments merit equal valuation. This mind-map provides a 'point of departure' for the EAP approach.

Constructed Commons:

*Communities rely on a range of services such as schools, 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.*

Natural Commons:

*Communities also use and rely on numerous services provided by another type of commons: **natural assets**. The natural commons host ecological services such as stream systems, wetlands, riparian zones and natural habitat.*

Constructed Commons: There is a bias in the way communities have accounted for land development over time, and this bias favours constructed works. As a result, assets considered as capital appear in the financial statements of local governments. In addition, monies raised by taxation and expended for works are recorded in detail.

Natural Commons: Although the natural commons provides many services desired by communities, their worth does not appear in financial statements. Even the idea of a natural commons is unfamiliar to the public. **EAP brings the natural commons into focus.**



An Urban Creekshed has Two Parallel Systems: If communities wish to see a greater use and protection of the *natural commons*, **through maintenance (prevent degradation) and management (enhance) of ecological services**, then a way is needed to get a financial value for the natural commons in front of the public - so that they understand what matters. To this end, the EAP process looks at the *value of the lands* that underlie the natural commons, and the worth of the services they provide.

Both the constructed commons and the natural commons are systems. A community occupies a landscape defined by road and drainage systems, land use zoning, buildings, institutions, etc. The configuration usually is not congruent with the watershed systems which underlie it. The critically important 'water balance (ecological) services' of the natural commons depend on the functioning condition of the hydrology of a watershed.

Introduction to Demonstration Applications

The capsule summaries presented later in this document provide a high-level picture of what was learned from the two EAP demonstration applications on Vancouver Island. Comprehensive and detailed, the individual reports assess the worth of ecological services using EAP. As supporting references, the two reports provide the interested reader with a deeper understanding of the analyses and findings.

Existing Conditions:

Brooklyn Creek and Busy Place Creek (Sh-hwuykwsele) are small creeksheds whose hydrology and ecological (water balance) services have been altered and degraded by decades of land use impacts.

Creekshed Lenses:

Local governments, First Nations, and community, businesses and other stakeholders have divergent views about what the ecological services of the creeksheds may be worth.

Creekshed Context: Each EAP demonstration application is characterized by a multi-jurisdictional reality as described below:

- **Brooklyn Creek Demonstration Application in the Comox Valley**¹ – there are three local governments, namely the Town of Comox, City of Courtenay and Comox Valley Regional District; as well, the Ministry of Transportation and Infrastructure (MOTI) shares jurisdiction with the regional district.
- **Busy Place Creek Demonstration Application in the Cowichan Valley**² – there is one local government, namely the Cowichan Valley Regional District, and it shares jurisdiction with MOTI; as well, it is relevant and important that the Cowichan Tribes have land holdings at the top and bottom of the watershed, and express a strong social connection to the creekshed.

A key message is that the creeksheds are viewed through multiple lenses, and these differing perspectives need to be synthesized to achieve lasting maintenance and enhancement objectives.

Creekshed Lenses: The EAP analyses have established that:

- **Brooklyn Creek:** The intervenors involved in management of the three catchments have very different views of the worth of its ecological systems, in large part because of the differing nature of land use, and this is reflected in how each catchment is maintained.
- **Busy Place Creek:** Known also by the Coast Salish name, *Sh-hwuykwsele*, this creekshed offers a rare opportunity to interweave Indigenous knowledge and Western science in building a strong collaboration around the focus of hydrology.

Within both creeksheds, the stewardship sector is showing leadership through involvement in enhancement and remediation projects.

¹ For Brooklyn Creek https://waterbucket.ca/gi/wp-content/uploads/sites/4/2018/12/Comox-Valley_Brooklyn-Creek-EAP_Sep2018_low-res.pdf

² For Busy Place Creek: https://waterbucket.ca/gi/wp-content/uploads/sites/4/2018/12/Cowichan-Valley_Busy-Place-Creek_EAP_July2018_low-res.pdf

What We Learned: A Synopsis

The two EAP Demonstration Applications could not have proceeded without the involvement and consultation of collaborators. These included stream-keeper organizations, First Nations participants, local government departments, local Ministry of Transportation and Infrastructure representatives, and knowledgeable individuals.

Key Findings: The essence of what we learned as an outcome of undertaking the two EAP Demonstration Applications is distilled into a succinct set of statements as follows:

Aesthetic Values refers to uses that are accessible to the community:

Examples of commons use include natural features in parks, along greenways and other commons areas, natural areas (the stream and riparian zone) including urban woodlands, bird habitat, salmon spawning sites, ponds, wetlands, etc.

Singular use includes property owners whose proximity to the stream adds to enjoyment of their property and, likely, an uplift on the financial value of the property.

1. The EAP Demonstration Applications illustrate how residents and the community may recognize and use ecological services supported by the hydrology and stream system of a local creekshed.
2. Historical land uses have degraded the functioning condition of the hydrology and stream in settled areas. The extent of present-day use and investment in maintaining and managing a local creekshed indicates what residents and the community think these ecological assets are **worth**.
3. The concept of worth revealed that residents and the community relate to a **package of ecological services**; that is, several kinds of socially important value provided by the stream (as defined in the Riparian Areas Protection Act Regulations). And these are:
 - **Intrinsic Value:** refers to support of natural systems - terrestrial and aquatic life.
 - **Aesthetic Values:** refers to uses accessible to the community in **common use** as well as **singular uses** by residents (refer to sidebar for examples).
 - **Infrastructure Values:** refers to uses of the land and stream as an integrated system for detention and infiltration of rainwater, attenuation of potential flooding, as well as use of the stream for conveyance of discharges from storm sewer outfalls, which reduce capital expenditures for engineered works.

The limitations of the two EAP Demonstration Applications are recognized as follows:

The theory of EAP evolved over the course of the two projects.

The two applications included significant rural or semi-rural areas in the creekshed.

The content of the EAP resulted in reports that are rather “technical” for many readers.

Consultation with collaborators suggested that for some, technical versions would be useful.

4. The EAP Demonstration Applications also led to the realization that attempts to place a specific financial value on ecological services was not feasible and would not have indicated what the community thinks such services may be worth.

This is not to say that the field of research leading to imputed financial values of natural assets is not important. Rather, it is more useful for local communities to adopt an approach based on the current creekshed conditions and the public’s awareness of what this means for the availability of ecological services.

5. As the theory of EAP evolved over the course of the two demonstration applications, however, the understanding of what matters led to development of a methodology to determine the financial value of the land under the stream and riparian zone.

This is called the **natural commons asset value**. The logic is that these lands would be used for another settlement purpose if not occupied by the stream.

The approach has the advantage of using readily available financial information supplied by BC Assessment Authority for land values, parcel by parcel. By calculating the financial value of the natural commons asset, local governments will have a **proxy statement** (capital asset value) that could be used for budget and planning purposes.

6. The EAP Demonstration Applications also led to several succinct realizations:

Creekshed hydrology is the engine that powers ecological services. Successful, long-term strategy and plans to maintain and manage ecological services must involve conditions of the entire creekshed.

BC Assessment financial information of land values includes the influence of the ecological commons. Buyers and sellers of property take into account the location of a parcel in relation to parks, greenways, natural areas, etc. Typically proximity is an influential factor in relation to the transaction price of a parcel.

The Ecological Accounting Process does not require special competence. It can be applied by local government and community collaborators.

Look at Creeksheds Differently:

“We listened. We heard what they said. They got us thinking about what we had learned. The process yielded four defining conclusions,” says Tim Pringle.

A Process, Not a Protocol:

Testing EAP through two demonstration applications resulted in this finding: EAP is a process, not a protocol.

Worth versus Value:

Looking through the ‘worth’ lens led to a fundamental shift in approach, one that is in contrast to the use of ‘imputed’ values.

Maintenance vs Management:

*Maintenance means **prevent degradation**; Management means **enhancement of ecological services**.*

Natural Commons:

The ribbon of setback areas on each side of the stream together with the land under the stream.

What Collaborators Told Us

“Collaborators in the demonstration application process told us what was on their minds about ecological services in the two creeksheds,” reports Tim Pringle. EAP Chair and project team leader.

“Community members and intervenors have selective awareness about the ecological services of creeksheds:

- some want aesthetic influences for parks, trails, greenways, urban forests and residential parcels;
- others want to see salmon;
- public works needs the conveyance capacity as part of the Town's rainwater drainage system.

“Few individuals understand the connection between the hydrology, especially upland, and the functioning condition of dependent ecological systems.”

Need for a Strategy / Implementation Plan: “In the Town of Comox, for example, collaborators would like to see enhancement of the entire creekshed, but they don't know much about what it costs for improvements or maintenance. Only the Town's Parks and Public Works departments have a feel for that type of information.

“Key collaborators do realize, however, that making improvements to hydrology and ecological services requires a strategic plan - one that managers in local governments and MOTI would share; and one that would include the stewardship community. They also get it that improvements must occur throughout the creekshed.

“They also want to understand what the creekshed is worth in order to manage it successfully,” observes Tim Pringle.

What Next: “By providing a value for the land underlying the stream and riparian zone, collaborators would have a much more realistic idea of the worth of the ecological services supplied by environmental assets.

“The next step is doing. **A strategy is the path to success**, and becomes our primary interface with the world. Find the leadership and opportunity within a creekshed to adopt a strategy, devise an implementation plan, and confirm the worth of undertaking enhancement and management,” urges Tim Pringle.

The Purpose of EAP - The Why

Living Water

Smart provides the B.C. Government's vision for sustainable water stewardship and sets the direction for changes to water management and water use.

These changes are crucial for adapting to climate change impacts and the pressures placed on water resources from a growing population and economy.

Source: Ministry of Environment website

BC Framework

states that “Assets are the physical infrastructure owned by local governments to enable service delivery.... Assets may also include natural resources and the essential ecological functions that nature provides.”

Source: page 8

Provincial Context

Provincial authorities charged with oversight of local government ability to provide sustainable infrastructure have identified the need for measures to devise, adopt and follow asset management strategies.

The Ministry of Municipal Affairs offers services to local government concerning planning and infrastructure, and together with the Union of BC Municipalities, co-chairs Asset Management BC. The latter is the lead for this provincial initiative: [Asset Management for Sustainable Service Delivery: A BC Framework](#)³.

The Ministry of Environment directed communities along a similar path when it launched the Living Water Smart initiative in 2008. This strategy requires knowledge about the condition of natural assets supporting hydrology and the dependent ecological (water balance) services. Ensuring supply of potable water and increasing conservation of supplies are among the objectives of the strategy.

These directions are captured under the focus: Sustainable Watershed Systems, through Asset Management.

How Does EAP Fit In?

Asset Management BC intends that “natural assets” (undefined) will be included by local governments in their Asset Management strategies and plans. EAP provides a method to include natural assets. Inclusion requires definition and measurement.

EAP defines natural assets as the hydrology of a watershed and the ecological services dependent on that hydrology.

Communities expect many services to be available from “nature” in their neighbourhoods. These natural commons include woodlands, wetlands, ponds, streams, riparian areas, salmon and fish-bearing conditions, etc. Usually, communities want these assets to add aesthetic appeal to parks, trails, natural areas/woodlands, and the opportunity to view fauna and flora in their natural conditions.

³ http://waterbucket.ca/wscblog/files/2015/01/Asset-Management-for-Sustainable-Service_Delivery_A-Framework_for_BC_Dec-2014_short-version.pdf

Community Expectations:

Communities expect services to be available from “nature” in their neighbourhoods. They also expect that local governments will protect the hydrology engine and thereby prevent flooding, inconvenience and failure.

Valuation of Natural Assets:

*In the absence of a standard method of measurement, **analyze the actions of communities** to find out what residents think natural commons assets are worth.*

Worth & Financial Value:

EAP focuses on wetlands, ponds, streams and riparian areas because these natural features provide the services desired by local communities.

Hydrology is the Engine that Powers Ecological Services:

Communities also expect the hydrology to recharge aquifers, support the functioning condition of wetlands, streams, ponds, riparian areas. Additionally, there is the expectation that flows from storm sewer systems and roadway ditches will be carried away to streams and ultimately discharge into the ocean.

Communities expect these services (natural commons assets) to be managed, at least to the extent that flooding, inconvenience and failure will be avoided.

Where natural conditions have not been severely impaired, rainfall is intercepted and detained by vegetation and soils; it infiltrates and gradually moves to lower elevations, contributing to streams and groundwater.

This process supports a number of ecological services important for terrestrial and aquatic life, as well as uses desired by local communities. The Water Balance Methodology (WBM) is used to analyze the functioning condition of a watershed.

Restore Hydrology to Sustain Ecology: Historical land use practices have degraded the basic processes of creekshed hydrology and the dependent ecological services. The WBM helps to identify restoration and enhancement options that may be implemented using green infrastructure and *design with nature* practices. These are measures that mimic the natural movement of rainfall and watershed function.

While the WBM provides the technical assessment of the condition of the hydrology of a watershed or creekshed, EAP enables understanding of the social perspective on the worth of the ecological services provided by the stream.

Are ‘Natural Commons Assets’ Measured in Terms of Worth and Dollar Value?

No common or standard method exists to measure the financial value or worth of services related to the natural commons (ecological assets). Nor is the land devoted to them given a consistent dollar value. Consequently, maintenance and management is irregular; that is to the extent that it occurs, the activity is based on local experience and practice.

Yet residents use and enjoy ecological services as important amenities (streams, features in parks, natural areas, etc.), thereby demonstrating that they are worthwhile.

Worth refers to local government and community use and investment in ecological services and the maintenance (avoid degradation) and management (enhancement) activities that take place.

Stakeholder Decisions about Worth:

EAP looks at the history of stakeholder initiatives. These are a measure of stakeholder understanding of ecological services and what they may be worth.

This perspective enables EAP to emphasize what the measures it proposes may offer in terms of:

- **environmental stewardship** (protecting natural systems),
- providing **drainage functions** and other infrastructure needs of human settlement (social and aesthetic),
- protecting **property values**, and
- opportunities to reduce **liability** (loss of function and capacity) stemming from environmental degradation.

Need for a Method to Determine the Worth and Financial Value of Ecological Assets

One can analyze the expenditures made over time to maintain and manage the natural commons (ecological assets). These expenditures are made to ensure desired usage of the ecological services.

- **Maintenance refers to avoiding degradation.** In the present time, most maintenance is related to dealing with problems such as clogged ditches, invasive species, erosion, debris blockages in a stream, dangerous trees, etc.
- **Management refers to improving the condition of the ecological asset.** Examples include increasing wetland areas to improve retention and infiltration, restoring a stream channel by putting winding back in, increasing the amount of riparian native vegetation, installing riffles, etc.

Community investment in maintenance and management reflect *worth*.

Understanding Financial Value: While worth provides a view of community commitment to protecting and using services based on ecological assets, it is always a conditional measure; it pertains to a specific situation. A more replicable measure is needed to assist strategy development.

- **When Riparian Areas Protection Regulation was introduced** in British Columbia, for example, it recognized the universal importance of the riparian zone associated with streams, wetlands and other water-related ecological assets. The regulation confirms the intrinsic value of streams.
- **Set-back areas along streams are defined and included in local government bylaws.** These measures reflect provincial regulation and identify stream and sensitive environmental areas occurring in the local natural commons.

EAP uses the following method to calculate the financial value of the land underlying the stream and adjacent set-back area.

Use of Real Numbers for Decision Making:

EAP deals with real numbers which practitioners need to devise Asset

Management strategies and implementation plans that achieve Sustainable Service Delivery outcomes.

There are two sources of numbers:

The first are the expenditures made to maintain and manage ecological assets that stakeholders want to enhance parks, trails, greenways, etc. to lift up property values, to provide stormwater conveyance, and so on.

This is Worth.

*The second source is the assessed value of lands that underlie ecological assets such as a stream corridor. It also includes privately-owned lands subject to set-back provisions required by the Riparian Areas Protection Act Regulations. ***This the dollar value of the Commons Asset.****

Calculating Financial Value: How can the ecological services /assets that residents and property owners enjoy in the context of a creek and riparian area be given a dollar value?

Specific and Distributed Concepts: The worth perspective reflects the specific and distributed views/expectations of community members about using/enjoying these assets.

- **Specific:** The owner of a residential property that abuts a creek enjoys the amenity aspects (flora, fauna, shade, privacy, etc.) and, likely, an up-lift on the property value.
- **Distributed:** Community residents expect to have park facilities, trails, greenways in their community. They want to use and enjoy these amenities – probably with some awareness that the nearby riparian and creekshed environment makes them appealing.
- **Distributed:** The local government likely uses the stream for conveyance of rainwater collected from storm sewers.

Implicit in these expectations about worth, is some level of confidence among property owners and residents that these assets are maintained and managed.

Real Numbers: While these assets have a number of potential worthwhile uses, they do not appear on the asset statement of the local government as financial values. However, the means to reach a dollar value exists.

It involves using BC Assessment information regarding the land value and *Riparian Areas Protection Act Regulations* to define the area of land occupied by the riparian zone and creek corridor. This is the regulatory setback and the land under the stream.

Natural Commons Asset Calculation: Taken together, the stream corridor and riparian zone are part of the Natural Commons. They are referred to as the commons asset in the following calculation:

- Obtain the assessed value and area of properties that abut the stream (or other ecological asset).
- Determine the area of each property that lies within the required setback (defined by local government bylaws or Riparian Areas Protection Act Regulations) as a ratio of the total area of each lot. The boundary of each property ends at the high-water mark of the stream.



Marvin Kamenz

Municipal Planner
Town of Comox

Marvin Kamenz coined the term "**package of ecological services**" to describe the many advantages the community expects to receive from a creekshed now and in the future:

"The Ecological Accounting Process (EAP) focuses on the worth of ecological services to residents, rather than their imputed value. Thus, worth deals with real numbers which local governments need to deliver outcomes.

"The worth of a creekshed is defined as a package of ecological services made possible by the hydrology. Looking through the 'worth lens' proved transformational."

- Take the stream at a nominal width – say, for example, 3 metres.
- Calculate the financial value of the portion (in the set-back area) of each abutting property and the land under the stream at the same per-square-meter value as the abutting properties.
- In view of the shared and distributed expectations of the use of the ecological services (assets), take the Commons Asset financial value at 50% of the calculation.

Refer to page 17 for details of the Commons Asset Calculation.

Worth is 'Value in Use' (Returns for Expenditures)

Residents, local government departments, streamkeepers and other intervenors want their parks, greenways and trails enhanced by the aesthetic qualities of the stream and its riparian features. Opportunities to enjoy natural areas and see salmon spawning are prized; and the conveyance of rainwater from local storm sewers is essential to the drainage infrastructure.

EAP focuses on **worth** – that is, *value in use* – rather than market value, which is *value in exchange*. Worth refers to likely returns for expenditures. Furthermore, an over-arching / paramount finding is that:

The worth of a creekshed is a package of ecological services made possible by the hydrology, and enjoyed as natural commons.

Looking through the 'worth lens' proved transformational in the process of carrying out the two Vancouver Island demonstration applications. It led to a fundamental shift in philosophy regarding how best to value natural commons assets.

Investment of Resources: A key observation is that less emphasis should be placed on *monetization of ecological services*. Rather, it is more realistic to focus on the *investment of resources* – that is, time and money – as well as aspirations of motivated intervenors.

For this reason, EAP examines the investment of resources already made by the community, as well as aspirations concerning the maintenance and management of ecological (water balance) services in 'creeksheds'. By definition, these are small watersheds.



John Henneberry

Professor of Property
Development Studies,
University of Sheffield,
United Kingdom

“Over the last decade, an industry has developed that values different aspects of nature in different ways.

“Its growth has been underpinned by the argument that those assets that cannot be priced and traded are either undervalued or overlooked. Putting a price on nature allows it to be included in the market calculus.

“It is also argued that the discipline involved in doing this contributes to more rational and therefore better decisions involving nature.

“This drive to subject nature to an economic rationale has been much criticised.”

Social Context Establishes “Worth”

Pioneer work by Professor John Henneberry at the University of Sheffield in the United Kingdom has identified the same methodological problems that the Partnership for Water Sustainability has identified – that is, natural systems do not dissect conveniently in order to be quantified and given financial value.

Calculating Nature: “Quantifying and valuing nature are complex tasks. Undertaking them alters our conception of nature,” wrote⁴ Professor John Henneberry in an opinion piece (December 2018). “As a result of it, nature appears more fragmented because we have to slice it into categories and dice those categories into bits before we can value bits of those bits. **The sum of these parts is far short of the whole and does not capture the interconnectedness and holism of nature.**”

“In addition, our view of nature is biased to those aspects of it that can be measured and particularly to those that can be valued because *‘what can be counted usually counts’*.”

“Before we can measure or count something, we need to know what it is. It must be distinguishable (clearly identified) and distinctive (differentiated from other things). But nature is far too complex a thing to be treated in this way.”

The View through a Social Lens: In contrast to an economic rationale, EAP is underpinned by a simple strategy: approach the problem from a social point of view. **What does the community think its ecological assets and services (the natural commons) are worth?**

Worth will be reflected in investment of time, dollars and services to maintain and manage local ecological assets such as a stream and associated riparian areas. These are **natural commons** assets. To the extent that a community recognizes and wants to use and enjoy the ecological services, it would invest.

In summary, it is not the technical-financial approach that allows us to quantify the worth of natural commons assets. Rather, **it is how the community uses and understands the available ecological asset that determines the value.** In British Columbia, this is a starting point when we talk about EAP and valuing the **package of ecological services** made possible by the hydrology of a creekshed.

⁴ <https://theconversation.com/how-the-neoliberal-obsession-with-valuing-nature-changes-our-understanding-of-it-103366>

Genesis, Evolution & Application of the EAP Methodology through Demonstration Applications

Genesis: The Guiding Philosophy

Land Use and Conservation Are Equal Values:

“So, how did I get on this path? It was 1990 when I read the language in the Real Estate Services Act and reflected on what it did and did not say,” recalls Tim Pringle.

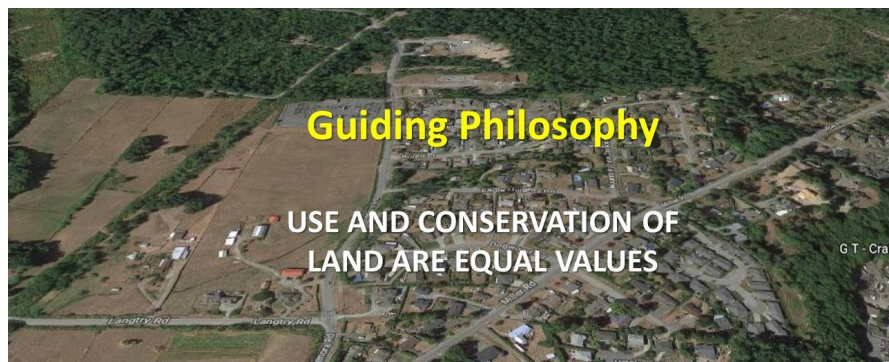
“The Act stated very narrowly that the REFBC would support non-profit endeavours related to land use and real estate.

“The Act defined land as ground and whatever improvements are on the ground. This led me to ask: why are we not talking about the land and whatever natural assets are on the land?”

Tim Pringle was the first REFBC Executive Director, serving from 1986 through 2008. In 2010, he was honoured as the inaugural recipient of the **BC Land Champion Award**.

EAP is a major milestone in a journey that had its’ genesis when Tim Pringle convinced his Board of Governors at the Real Estate Foundation of British Columbia (REFBC) to adopt a philosophy that *“use and conservation of land are equal values”*. It took him a year to make the case and achieve this outcome. From that point forward (1991), the REFBC funded work in the stewardship and conservation sectors applying this guiding philosophy.

Having this context provides essential understanding. The notion of *equal values* launched Tim Pringle on a career trajectory that has culminated with the EAP initiative. Suffice to say, he has thought long and hard about how to value the services provided by nature.



A Perspective on ‘Getting It Right’: Twenty five years ago, green infrastructure ideas and practices were just starting to take root. And since then, they have evolved. From his vantage point as Chair, EAP Initiative, Tim Pringle offers this perspective:

“If we know how to do a much better job of protecting ecological features in our communities and on our landscape, then **why aren’t we doing a better job?** Why are we still seeing streams being degraded? Why do we still see practices that are embedded in land use policy and regulation that are 50 years old in some cases? **How do we change that?**”



Vision for EAP in ‘Beyond the Guidebook 2015’:

“The best blend of engineered assets (infrastructure) and natural assets (that provide ecological goods and services) would support a robust long-term asset management plan and the required financial commitments.”

Account for Risks that Result from Land Uses:

EAP makes the argument that concepts of land and improvements (useful features upon the land) should apply both to man-made improvements as well as those made by nature.

Thus, the financial, management and risk aspects of all "land uses" would be recognized and included in management strategies by all stakeholders, including private owners of property.

Evolution of the EAP Concept

[Asset Management for Sustainable Service Delivery: A BC Framework](https://waterbucket.ca/gi/wp-content/uploads/sites/4/2015/10/Asset_Management_for_Sustainable_Service_Delivery_-_A_BC_Framework-Asset_Management_BC-September_16_2015.pdf)⁵, jointly released by the provincial government and Union of BC Municipalities in early 2015, **sets a strategic direction** for local government service delivery:

It refocuses business processes on how physical and natural assets are used to deliver services, and support outcomes that reduce life-cycle costs and address risks.

In November 2015, the Partnership for Water Sustainability released [Beyond the Guidebook 2015](http://waterbucket.ca/wp-content/uploads/2017/10/Beyond-The-Guidebook-2015.pdf)⁶. It supported the BC Framework by introducing the vision for an Ecological Accounting Process as one of the twin pillars for *Sustainable Watershed Systems*.



More Than Calculations: “The vision for EAP set the challenge: develop a practical methodology, one that would be relevant to local government managers and the community, for determining the monetary value of drainage infrastructure and other services drawn (or adapted) to some degree from ecosystems,” states Tim Pringle.

“Initially, we saw EAP as a tool – that is, ‘the EA Protocol’ - that would help practitioners **calculate the opportunity cost** of balancing ecological services with drainage infrastructure.

“However, the demonstration applications revealed that the term ‘EA Process’ more accurately describes the challenge of working with multiple intervenors to **accurately describe the ecological services made possible by the hydrology**. This comprehensive approach rarely takes place, but it is needed for strategic plans.”

⁵ https://waterbucket.ca/gi/wp-content/uploads/sites/4/2015/10/Asset_Management_for_Sustainable_Service_Delivery_-_A_BC_Framework-Asset_Management_BC-September_16_2015.pdf

⁶ <http://waterbucket.ca/wp-content/uploads/2017/10/Beyond-The-Guidebook-2015.pdf>

A Method to Assign a Dollar Value to the Stream Corridor:

EAP introduces a method to determine the value of the commons land assets.

The calculation involves defining the stream corridor and riparian zone, using BC Assessment data for abutting properties to determine the \$\$ value of the area involved in the commons zone.

The same method can be used for other ecological features such as wetlands, ponds, marshes, woodlands, natural areas, etc.

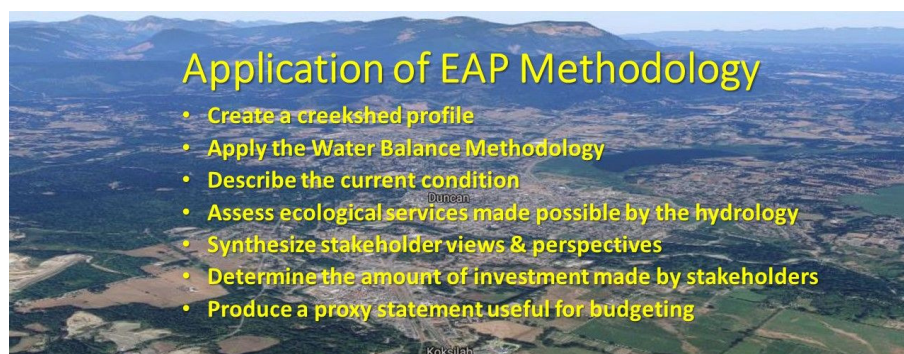
How to Use It:

*Once this "capital value" has been determined, a strategy for management and budgeting for same may be determined to ensure that these natural assets will be included in the overall **Asset Management / Sustainable Service Delivery Strategy** of the local government.*

Application: Valuing the 'Natural Commons Asset'

The *Package of Ecological Services* cannot exist without hydrological services provided by the host creekshed. A critical lack / absence in management of the Natural Commons Asset is recognition in a formal way (one that supports financing and management) of the connection between hydrology and ecological services.

"We all are familiar with the sometimes remote connections between rainwater, retention, detention, infiltration, interflow, recharge, etc. and the riparian and stream corridor ecological services. These connections must be understood if proper management is to take place," emphasizes Tim Pringle.



What the Reader Needs to Know: The logic behind EAP is distilled into this set of statements:

- Communities and local governments rely on a *Package of Ecological Services*
- The reliance occurs in relation to aesthetic features: parks, trails, greenways, urban woodlands, etc.
- There are expectations in support of municipal drainage services: conveyance, retention, infiltration, etc.
- Ecological services such as streams, wetlands, ponds, marshes, woodlands, etc. depend on the hydrology of the watershed.
- Maintenance (prevent degradation) and management (enhancement) are required. This should occur in the context of a strategic plan and budget.
- Currently there is no mechanism to share this need across local government (and other stakeholder) jurisdictions.
- Concepts of land value, financing and management should be consistent for man-made improvements as well as those made by nature. This would allow natural assets to be included in any planning for *Asset Management for Sustainable Service Delivery*.

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 including moderation of water temperature, habitat for terrestrial and aquatic life, wetlands, ponds, nesting places, woodlands.

From a human settlement point of view, a creek is an amenity that can be enjoyed in association with parks, greenways & 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 local government areas. A municipality also uses the creek for stormwater conveyance.

A Method to Assign a Dollar Value to the Stream Corridor:

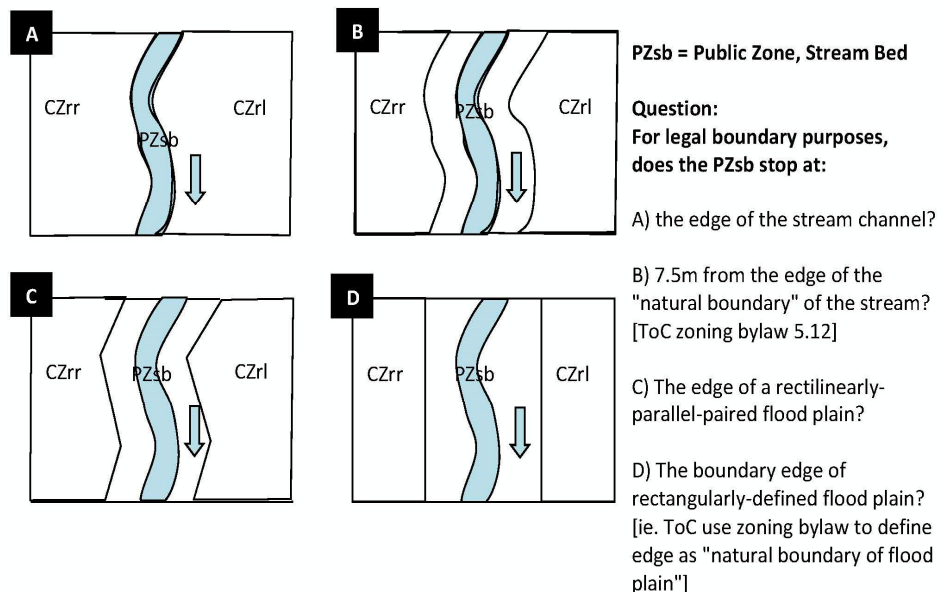
Under local zoning, and the Riparian Areas Protection Act Regulation, residential and other classes of property that have a boundary contiguous to a stream corridor/riparian zone or other sensitive environmental feature have a set-back requirement. For proximate properties there would be a portion of the lot that is shared as part of the natural commons (community values and enjoyment). Thus, its financial value also would be shared.

Using the assessed value of a lot (the land), the percentage in the set-back would have a specific value. As a rule of thumb, the area of the lot in the shared set-back area together with the stream corridor area itself could be given a financial value that is 50% of the assessed value. Thus, the community and individual owners have an interest in these lands, that is the commons asset concept

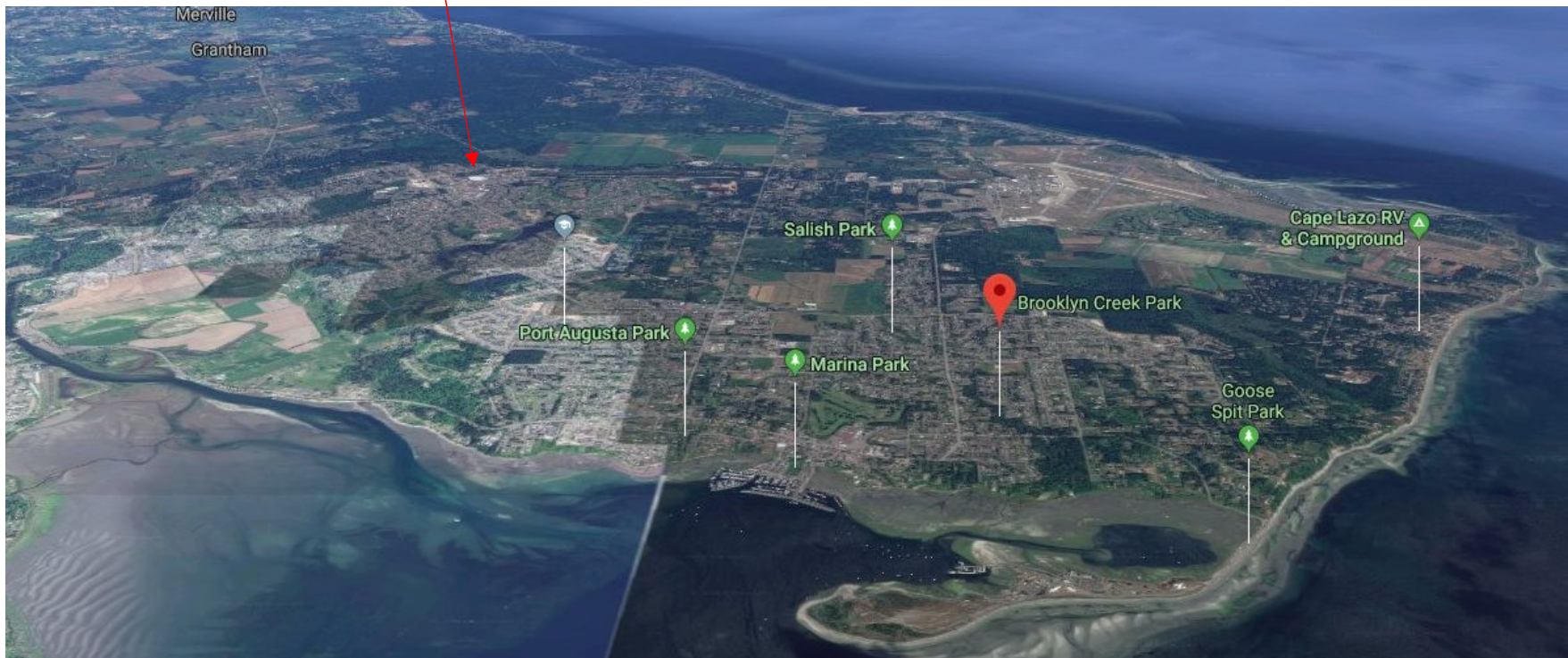
Town of Comox Example: Below, four options are illustrated for defining the Commons Asset zone. This is the land that supports the various ecological services that stakeholders perceive as worth managing and maintaining the *Package of Ecological Services* listed opposite. Option D was selected for testing of the methodology.

Land areas are readily extracted from the local government's GIS mapping system. Using civic addresses, the land value of each property in the analyses is easily obtained from BC Assessment.

The analysis yields a single number: \$ per lineal metre of stream corridor. This is the proxy value of the Commons Asset. It is a starting point for local governments to establish annual budgets for maintenance and management of ecological services.



Brooklyn Creek headwaters originate
at the Home Depot site in Courtenay



Source: Google Earth

Comox Peninsula & Brooklyn Creek Study Area

Brooklyn Creek Demonstration Application In the Comox Valley

Setting the Context

Synopsis of Findings:

The Town of Comox has managed and improved the functioning condition of the lower catchment through its long range plan plus strong collaboration with community partners and external funders.

In the middle and upper catchments, the hydrologic condition remains threatened and degraded.

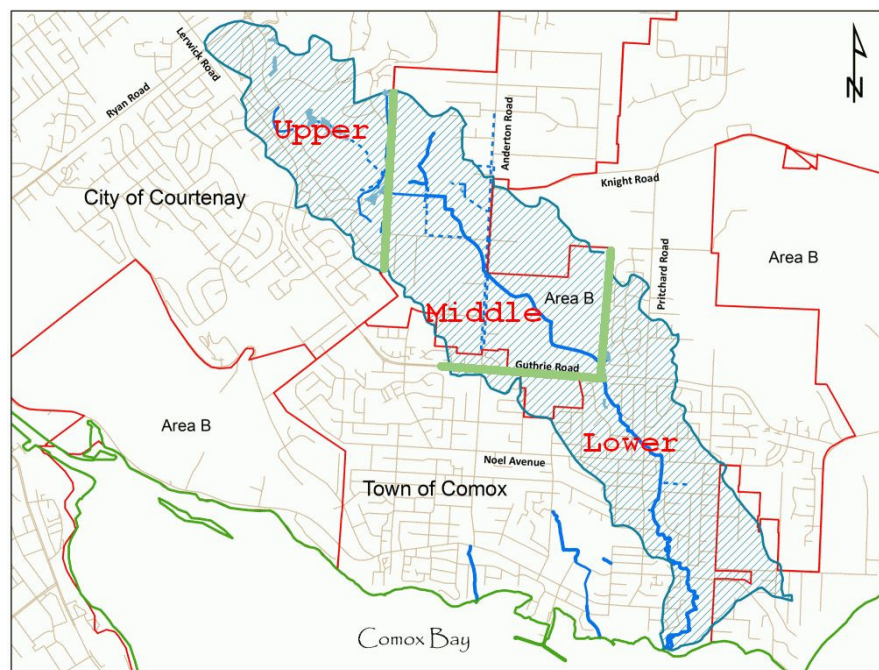
Strategy plus Commitment:

In Comox, stakeholders decided that Brooklyn Creek was worth investment. Work began in 2005 and has been carried out as series of annual projects.

An approach integrating engineering and biology has implemented features designed to meet eco-system and settlement needs.

Three local governments have jurisdiction over land use in the Brooklyn Creek creekshed, creating three zones (catchments) as illustrated below. This results in three distinctively different land management strategies.

- **In the upper zone** (City of Courtenay), the headwaters catchment has been altered and made subordinate to engineered drainage design and construction.
- **In the middle zone** (Comox Valley Regional District), large lot as well as dense rural subdivision has cut up the top metre of the landscape, thereby impairing natural hydrology.
- **In the lower zone**, the Town of Comox and collaborators have adopted and executed a long-range strategy to enhance and maintain the stream corridor and riparian zone.



The Brooklyn Creek Creekshed has 3 distinctive zones

Changes in Hydrology:

The EAP analysis considered historical land use changes in the Brooklyn Creek drainage area.

Cumulative impacts have compromised and degraded hydrological systems and dependent ecological services in the creekshed.

Assessment Tool:

The research applied the Water Balance Methodology as the tool to assess the current functioning condition of the hydrology.

Decades of constructing engineered drainage infrastructure to collect and convey away rainfall has caused the creekshed to lose much of its capacity to spread, retain and infiltrate rainwater.

As a result flooding has increased as has erosion, sedimentation, debris blockages and loss of aquatic and terrestrial habitat.

State of Ecology and the Water Balance

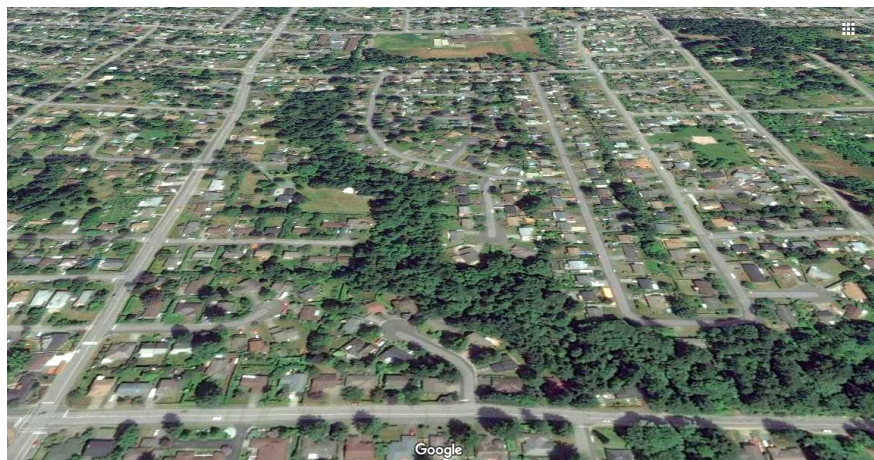
Brooklyn Creek is a small creekshed, ~6 square kilometres, whose hydrology and ecological services have been altered and degraded by decades of land use impacts. Jurisdiction of the watershed, stream and riparian areas is shared by numerous agencies.

Of three local governments with management authority over *land use and conservation* in the creekshed, only the Town of Comox has acted strategically for more than a decade to **maintain (prevent degradation)** and **manage (enhance)** the stream corridor and the available ecological services.

The EAP analysis established that intervenors involved in management of three catchments of the Brooklyn Creekshed have very different views of the worth of its ecological systems.

Drainage and Infrastructure Servicing Practices: Past and continuing land use (development) practices have considered hydrology only in a superficial manner - that is, what can be done with rainwater runoff that affects rural lots, agriculture, urban development, roads, ditches, parks and other features of the built environment?

As is the case in most small watersheds, historic standards and regulation of design and construction of drainage systems have failed to prevent degradation of the hydrology of the Brooklyn creekshed and the dependent ecological systems.



Brooklyn Creek riparian corridor in the Town of Comox

In the Middle & Upper Catchment Areas:

In contrast to the Town of Comox, the middle and upper creekshed catchment areas have no management plans for the creek corridor or riparian zone.

In each catchment, however, the creek is used for conveyance as part of the local government rainwater drainage system. Also, the upper catchment is almost fully developed for residential, recreational and commercial uses.

As a Consequence:

The Town of Comox enhancement work is subject to the impacts related to decisions made by middle and upper creekshed managers.

Without improvements in the middle and upper catchments, the permanence of work in the lower catchment will remain limited.

Intervenor Views of Worth

The Town of Comox is the management authority in the lower catchment of the creekshed. Its perspective on the worth of the ecological services supplied by the creek corridor and riparian areas has led to considerable investment in maintenance and enhancement.

The managers in the middle and upper watershed are making very limited investments in maintenance; and, none in enhancement. The upper catchment is now an engineered drainage area.

In the Lower Catchment: The Town's actions through the parks, public works and planning departments in concert with the Brooklyn Creek Watershed Society reflect that these intervenors understand the worth (*value in use*) of the package of ecological services provided by the creekshed:

They appreciate the insoluble connection between the condition of entire creekshed hydrology and the extent of ecological services available in their catchment.

This realization has led to investment of more than \$4 million to acquire, maintain and manage lands harbouring ecological systems and aesthetically-connected parks, greenways, trails and other recreational assets.



Brooklyn Creek Long-Range Enhancement

Overview

Assessment:

The EAP review confirms that the Town of Comox has managed and improved the functioning condition of Brooklyn Creek (lower creekshed catchment) though its long range plan and strong collaboration with community partners and external funders.

A New Way of Thinking:

The ribbon of setback areas on each side of the stream together with the stream bed area itself comprises a Commons Asset.

The Town of Comox strategy began with the Master Drainage Plan (1999) which confirmed the loss of capacity to retain and infiltrate rainwater throughout the creekshed. In the early 2000s flooding pushed the Town to construct a diversion facility (2005) at the cost of \$1.98 million.

At this juncture the Public Works Department, Parks Department and Brooklyn Creek Watershed Society collaborated to devise and adopt a long-range strategy to maintain and enhance the creek corridor and riparian areas.

The work carried out under this plan has been reported out annually since 2008 as the *Brooklyn Creek Channel Enhancement Project*. This is resulting in visible improvements to the stream corridor and riparian zone, and these are seen by parks users and others.

Cumulative Investment: Since that time about \$800,000 has been invested in annual projects with funding provided by the Town of Comox, external sources, and donated labour and expertise by the Watershed Society and others.

This enhancement work has been invested in lands owned and/or acquired by the Town for parks and greenway purposes (including 2.46 acres at the former Brooklyn Elementary in 2013 at a declared value of \$292,375). The Town also acquired 2.56 hectares of waterfront land at the mouth of Brooklyn Creek known as Baybrook farm for \$2.1 million in 2011. A portion of the funding came from the Nature Trust of BC.

Overall, the investment secures ecological services: the stream corridor, riparian areas, fish habitat, portions of the urban woodlands, as well as natural areas to enhance parks, trails, etc. The investment also maintains the conveyance capacity of the creek which is part of the municipal drainage systems.



Ecological Services & What They Are Worth:

EAP finds out what the ecological services that local governments rely on may be worth to the community (local government managers, residents, and other stakeholders).

Worth means how are the services used and managed; and what the expectations of the community may be.

Calculation of 'How Much':

The BC Assessment database is the foundation for the EAP Methodology to define worth and establish a starting point for an annual budget for creekshed management.

Annual Budget:

Based on real property management standards, applying 1% of total (capital) value per year would establish an annual budget of ~\$67K for maintenance and management of Brooklyn Creek ecological services.

What the 'Natural Commons Asset' is Worth

An outcome of the Brooklyn Creek Demonstration is a *valuation of worth* methodology that is founded on an understanding of how local governments rely on ecological services for:

- **Aesthetic Purposes:** These cover a range of uses related to active and passive recreation features and services which local governments offer to their residents.
- **Drainage Functions:** These encompass conveyance, rainwater retention, infiltration, groundwater recharge, and cleansing of surface flows.

EAP refers to these aesthetic and drainage features as a **Package of Ecological Services**. As linked features, the ecological services are part of the **Natural Commons Asset**.

Natural Commons Asset Described: This concept refers to the collective expectations of residents that parks, greenways and trails will be available for enjoyment; likewise flora and fauna. Residents also expect the municipal rainwater drainage system to function efficiently, and without the drama of erosion and flooding.

In reality, a considerable amount of land is committed to stream corridors, riparian areas, wetlands, ponds, woodlands / natural areas, etc. to serve common enjoyment. This land has financial value. Such lands clearly are committed to local government assets.

A Value for a Natural Commons Asset: The EAP analysis established a unit value of ~\$2700 per lineal metre of stream corridor "commons" zone along the 2.5 km stream length through the Town of Comox.



Busy Place Creek headwaters originate at the
Quw'utsun Smuneem Elementary School



Busy Place Creek (*Sh-hwuykwselu*) Study Area

Source: Google Earth

Busy Place Creek Demonstration Application In the Cowichan Valley

Setting the Context

Synopsis of Findings:

The upland area of the creekshed has lost most of its wetlands and retention capacity.

In the lower area, stakeholders involved in enhancement and remediation projects have spent more than \$150,000.

Also, streamkeepers have helped with this work and other educational and project activities, contributing well over 1000 hours since 2001.

A Potential Strategy:

Stakeholders have an opportunity to build a strong collaboration around the focus on hydrology, one which offers future management gains for all, especially if there is a will to interweave Indigenous knowledge and Western science.

Busy Place Creek (Coast Salish: Sh-hwuykwselu) is situated south of the City of Duncan. Multiple entities have jurisdiction:

- Its upland source and discharge to the Koksilah River are in Cowichan Tribes lands, including the Cowichan-Koksilah estuary, which it nourishes.
- Activities within the mid-reach are regulated by the Cowichan Valley Regional District (CVRD), as well as by the Ministry of Transportation and Infrastructure (MOTI).

The creekshed provides ecological services. Yet the worth of these drainage-related ecological services has never been determined. Also, the water balance capacity to support key ecological systems such as wetlands and riparian areas has not been assessed previously.



In the lower reaches, the creek is located for half its' length in a roadside ditch

There is no existing Master Strategy / Plan: Cowichan Tribes, stewardship organizations, CVRD, MOTI and other agencies have participated in projects to manage and or enhance creek and estuary ecological systems in the lower reaches. But they have not created a joint plan to manage and improve the creekshed's water balance.

Although not within the scope of the EAP demonstration application, potential elements of an affordable and readily implementable water balance restoration strategy soon became apparent.

What was Sh-hwuykselu in the past?

Historically the Cowichan River included Somenos on its path to the sea through several large channels. One channel met and joined the Koksilah River.

The Sh-hwuykselu main stem came down from the upland area to the same confluence. This location became a meeting place for First Nations trade and exchanges, thus the name Busy Place Creek.

Today the rivers still flow to the flood plain, but they do not meet. Diking and channelization have changed the busy meeting place.

Today the creek comes down from the upland area, enters an artificial ditch and moves southward to join the Koksilah River.

The immediate area where the creek enters the floodplain now is Koksilah Industrial Park.

State of Ecology and the Water Balance

Sh-hwuykselu (Busy Place Creek) rises in Cowichan Tribes lands a little more than 2.6 kilometres from its mouth where it joins the Koksilah River, also in Cowichan Tribes lands. The connecting portion of 2 kilometres lies in the jurisdiction of the CVRD.

The Sh-hwuykselu creekshed comprises 2.78 sq. kilometres; the length of the stream main stem is 3010 metres (140m in storm sewer, 2870 in surface channel).

Like many small watersheds on the east coast of Vancouver Island, the Sh-hwuykselu creekshed (a 1st order stream) has been modified by more than 150 years of land uses which ignored its hydrology and dependant ecological services. As a result, much of its hydrological capacity has been compromised or lost.

What is the Sh-hwuykselu Creekshed Now? The present day creekshed is a scenic rural upland area with views over agricultural lands from the Eagle Ridge residential area and a short, steep transition zone through a residential area to reach the floodplain. However, the water engine, Sh-hwuykselu creek, has little prominence except in the floodplain.

Nearly all areas of the creekshed have been modified by land uses. All have had degrading impacts on the ecological systems in the creekshed. Land uses in the creekshed are agricultural (31%), residential (28.5%), industrial (31.5%) and First Nations (9%). Most land zoned for residential development has been built out. There are a few residential parcels remaining undeveloped.

In its compromised condition Sh-hwuykselu can add high volumes of water to periodic flooding in the Koksilah Industrial Park and nearby areas. The stream has been described as 'flashy'; it runs high and low depending on climate and seasonal conditions.

There is no active management or enhancement of the stream corridor outside of the areas with ditches other than occasional projects. The majority of the projected impacts due to increased flood frequency and magnitude have already taken place within the watershed.

Past, Present and Future Perspectives:

The Ecological Accounting Process (EAP) assess an entire watershed at the creekshed scale.

It focuses on ecological services supported by hydrological realities.

EAP considers what the watershed was, what it is now, and what the community would like it to be.

It then uses this “current state” analysis to determine the activities that stakeholders could undertake to improve its ecological services through management, enhancement and maintenance.

By choosing an option or mix of options stakeholders would decide to invest time, expertise and dollars.

*Their actions form the **measure of worth** that characterises the creekshed.*

Intervenor Views of Worth

A representative of Cowichan Tribes said that “Sh-hwuykwselu belongs in our lives as a culturally important ecological resource”. In the broader basin community, however, this small creekshed does not draw much public attention.

Still, Sh-hwuykwselu Streamkeepers have been active since 2001, investing about 18,500 hours of volunteer time in on-going work and several enhancement projects (removing invasive species, planting native species) as well as educational and signage projects.



Recognition of Worth: The stakeholders are changing their views about the worth of Sh-wuykwselu as an ecological asset. During the past decade stakeholders have invested in two remediation projects to reduce erosion; expenditures were \$65,780.

Other projects included a coho salmon refuge and rearing area dedicated for parkland (\$70,000 not including land acquired), and two maintenance/enhancement initiatives which involved \$14,845 of expenditures.

Streamkeepers have invested more than \$277,000 of volunteer time since 2002. Cowichan Tribes are involved in maintenance and enhancement work on their lands: at the Sh-hwuykwselu creekshed headwaters; and near the creek confluence with the Koksilah River.

Busy Place Creek Long-Range Enhancement

A Potential Strategy:

The upland area of the creekshed has lost most of its wetlands and retention capacity.

Three wetlands could be restored in their original locations, resulting in a number of enhancements to the ecological services.

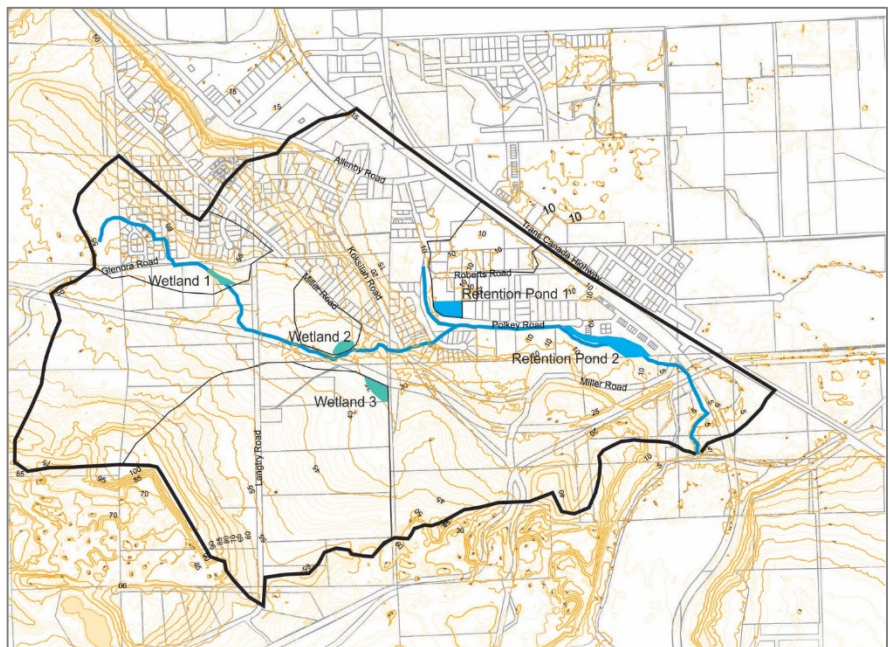
This strategy would serve natural systems (e.g. wetland environments, riparian zones, nutrient flows to the estuary, longer flow duration in the summer).

It would also accomplish several community objectives: water options for farms, attenuation of peak seasonal flows and potential flooding, enhanced riparian areas along proposed trails.

The 2.25 hectares potentially involved could be converted for an estimated \$100,000.

With a view to improving the creekshed hydrology, the EAP analysis shows that the most valuable investment that could be made would involve enhancing the upland retention and infiltration of rainwater by restoring three wetlands (about 2.7 hectares total) as shown on the map below.

These were previously drained or altered for agricultural use. The soils are such that infiltration would lessen peak flows, and the interflow (shallow sub-surface flow) would moderate and extend the seasonal flow duration.



Opportunities for restoration of the natural water balance in the Busy Place Creek tributary area

Benefits of Restoring the Water Balance: More predictable and dependable flows would attenuate local flooding (important to the Cowichan Valley Regional District) and enhance fisheries habitat (important to the Cowichan Tribes).

Enhanced riparian areas would be of value to proposed parks trails and the nearby rural subdivision. Finally, groundwater aquifer recharge would be achieved.

In Summary:

The EAP Methodology has established what the Sh-hwuykwselu may be worth from the point of view of stakeholder sunk investment and future opportunities to access more ecological services from the creekshed to serve human demands as well as the intrinsic needs of nature. The analysis has established:

- current functioning condition of creekshed;
- what enhancements (includes restoring, maintaining and improving) are possible and practical;
- anticipated benefits, including regulatory and mission-driven responsibilities of stakeholders;
- worth of the proposed enhancements in terms of protecting sunk investment in the creekshed ecosystems, financial practicality, and specific benefits for human settlement and intrinsic nature; and
- expenditures for enhancements amount to capital expenditures invested in land assets harbouring wetlands and riparian areas.

What the 'Natural Commons Asset' is Worth

The valuation of worth methodology developed through the Brooklyn Creek Demonstration Application has been similarly applied to the Sh-hwuykwselu creekshed to establish values for the Natural Commons Asset. Described previously, this is the land under the creek itself and in the setback areas of properties that abut the stream.

The BC Assessment database is the foundation for the EAP Methodology to define the worth of the Natural Commons Asset and establish a basis for setting an annual budget for creekshed management.

Package of Ecological Services: The improved hydrology resulting from restoration of three wetlands would support additional riparian areas and enhance the existing zones. As a result, the available ecological services would be more secure and aesthetically and practically worthwhile. This package of ecological assets and services would include:

- Improve stream and riparian functioning condition by increasing retention and moderating flow duration;
- Meet social and cultural objectives of Cowichan Tribes;
- Help continue use of the stream as a system to convey flows from local government and MOTI storm drains and ditches;
- Improve conditions for terrestrial and aquatic life including fish;
- Add aesthetic qualities important for parks, trails, natural areas features and property values; and
- Help attenuate potential flooding as well as contribute climate change adaptation strategies.

Financial Values for the Natural Commons Asset: Trial calculations involving four agricultural parcels and four residential parcels yielded unit financial values as follows for the Natural Commons Asset:

- **Agricultural Areas** (1270m length) = \$40 per lineal metre.
- **Residential Areas** (227m length) = ~\$1200 per lineal metre.

Expenditures (at 1%) for annual basic maintenance (to prevent degradation) in agricultural and residential areas would therefore be ~\$500 and ~\$2700, respectively. These numbers provide a starting point for establishing a creekshed maintenance budget.

Creeksheds as Local Government Infrastructure Assets

Moving towards a Water-Resilient Future:

The capacity-building program for “Sustainable Watershed Systems, through Asset Management” is aligned with the vision for

Asset Management for Sustainable Service Delivery: A BC Framework

New Paradigm - Creeksheds as Infrastructure:

A watershed is an integrated system.

Three pathways by which rainfall reaches streams are “infrastructure assets”.

The pathways provide “water balance services”.

Asset Management Continuum

Asset management has traditionally been about hard engineered assets such as waterlines, sanitary and storm sewers, and roads. Yet, watershed / creekshed systems are also “infrastructure assets”.

More specifically, trees, soil, green spaces and Water Balance pathways contribute to a municipal service function. These assets provide *hydrologic integrity* for a healthy watershed system.

Hydrologic integrity has emerged as 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.

Creeksheds are Integrated Systems: Asset management for sustainable service delivery occurs alongside associated evolution in community thinking.

By managing the built and natural environments as integrated systems, local governments would incrementally move towards a water-resilient future as an outcome.

A way was needed to conceptualize this process diagrammatically, and thus communicate what the journey by a local government to a *Water-Resilient Future* would look like.

Journey from Policy to Implementation: This led to the concept of a continuum of steps (refer to image on next page):

- Step One – embrace the BC Framework
- Step Two – implement Sustainable Service Delivery
- Step Three – apply the Ecological Accounting Process

The goal: build local government capacity to transition to Step Three. The outcome would be Sustainable Watershed Systems. Achieving this desired future depends on stakeholder commitment to implementing the whole-system, water balance approach.

In Step Three, application of the Ecological Accounting Process would focus on the investment of resources already made by many stakeholders, as well as their aspirations concerning the maintenance and management of ecological services.

Sustainable Watershed Systems and the Asset Management Continuum

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

STEP ONE: Embrace the **BC Framework**. Focus on engineered assets.
Develop Asset Management Strategy / Plan / Program.

STEP TWO: **Sustainable Service Delivery** is standard practice.
Think holistically. Implement life-cycle approach.

STEP THREE: Apply the **Ecological Accounting Process**. Account for Water Balance Services provided by naturally functioning creeksheds.
Assess hydrology to accurately describe ecological services.
Integrate climate adaptation into asset management.



Never forget that a watershed is an **integrated system** – with **three flowpaths** (*surface, shallow sub-surface, and deep vertical*), each with a different time scale

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

THE OUTCOME?

A Sustainable Watershed System!



Logo for the BC Framework

Interflow Explained:

The interflow system is very shallow, typically less than 1 meter from the ground surface.

Although the interflow system is a critical flow path within a watershed, it is not well understood.

It is fragile and vulnerable, and subject to unintended damage – for example, flow within the interflow system is readily intercepted by simply building a road or digging a ditch to improve the drainage of a land parcel.

Once intercepted, the interflow would be collected and conveyed to a stream much quicker than would happen naturally, within days rather than over a season.

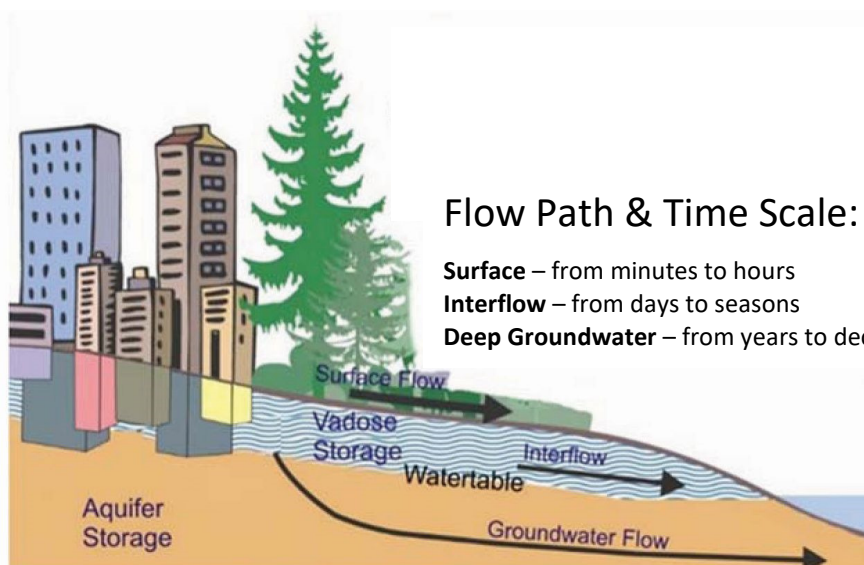
While this interception of flow would not increase the peak discharge to the stream, it would reduce the discharge within a few days of dry weather as the land dries out.

Whole-System, Water Balance Concepts

Creekshed protection starts with an understanding of how water gets to a stream, and how long it takes (refer to illustration below). Of the three pathways, interflow is vitally important (see sidebar).

In coastal British Columbia, interflow is the primary pathway (60% of annual volume) in an undeveloped watershed⁷.

When interflow is eliminated, there is more surface runoff volume. Then, flow in streams is at higher rates over longer periods of time. The net effect is that streams erode.



Protect the Surface Sponge: In everyday language, interflow is defined as the shallow horizontal movement of water through the surface soil 'sponge'.

Historically, community development and infrastructure servicing processes have overlooked, ignored or eliminated interflow. Instead, the thrust of drainage engineering standard practice is: *contain, control and convey surface runoff as quickly as possible.*

Get it right. Think like a system. Understand where the water goes naturally when it rains. Preserve the natural pathways by which water reaches streams. Slow, spread and absorb runoff. Mimic natural flows in streams.

Benefits would include less flooding, less stream erosion, more streamflow when needed most.

The mind-map opposite illustrates the approach to integration of the built and natural environments as a whole-system.

⁷ http://waterbucket.ca/rm/wp-content/uploads/sites/5/2018/01/Water-Balance-Approach-on-Vancouver-Island_Jan2018.pdf

RECONNECT HYDROLOGY & ECOLOGY: “Whole-System Approach” (4 Steps) to Integration of Built & Natural Environments				
	1. <i>WHAT is the issue?</i> – “Call to Action”	2. <i>SO WHAT can be done?</i> – “Core Building Blocks”	3. <i>NOW WHAT can we do?</i> - “Desired Outcomes”	4. <i>THEN WHAT?</i> – “Transferability”
Under each step, Cascading Key Messages define “What Really Matters”				
	<i>Success in Solving “In Your Face” Problems Would Mean:</i>	<i>Integrating Natural Assets into Asset Management Relies on Understanding that:</i>	<i>There are Paybacks When a Community “Gets it Right”:</i>	<i>Restorative Development Results in Sustainable Stream Restoration:</i>
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	Decrease the destructive footprint while increasing 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 <i>Whole-System Approach</i> and <i>Sustainable Service Delivery</i> - 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. Make where we live better.

EAP Supports 'Living Water Smart, British Columbia's Water Plan'

Healthy Watersheds:

"Shifting our focus to stream health requires substantial time and effort on the part of governments, communities, and other partners."

"Everyone benefits from better protection and use of water resources."

*P. 41
Living Water Smart*

Doing Business Differently:

While legislative reform is a foundation piece of Living Water Smart, collaboration takes place outside the legislative framework.

Living Water Smart is about motivating and inspiring everyone to embrace shared responsibility. Influencing behaviour and attitudes is at the heart of moving from awareness to action.

Living Water Smart, BC's Water Plan

In 2008, "Living Water Smart, British Columbia's Water Plan" was the Province's call to action, and to this day transcends governments. The Living Water Smart vision is:

"We take care of our water, our water takes care of us."

A decade after release of Living Water Smart, the hard work of hope has resulted in a policy, program and regulatory framework that enables community-based action to adapt to the New Normal – for example, a game-changer flowing from Living Water Smart is "Asset Management for Sustainable Service Delivery: A BC Framework".

Doing Business Differently: In Living Water Smart, the lynch-pin statement (found on page 43) is:

"All land and water managers will know what makes a stream healthy, and therefore be able to help land and water users factor in new approaches to securing stream health and the full range of stream benefits".

This vision statement guides the work of the Partnership for Water Sustainability. On the page opposite, the road map for water and creekshed sustainability illustrates how land and water processes can come together under the Living Water Smart umbrella.

Sustainable Watershed Systems: Hydrology is the engine that powers ecological (water balance) services. Thus, integration of the Partnership's work within the BC Framework should accelerate implementation of the whole-system, water balance approach at the heart of the Partnership's "Sustainable Watershed Systems, through Asset Management" program.

A pillar of Sustainable Watershed Systems is the Ecological Accounting Process. EAP assesses an entire watershed at a creekshed scale. The EAP focus is on ecological services supported by hydrological realities. EAP recognizes the worth of the natural commons assets and the services (uses) that they provide in a community.

Living Water Smart, BC's Water Plan



Road Map for Water & Creekshed Sustainability

EAP – The Next Stage

The concept of natural capital and natural assets can be a challenge to integrate effectively into asset management practices. Local governments need "real numbers" to deliver outcomes and support decision making. To this end, EAP deals with a basic question:

What is a creekshed WORTH, now and in future, to the community and various intervenors?

As explained in previous chapters, EAP provides a methodology to assign a dollar value to the "stream corridor and riparian zone" (natural commons assets) so that a baseline annual budget for maintenance and management of this "Natural Commons Asset" can be incorporated in asset management strategies and plans. Inclusion requires definition and measurement.

Program Overview: The first two applications (Brooklyn Creek and Busy Place Creek) are Stage 1 of a multi-year effort to test the EAP concept, refine the methodology, and demonstrate transferability. Briefly, the three stages are described as follows:

Steps in the EAP Analysis:

1. *Define the package of ecological services;*
2. *Define the required commons asset area;*
3. *Calculate the worth of the package of ecological services; and,*
4. *Calculate the financial value of the land supporting the ecological assets*

- **First, Stage 1 tested and evolved the concept for leveraging the BC Assessment database** in order to establish a financial value for the "Natural Commons Asset" (the land comprising the stream corridor and riparian zone).
- **Next, Stage 2 would refine the "valuation of worth" methodology** (developed in Stage 1) by further validating the EAP through additional demonstration applications with collaborating local governments.
- **After that, Stage 3 would focus on knowledge transfer to other communities.** In other words, the program goal would be to make the EAP approach transferable or replicable for any local government to use.

Further to the above, and in Stage 2, the program goal would be to position local government practitioners and their collaborators to integrate natural commons asset values (worth of ecological services) into asset management strategies. The practicality of this approach would be illustrated through analyses of demonstration applications of current importance to local governments.

On Transitioning 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.

Flowing from Living Water Smart, three landmark provincial initiatives came to fruition in 2014, and are game-changers.

Together they provide a platform for integrated and coordinated actions.



A Closing Perspective

The provincial government has long recognized that communities are in the best position to develop solutions which meet their own unique needs and local conditions.

This is the reason British Columbia’s regulatory environment for urban creekshed protection is outcome-based and relies on collaborative processes to implement changes in practice.

Call to Action: British Columbia is at a tipping point. A provincial policy, program and regulatory framework is in place to help local governments bridge the gap between policy and new standards of practice, create greener communities, and prepare for climate change. This framework recognizes the connections between land and water – and that what happens on the land matters.

Adapting land use, infrastructure servicing and asset management practices to sustain and enhance ecological (water balance) services requires that a “top-down & bottom-up” process be in play to align and accelerate provincial, regional and local actions.

Otherwise, the process to adopt, change or evolve standards of practice in order to apply tools such as EAP may be painfully slow, might not happen, or could simply peter out due to indifference or neglect. Those alternative futures would result in further cumulative impacts, rather than cumulative benefits.

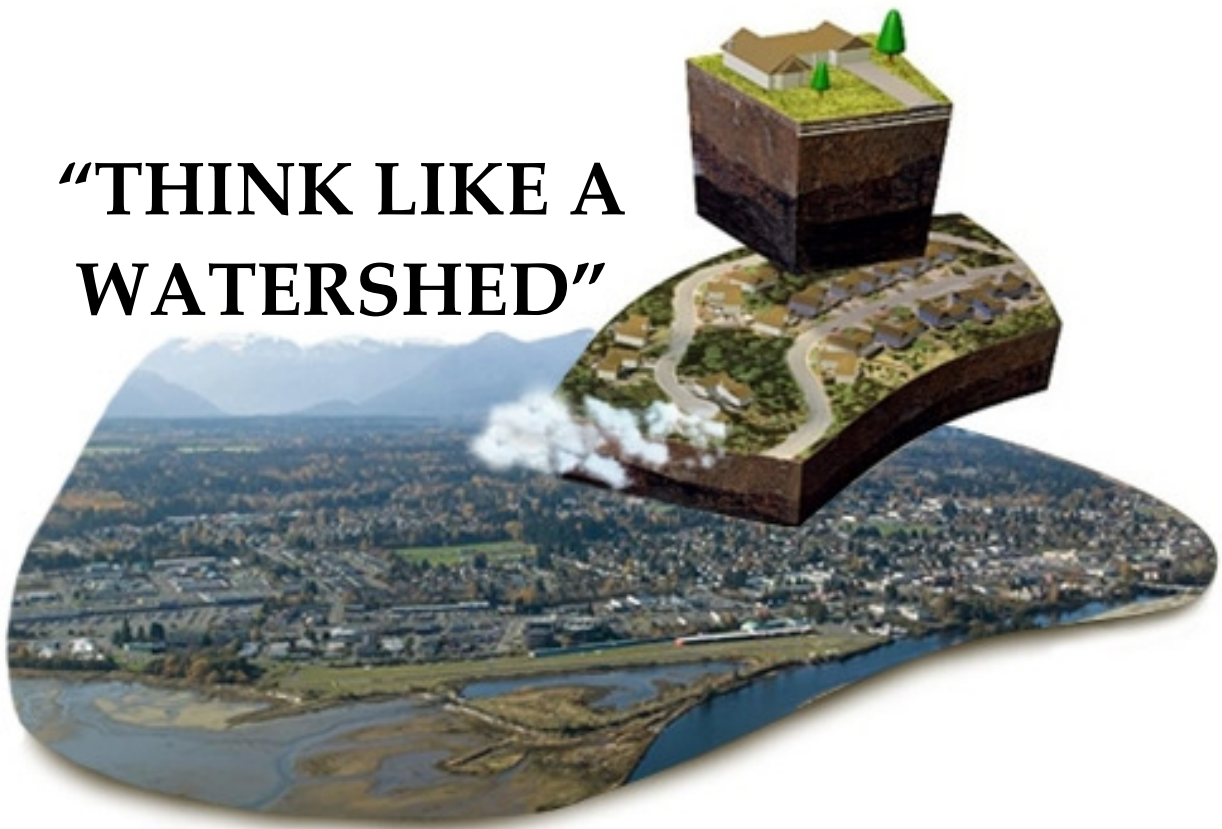
Community Benefits: Implementation of a whole-system, water balance approach, founded on the twin pillars of the Water Balance Methodology and EAP, would result in these desired outcomes:

- **AVOID** an unfunded liability (by limiting stream erosion, preventing flooding, improving water quality);
- **ADAPT** to a changing climate; and
- **REDUCE** life-cycle costs for drainage infrastructure.

British Columbia communities can adapt to the New Normal. They can create a water-resilient future where flood and drought risks are reduced, and ecological services are sustained. As a result of initiatives inspired by Living Water Smart, such as EAP, local governments now have access to tools and experience that would help them to “get it right” through collaboration and commitment.

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“THINK LIKE A WATERSHED”



A watershed 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 watershed landscape, streams and foreshores, groundwater aquifers...and PEOPLE....function as a **whole system**.



the partnership
for water sustainability in bc