North Shore Streamkeepers' 2017 Workshop

Stormwater Impacts Communities & Creeks – What Can Streamkeepers Do?

What Happens on the Land Does Matter!

Moving Towards "Sustainable Watershed Systems, through Asset Management"

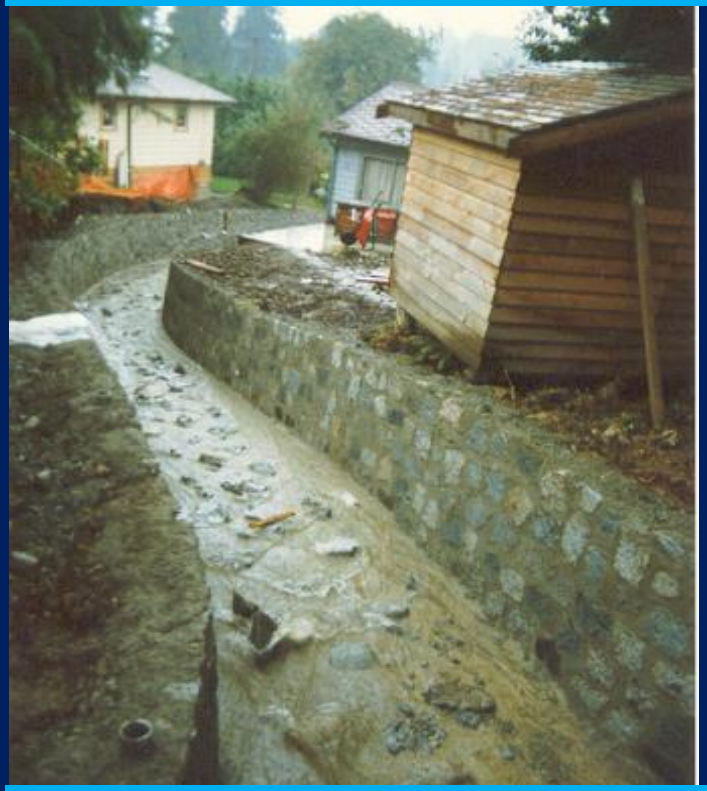
March 2017

- Kim A Stephens, M.Eng., P.Eng., Executive Director

the partnership for water sustainability in bc

My career perspective on contrasting approaches to reducing risk:

Deal with Consequences:
Be reactive in solving problems



Engineered Solution
(Parkside Creek -1987)

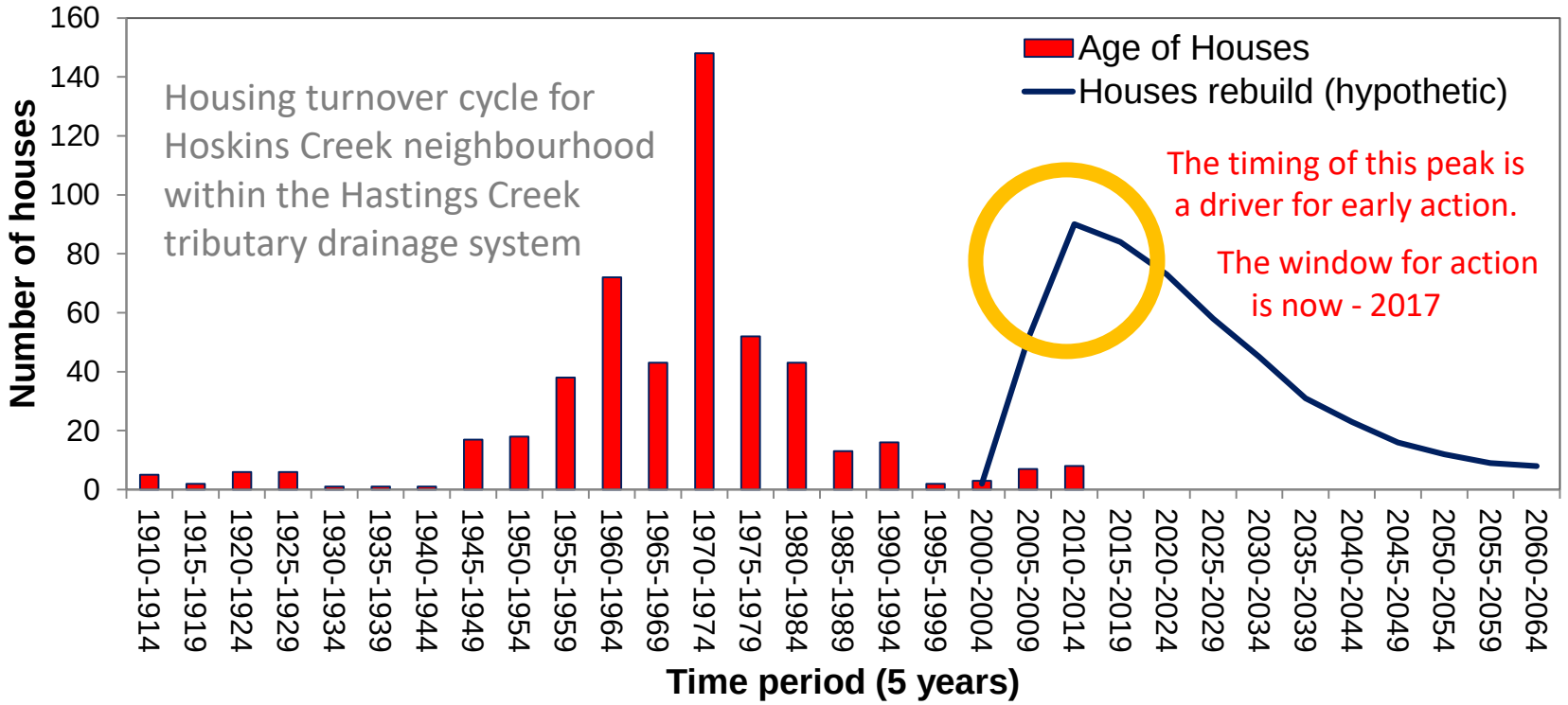
OR

Eliminate the Causes:
Be proactive in preventing problems

Mimic Flow-Duration
(replicate pathways by which rainfall reaches streams)

Redevelopment of Single Family Neighbourhoods creates opportunities to "get it right" the second time and restore watershed health in North Vancouver

THE CHALLENGE: Will the District act in time to catch the peak? Time is of the essence!



So, what can streamkeepers do?

Scope of your involvement and influence is expanding beyond the creek channel

"Looking ahead, an informed stewardship sector may prove to be the difference-maker that accelerates implementation of the ***whole-system, water balance approach***."

"Wouldn't it be great if everyone really understood what it means to think and act like a watershed."

Peter Law

Regional Biologist & Guidebook Chair,
Ministry of Environment (retired)

Vice-President, Mid Vancouver Island
Habitat Enhancement Society

When “convening for action”, three “big ideas” provide a backdrop for the journey ahead:

- Shifting Baseline Syndrome
- Whole-System, Water Balance Approach
- Cathedral Thinking

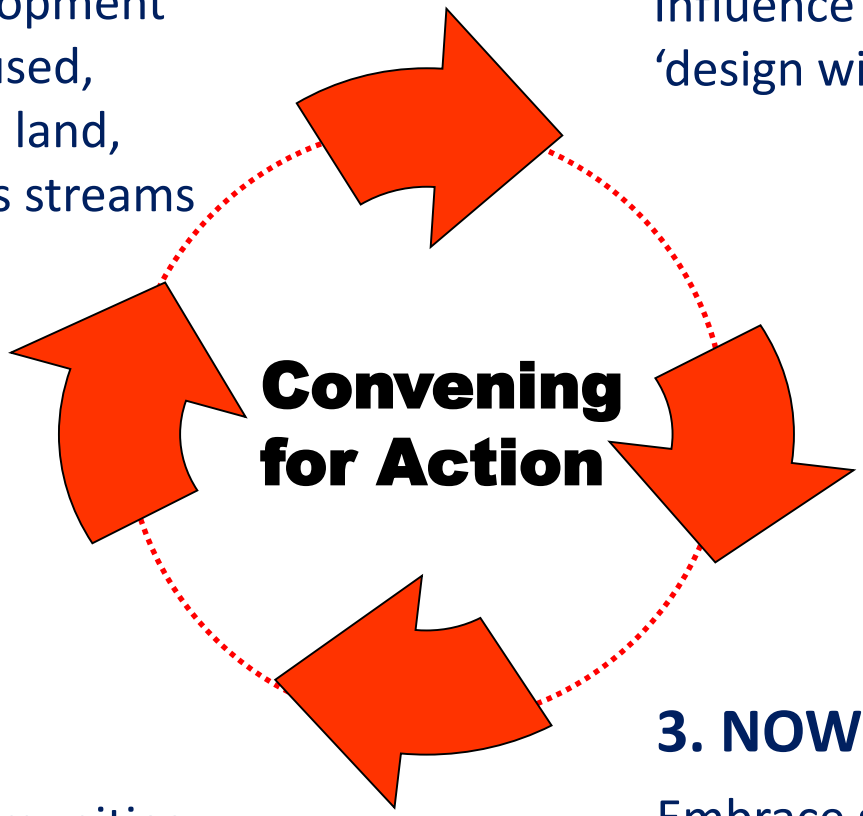
*The **"BC process"** for moving from **Awareness** to **Action** is founded on alignment, collaboration and partnerships*

1. WHAT is the issue?

The form of land development impacts how water is used, how water runs off the land, and how water reaches streams

2. SO WHAT can be done?

Influence practitioners to 'design with nature'



4. THEN WHAT?

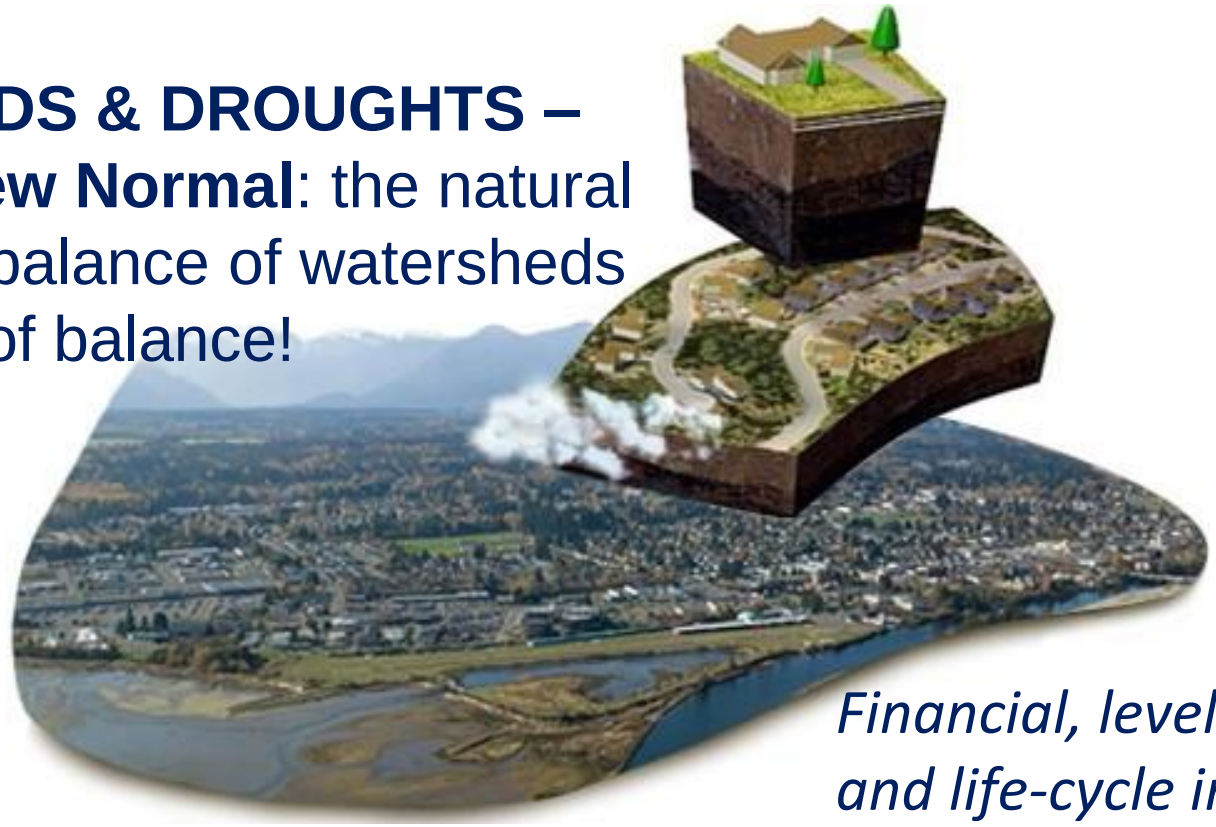
Replicate in other communities

3. NOW WHAT can we do?

Embrace share responsibility, learn by doing and establish precedents

LOOKING BACK: A legacy of past community planning and infrastructure servicing practices is…

FLOODS & DROUGHTS – the New Normal: the natural water balance of watersheds is out of balance!



Financial, level-of-service and life-cycle impacts and implications are drivers for local government action

LOOKING AHEAD: **We face a moment of truth due to a changing climate**

"Pineapple Express" & November 2014 Flood:
Cause-and-Effect

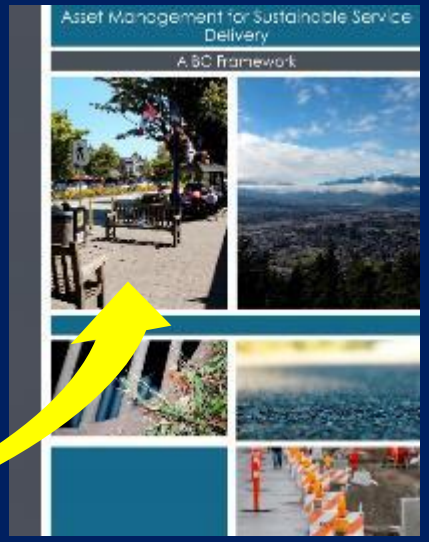
It has taken more than a decade to implement a policy, program and regulatory framework that makes possible 'Water-Resilient Communities'

Three game-changers in 2014.

The **BC Framework** is the lynch-pin.

It provides the reason to view infrastructure differently.

The next step is to integrate 'watershed systems thinking' into asset management.



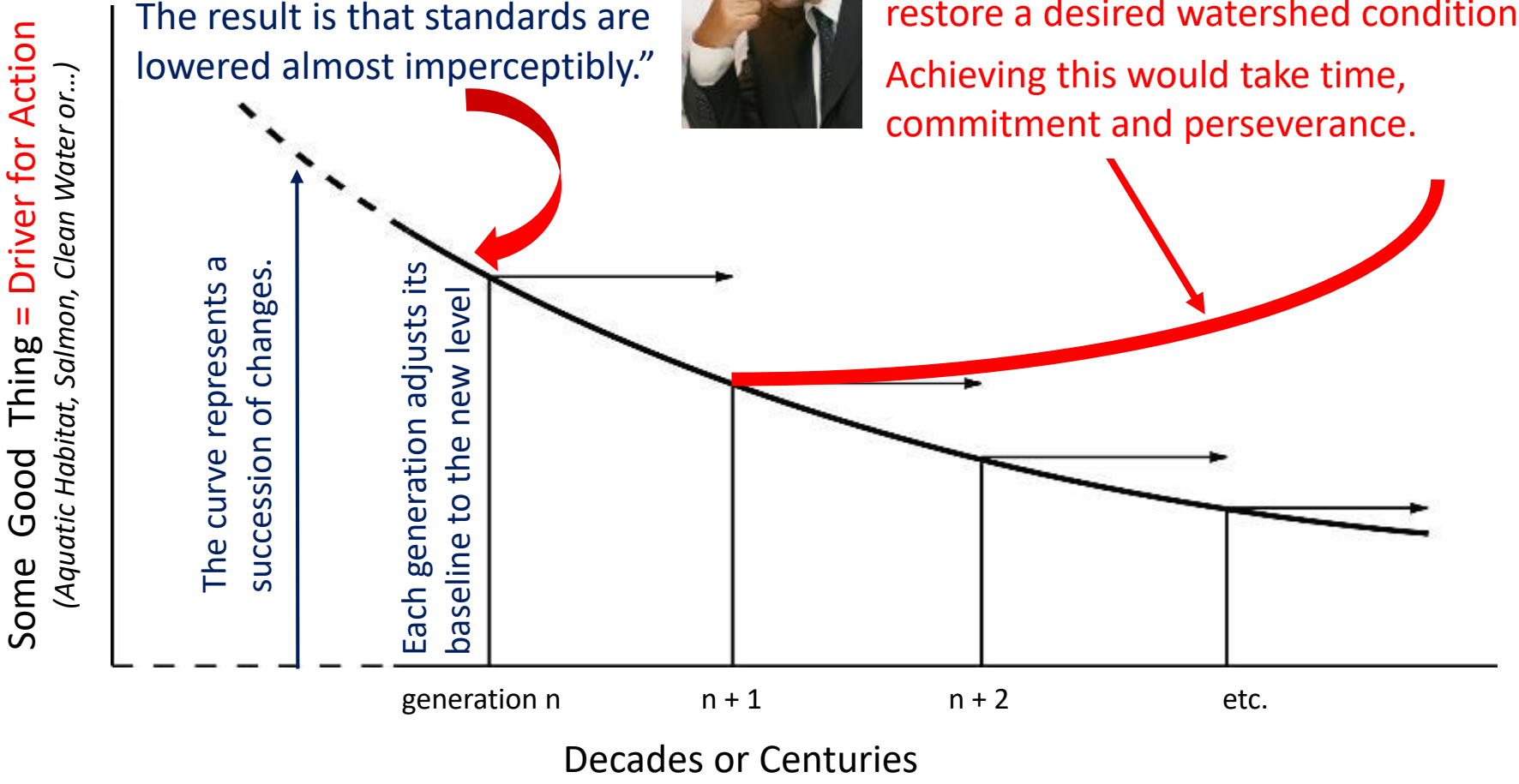
In 1995, Dr. Daniel Pauly coined the phrase

"Shifting Baseline Syndrome"

"With each new generation, the expectation of various ecological conditions shifts. The result is that standards are lowered almost imperceptibly."

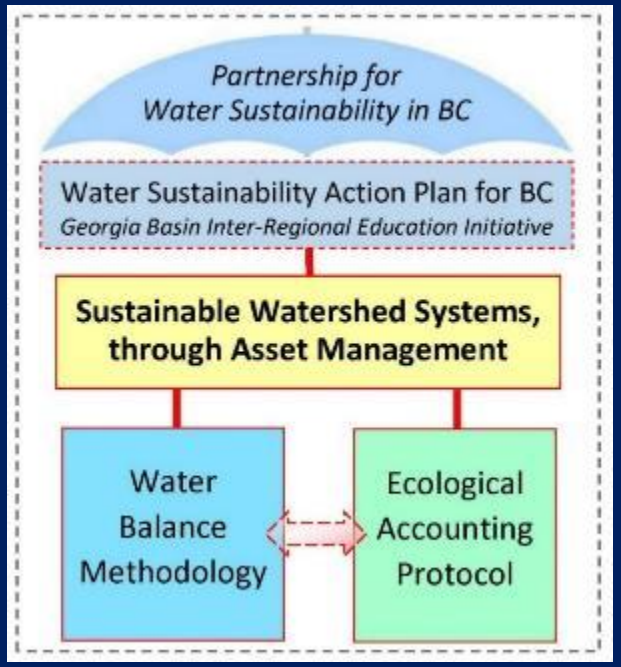
Communities could re-set the ecological baseline IF they would implement 'standards of practice' that restore a desired watershed condition.

Achieving this would take time, commitment and perseverance.



LOOK AT DEVELOPMENT DIFFERENTLY:

To protect watershed health, engineered infrastructure ought to fit into natural systems, rather than the other way around



THE TWIN PILLARS

In 2002, the Province adopted the **Water Balance Methodology**

Now, the Partnership is developing EAP as a tool to calculate the **opportunity-cost** of drainage infrastructure

INTRODUCING THE NEW PARADIGM –
"Watersheds as Infrastructure Assets"

The 3 pathways are:

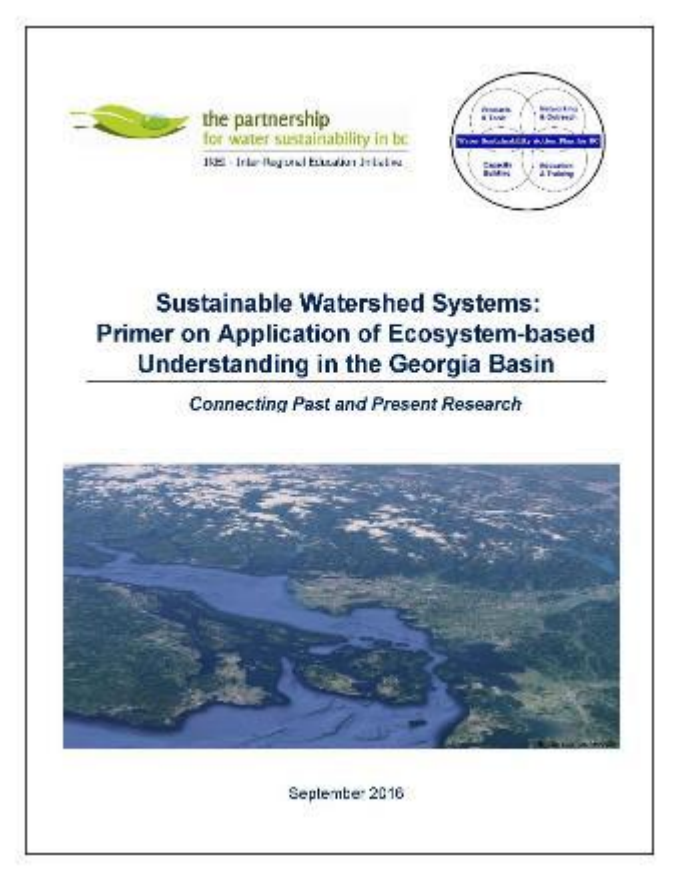
- *over the land surface*
- *shallow horizontal (interflow)*
- *deep vertical to groundwater*

A watershed is an **integrated system**.

The **three pathways** by which rainfall reaches streams are 'infrastructure assets'.

The three pathways provide **'water balance services'**.

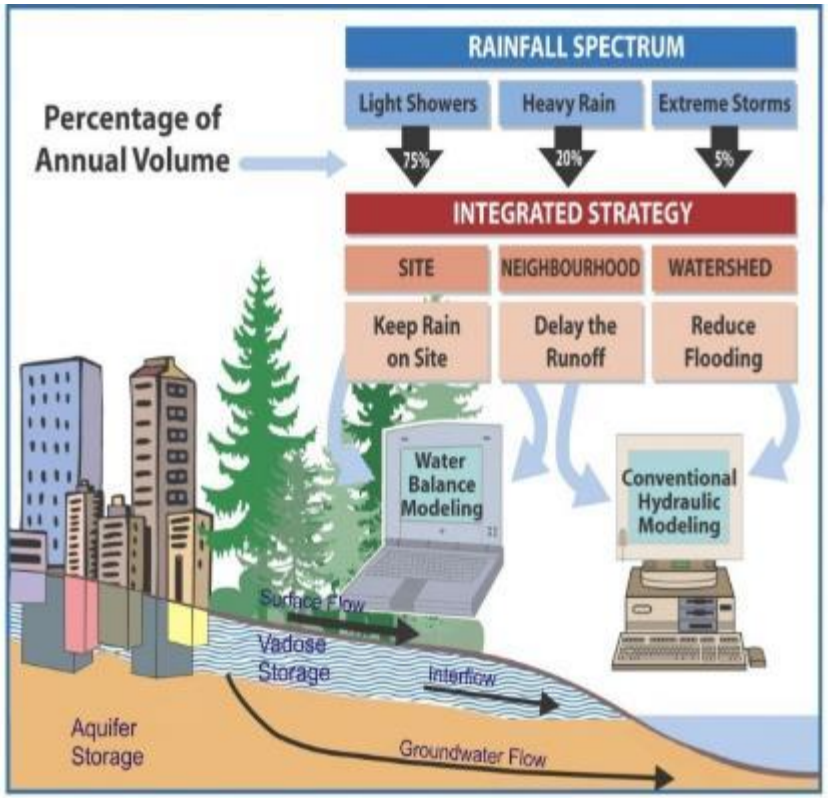
Everyone learns about the Water Cycle in elementary school ……..



visit waterbucket.ca & go to page for 'Guidance Documents & Resources'

The Primer is written to help multiple audiences – whether elected, technical or stewardship – ask the right questions and ensure that "science-based understanding" is applied properly and effectively to implement practices that restore the hydrologic integrity of watersheds.

Watershed protection starts with an understanding of how water gets to a stream, and how long it takes…



Surface runoff

from minutes to hours

Interflow

from days to seasons

Deep Groundwater

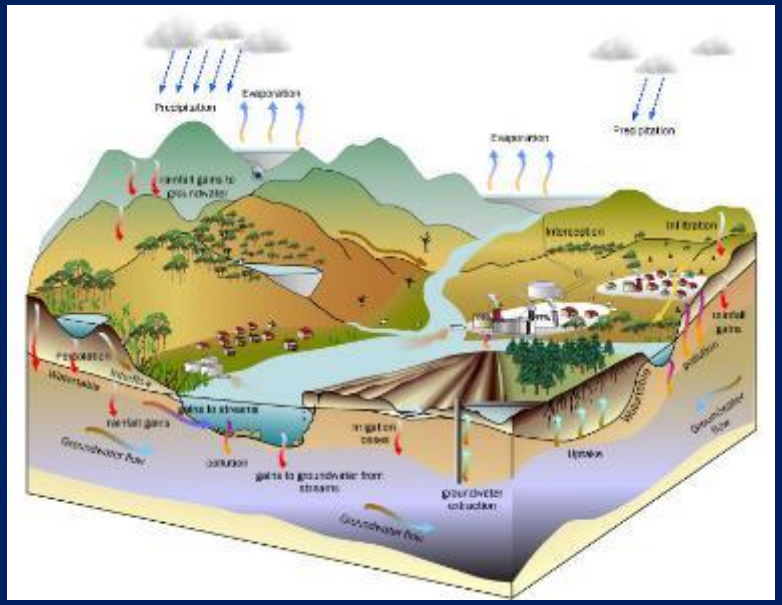
from years to decades or more

GUIDING PRINCIPLE #1:

Maintain the proportion of rainwater entering the stream via each pathway!

Water Balance in a West Coast Watershed

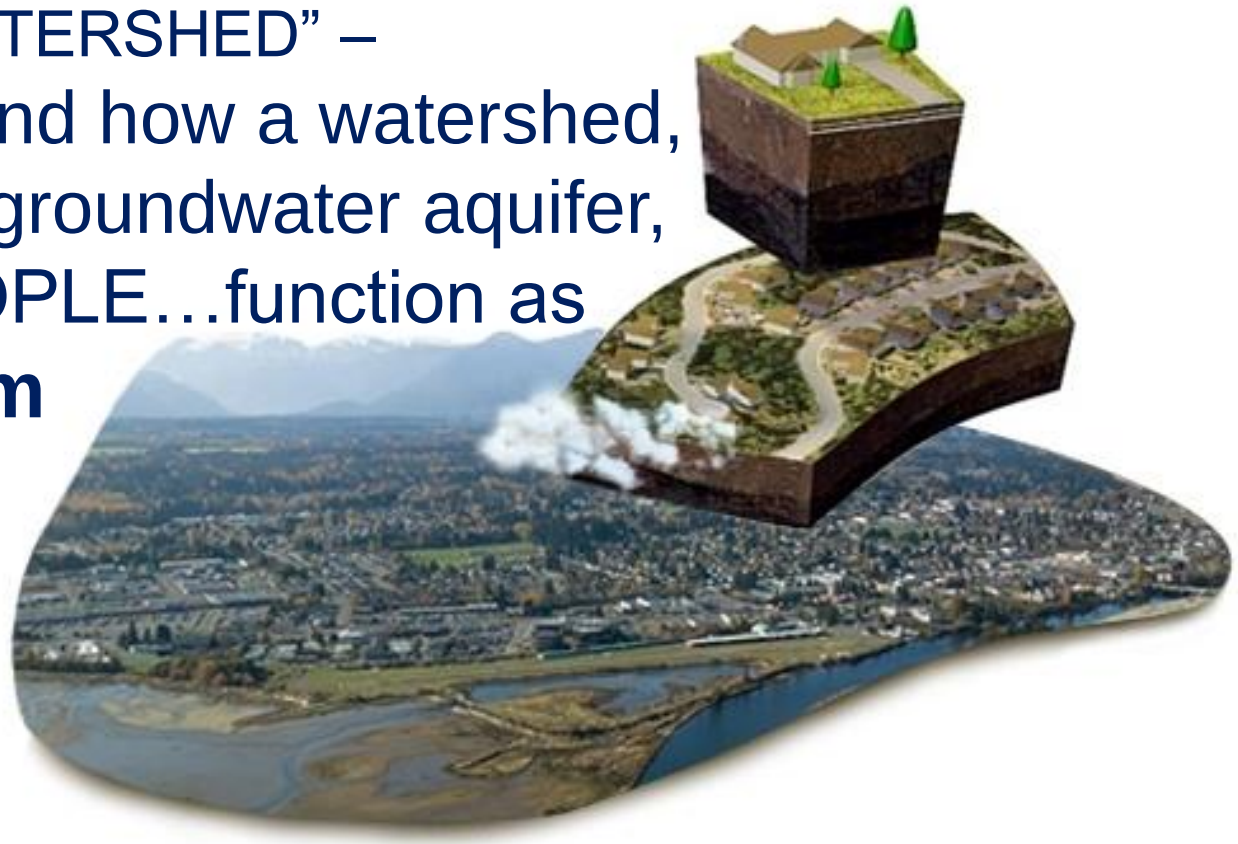
Guiding Principle #2 : *Understand where the water goes naturally and reproduce those conditions*



PRECIPITATION = 100%		
LOSSES = 20%		
	Surface Evaporation	= ~10%
	Loss to Deep Groundwater	= ~ 5%
	Plant Transpiration	= ~ 5%
STREAMFLOW = 80%		
Water Balance Pathways	Direct Runoff	= ~10%
	Groundwater from Aquifers	= ~15%
	Interflow	= ~55%

Guiding Principle #3: *Restore interflow to maintain hydrologic integrity*

"THINK LIKE A WATERSHED" –
means understand how a watershed, its streams, the groundwater aquifer, sites….and PEOPLE…function as a **whole system**



Use and develop land in a way that mimics the natural **FLOW-DURATION** to:

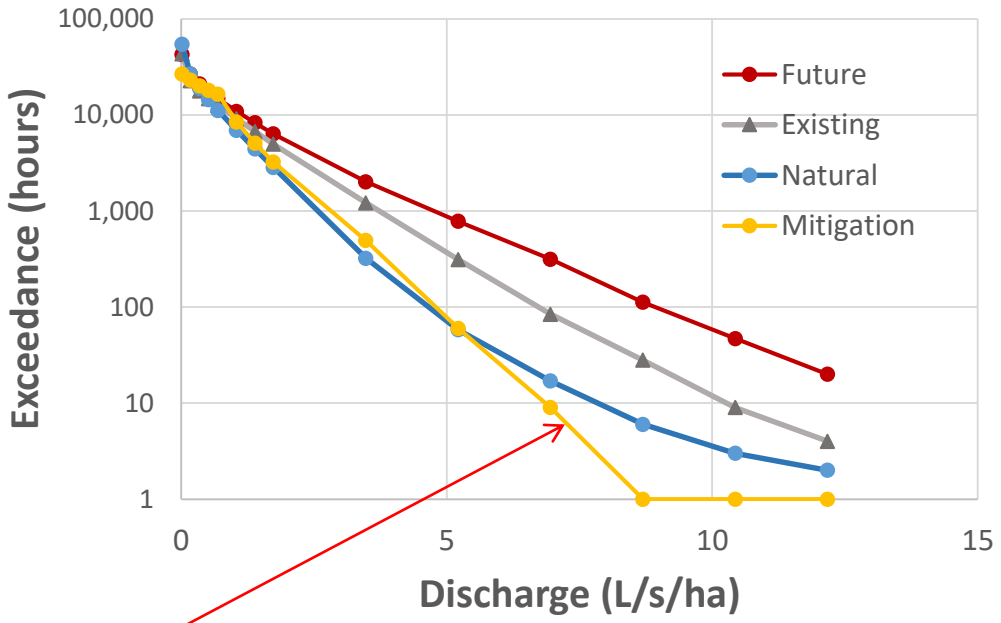
1. Reduce Risk
2. Improve Watershed Health
3. Comply with Regulatory Requirements

If the desired outcome is to limit **stream erosion,** prevent flooding and improve water quality, then……

GUIDING PRINCIPLE #4 –
Replicate the flow-duration pattern to mimic the Water Balance

Flow-Duration Relationship

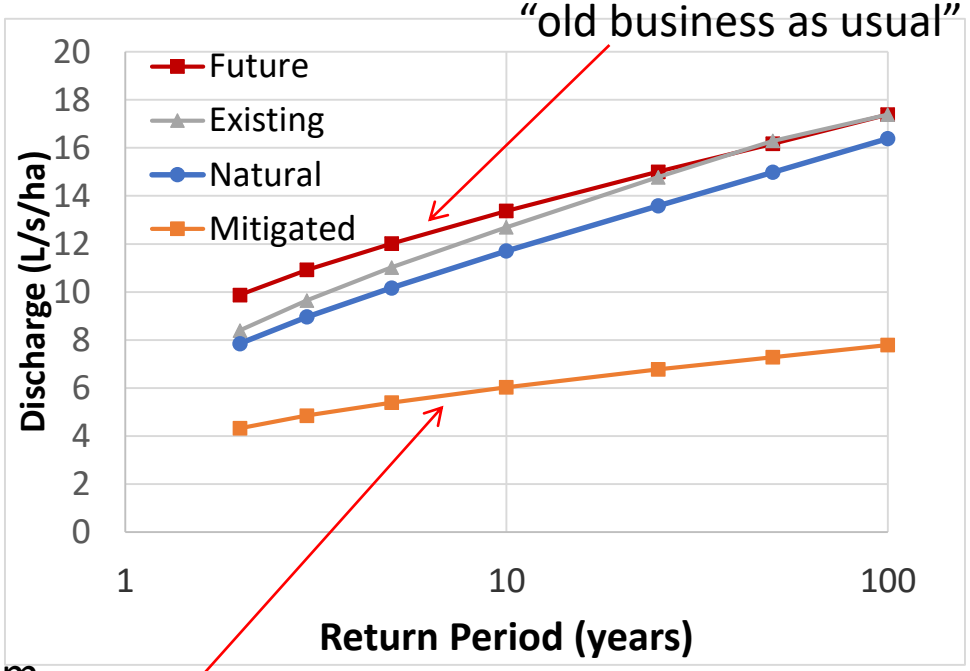
Mitigation Objective:
Reduce flow duration to Natural Conditions



A possible future scenario with mandated mitigation for all new development & redevelopment

If the desired outcome is to limit stream erosion,
prevent flooding and improve water quality, then……

Flood Discharge Relationship



Mitigation Objective:
Reduce flood frequency to Natural Conditions

Achieving the goal of reduced stream erosion, by reducing flow-duration to natural conditions, provides the added benefit of substantially reducing flood risks

A journey to a water-resilient future starts with the first rain garden…..

Visualize the design elements of a Rain Garden:

- Volume for Interflow Storage
- Release to Sustain Duration of Interflow (Shallow Groundwater)
- Area to Allow for Deep Groundwater Recharge

MANAGING BY THE NUMBERS: For the past decade in BC, thought leaders have encouraged practitioners to "think like a system" rather than "like an accountant"…

About Sustainable Service Delivery:

- focus is on desired outcomes, not prescriptive methodologies
- it is about the SERVICE, not the asset
- what 'services' are important, what is the desired 'level-of-service' for each, and how will the services be delivered sustainably

Andy Wardell
Acting CFO, North Van District
& Co-Chair, Asset Management BC

"The role of local government is to deliver services. Achieving sustainable service delivery is the end goal of asset management."

David Allen, Co-Chair
Asset Management BC
&
CAO, City of Courtenay

Asset Management Continuum for Sustainable Service Delivery

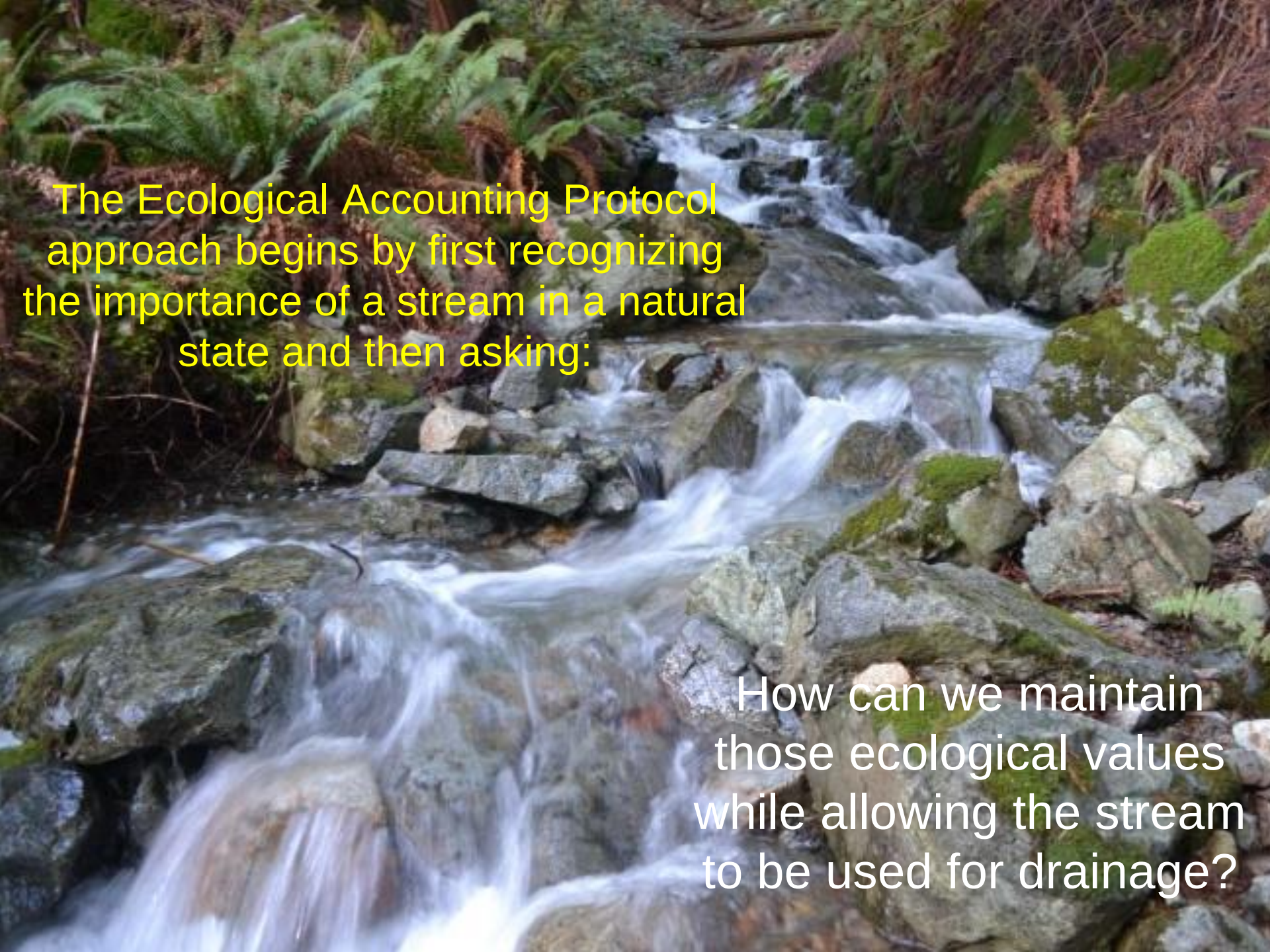
GROUND ZERO: In the beginning, no **Asset Management Plan** exists. A consequence is an 'unfunded infrastructure liability'.

STEP ONE: Local governments embrace the BC Framework, with an initial focus on core engineered assets (water supply, sewage, roads) and embark on an **Asset Management Strategy / Plan / Program** process.

STEP TWO: Local governments start thinking holistically and implement a life-cycle approach to infrastructure decision-making so that **Sustainable Service Delivery** for engineered assets becomes standard practice.

STEP THREE: For the drainage function, local governments will integrate natural systems thinking and climate adaptation into asset management and account for the **Water Balance Services** provided by watershed systems.

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


The Ecological Accounting Protocol approach begins by first recognizing the importance of a stream in a natural state and then asking:
How can we maintain those ecological values while allowing the stream to be used for drainage?

If communities are to truly benefit from use of nature's assets to provide vital community infrastructure services, then two issues must first be recognized as being impediments to changes in practice:

- Widespread lack of understanding of the relationship between flow-duration and stream (watershed) health

- Widespread application of a standard of practice that has led to the current situation of degraded streams, and that has little connection to real-world hydrology

Andy Reese coined the term Voodoo Hydrology in 2006 to describe the misapplication of science that characterizes drainage engineering and stormwater management practice

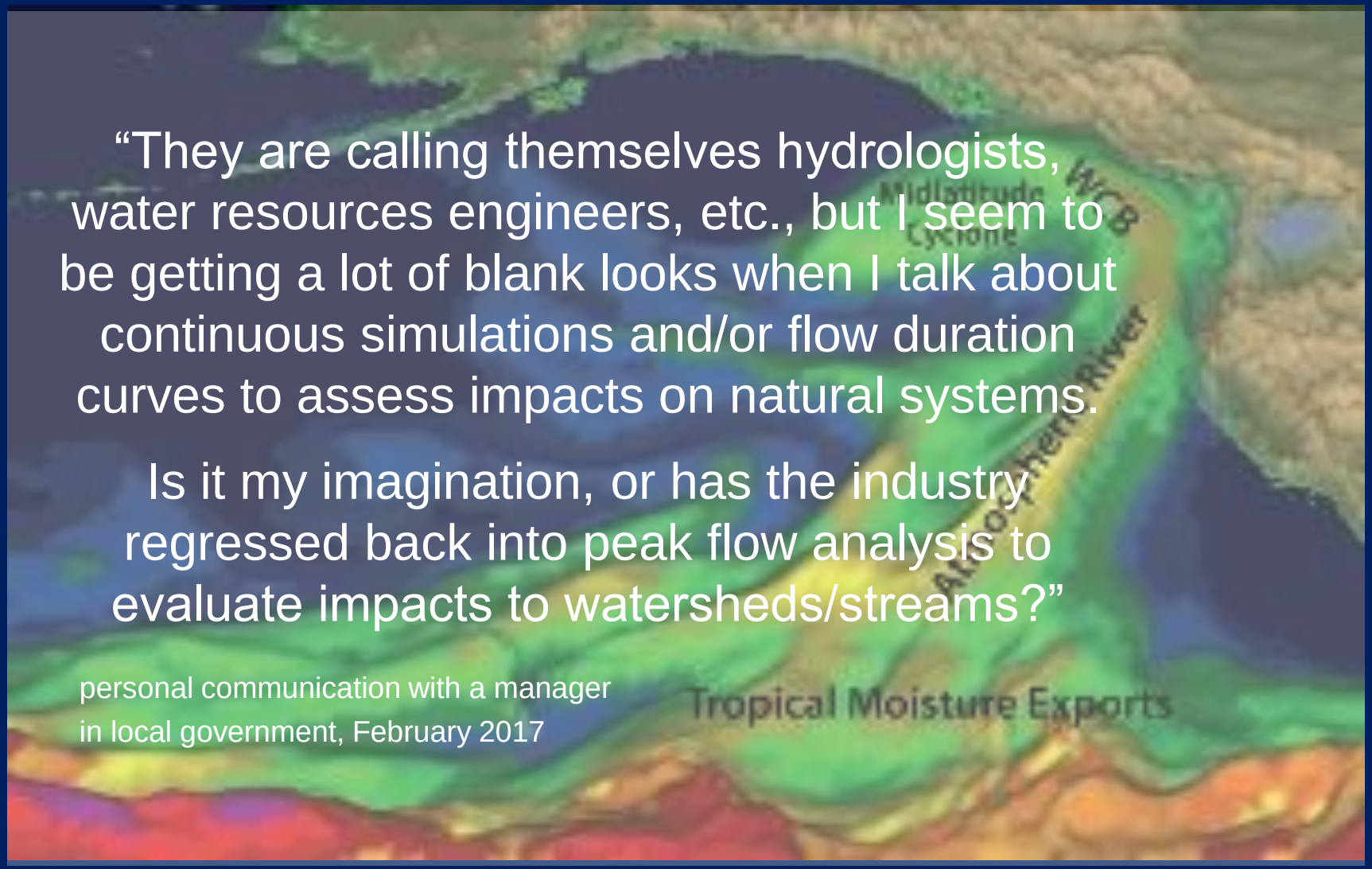
"The rise of Green Infrastructure and Resilience Planning opens the door for newer Voodoo like never before"

Andy Reese

Water Resource Engineer, Writer, Speaker

Co-author of "Municipal Stormwater Management"

CHANGING CLIMATE & HYDROLOGIC INSTABILITY: The risks are too high, and the margins for error too small, to view water and watersheds only through narrow technical lenses

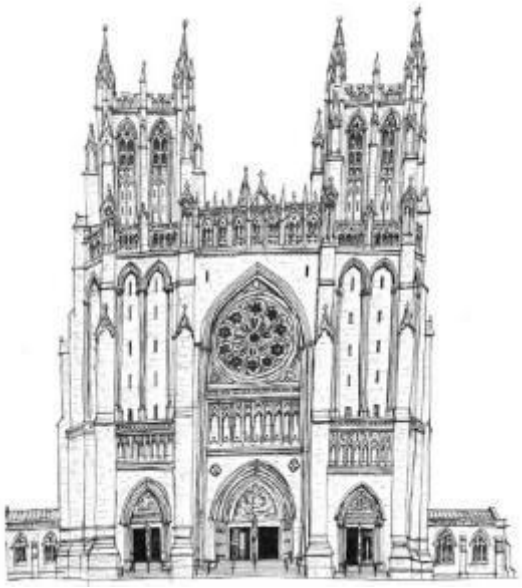


"They are calling themselves hydrologists, water resources engineers, etc., but I seem to be getting a lot of blank looks when I talk about continuous simulations and/or flow duration curves to assess impacts on natural systems.

Is it my imagination, or has the industry regressed back into peak flow analysis to evaluate impacts to watersheds/streams?"

personal communication with a manager in local government, February 2017

“Cathedral Thinking” aptly describes the vision for **Sustainable Watershed Systems, through Asset Management**



In embarking on this journey to a water-resilient future, we can learn from our ancestors.

The builders of great cathedrals in medieval times thought in terms of multiple generations carrying out their work, to complete a dream that would not be realised until long after the originator’s death.

The foundation for Cathedral Thinking:

a far-reaching vision, a well thought-out blueprint, and a shared commitment to long-term implementation

To learn more, visit
www.waterbucket.ca

To add your name to the database for our weekly e-Newsletter,

email the Partnership for Water Sustainability in BC at

outreach@waterbucket.ca