


2018 Annual Conference - Engineers & Geoscientists British Columbia

Moving Toward a Water-Resilient Future: Reflections on Engineers, Science & Getting It Right

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



the partnership
for water sustainability in bc

A portrait of Morgan Guerin, a man with dark hair, wearing a dark blue polo shirt with a small teal logo on the chest. He is standing outdoors in front of a paved area and trees with autumn foliage. The background is slightly blurred.

“Plant seeds in minds.
Think about what you
want in the future.
Say something
enough times and
people will hear it.”

Morgan Guerin
Councillor & Fisheries Officer
Musqueam First Nation
October 2017

My presentation is designed to seed
a conversation about these ideas....

- **WHAT IS THE ISSUE:**
The Natural Water Balance Is Out of Balance!
- **SO WHAT WILL WE DO:** Value Creeksheds as
Infrastructure Assets & Restore the Water Balance
- **NOW WHAT:** Restorative Development Is Possible,
One Property at a Time



What Happens on the Land Does Matter!

The “New Normal” in British Columbia:
FLOODS & DROUGHTS - along with
longer, drier summers & warmer, wetter winters

In British Columbia, we are looking at the water cycle/balance with fresh eyes to develop new approaches, methodologies and tools that would enable communities to achieve what we define as “Sustainable Watershed Systems, through Asset Management”

CONTEXT: A legacy of past community planning and infrastructure servicing practices is...

THE NEW NORMAL –

Floods & Droughts : 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

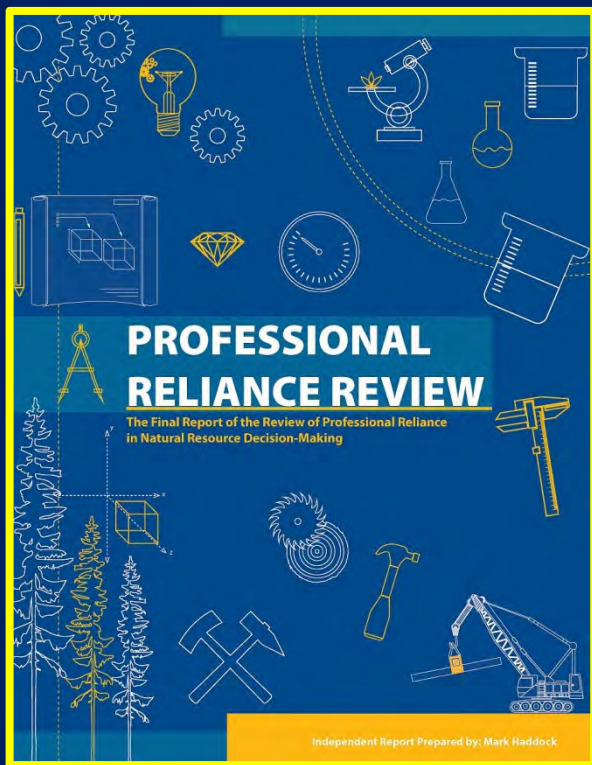
*It is not the end of the world;
just the beginning of another:*

“Prominent scientists say 2018 marks a turning point in human history. We may have crossed an invisible threshold into a new climate regime.”

Bob Sandford
EPCOR Chair
United Nations University



QUESTION: *Do you wonder whether land use, environmental and drainage planning processes are effective in protecting stream health in the urban setting?*



CONTEXT IS EVERYTHING:

High profile consequences of the “professional reliance model” have been well-publicized in the natural resource management sector.

Not as well-understood are the trickle-down consequences of “professional reliance” in the local government sector.

The latter are insidious and have resulted from a comparable absence of provincial oversight.

A Call to Action!

Quotable quote from an op-ed in the Vancouver Sun on September 25, 2018

NATURE OF THE ISSUE: “Entrenched beliefs and a reluctance to change 20th century engineering practices have consistently resulted in missed opportunities to ‘get it right’. A central authority is necessary to establish expectations and ensure practitioner accountability.”

Kim Stephens, Bob Sandford & Tim Pringle

Introducing the Context for Restorative Development

Pause & Reflect on this Powerful & Defining Quote



“80% of the revitalizing work done by urban planners and civil engineers in the 21st century will undo 80% of the work their predecessors did to cities and nature in the 20th century.”

Storm Cunningham
Author – Motivator – Publisher
*Free Public Lecture on April 3
Parksville 2019 Symposium*

“Sponge Communities” - a catchy way to describe the goal in restoring the capacity of the urban landscape to absorb water and release it naturally



*in 2013, President Xi Jinping injected a new term into the global urban design vocabulary when he proclaimed that cities should “act like sponges” and launched **China’s Sponge City program.***

Restorative Development: Where To From Here?

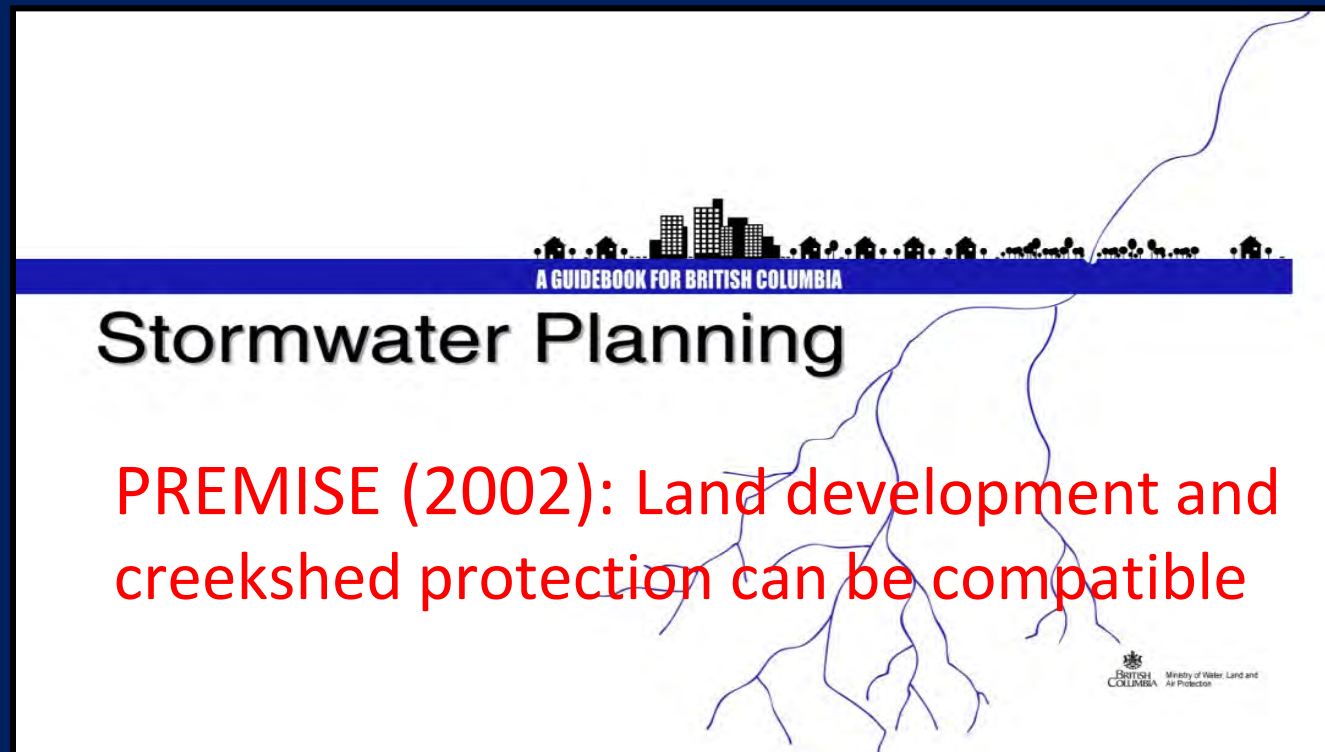
**Vision + Courage + Science +
*'Judgement + Experience'***

- a powerful mix when applied in a balanced and effective fashion, and tempered by an appreciation for human behaviour

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The Guidebook is the foundation document
for the Water Balance Approach in BC





3 Game-Changers!

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

2003 – The Teachable Year

(drought, forest fires – KELOWNA!, floods & pine beetle)

2008 – Call to Action

(Living Water Smart, Green Communities)

2014 – Game-Changers Enable Action

With release of *Beyond the Guidebook 2015*, an educational goal:

Those who are involved in municipal land use and drainage would understand the vision for.....

“Sustainable Watershed Systems, through Asset Management”

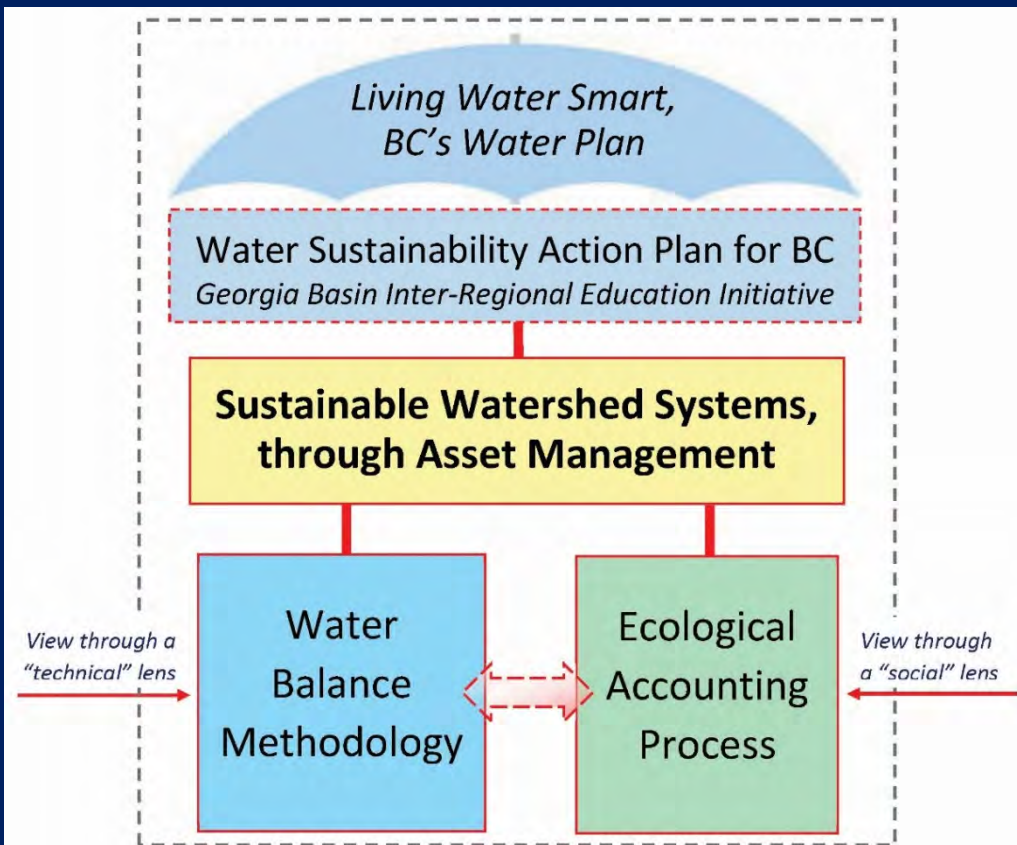
THE NEW PARADIGM —
“Creeksheds as Infrastructure Assets”

A creekshed is an **integrated system**.

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

The three pathways provide ‘**water balance services**’.





The Twin Pillars of Sustainable Watershed Systems

Hydrology is the Engine that Powers Ecological Services

The "twin pillars"
for restorative
development:

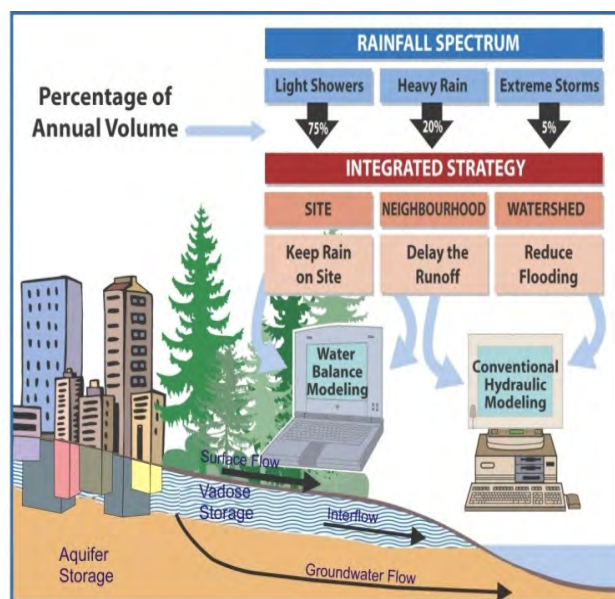
Hydrology is the Engine that Powers Ecological Services:

“The *Ecological Accounting Process* (EAP) is a whole-system, water balance view of creeksheds that assesses hydrology in order to accurately describe ecological services.”



Tim Pringle, Chair
EAP Initiative

Standard engineering practice only considers surface runoff in analyses. Yet the flow of rainwater from cloud to stream is comprised of three water balance pathways, each with a different time scale:



Surface runoff
from minutes to hours

Interflow (shallow horizontal)
from days to seasons

Deep Groundwater
from years to decades or more

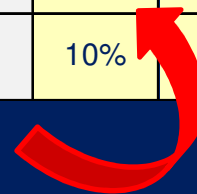
GUIDING PRINCIPLE:

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

Streams erode when there is more surface runoff volume, at higher rates, over longer periods of time!

Historically, the community development and infrastructure servicing process has overlooked, ignored or eliminated interflow.

		Annual Water Balance by Region				
Flow Paths	Coastal BC	Alberta - Edmonton	Ontario - Ottawa	Nova Scotia	Maryland	
Precipitation	100%	100%	100%	100%	100%	
Evaporation						
Streamflow	80%	8%	60%	72%	60%	
▪ Surface Runoff	10%	4%	10%	10%	10%	
▪ Interflow	60%	3%	25%	52%	25%	
▪ Aquifer Flow	10%	1%	25%	10%	25%	



Linking Rainfall, the Landscape, Streamflow, Groundwater and Sustainable Service Delivery has been a building blocks process

2002 – How to reduce runoff volume

2007 – How to mimic flow-duration

2012 – How to sustain deep infiltration

2013 – How to integrate performance targets

2014 – How to downscale targets to a site level

2015 – How to view water balance pathways as infrastructure assets providing services

A KEY MESSAGE: *Science-based understanding becomes clearer over time*

A photograph of a waterfall in a lush forest. The water is white and foamy as it cascades over dark rocks. The surrounding area is filled with green ferns, moss, and other vegetation. A large tree trunk is visible on the right side of the frame. The text is overlaid on the image in yellow and white colors.

How will communities 'get it right'
through collaboration as land
develops and redevelops?

How can we maintain
those ecological values
while allowing the stream
to be used for drainage?

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BRITISH
COLUMBIA
The Best Place on Earth



In 2008, Premier Campbell issued a call to action....

“By 2012, 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.”

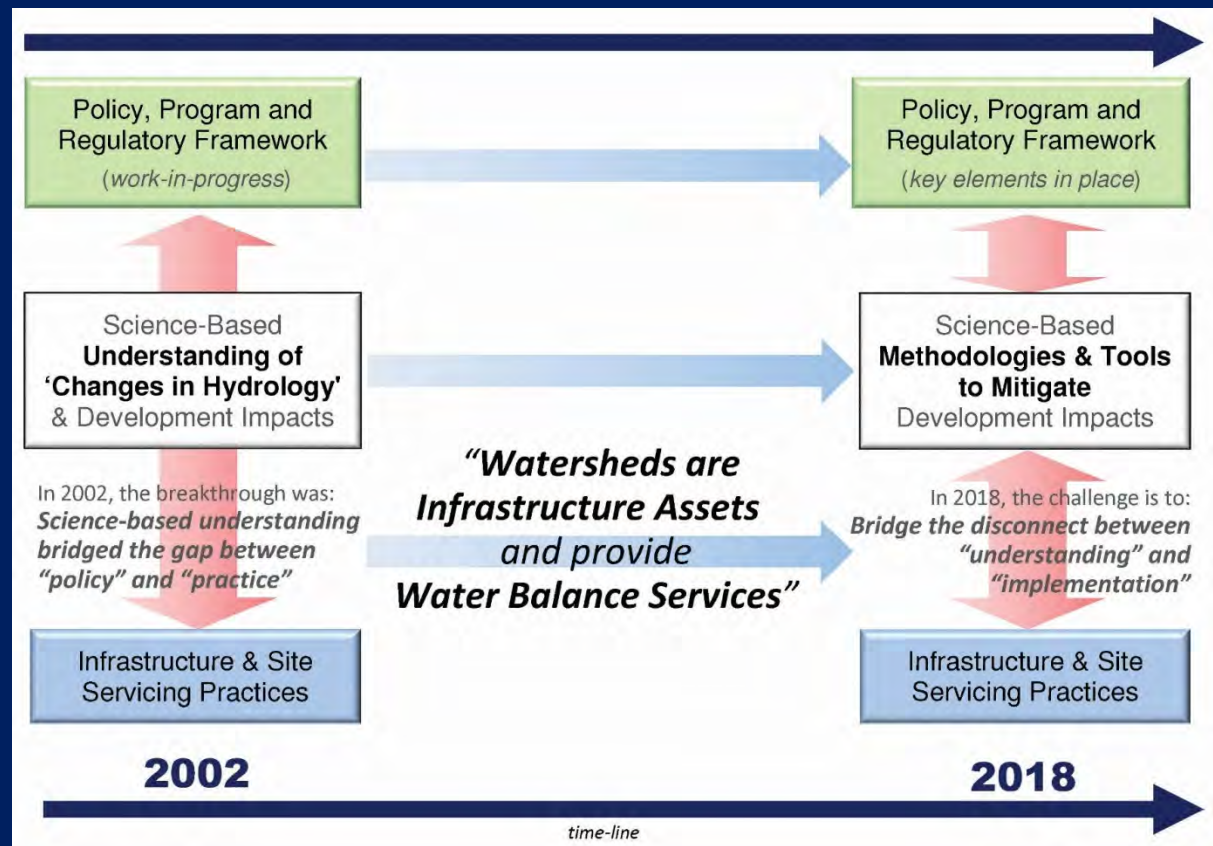


Gordon Campbell
Premier of BC (2001-2010)

Page 43,
Living Water Smart, British Columbia's Water Plan,
released June 2008

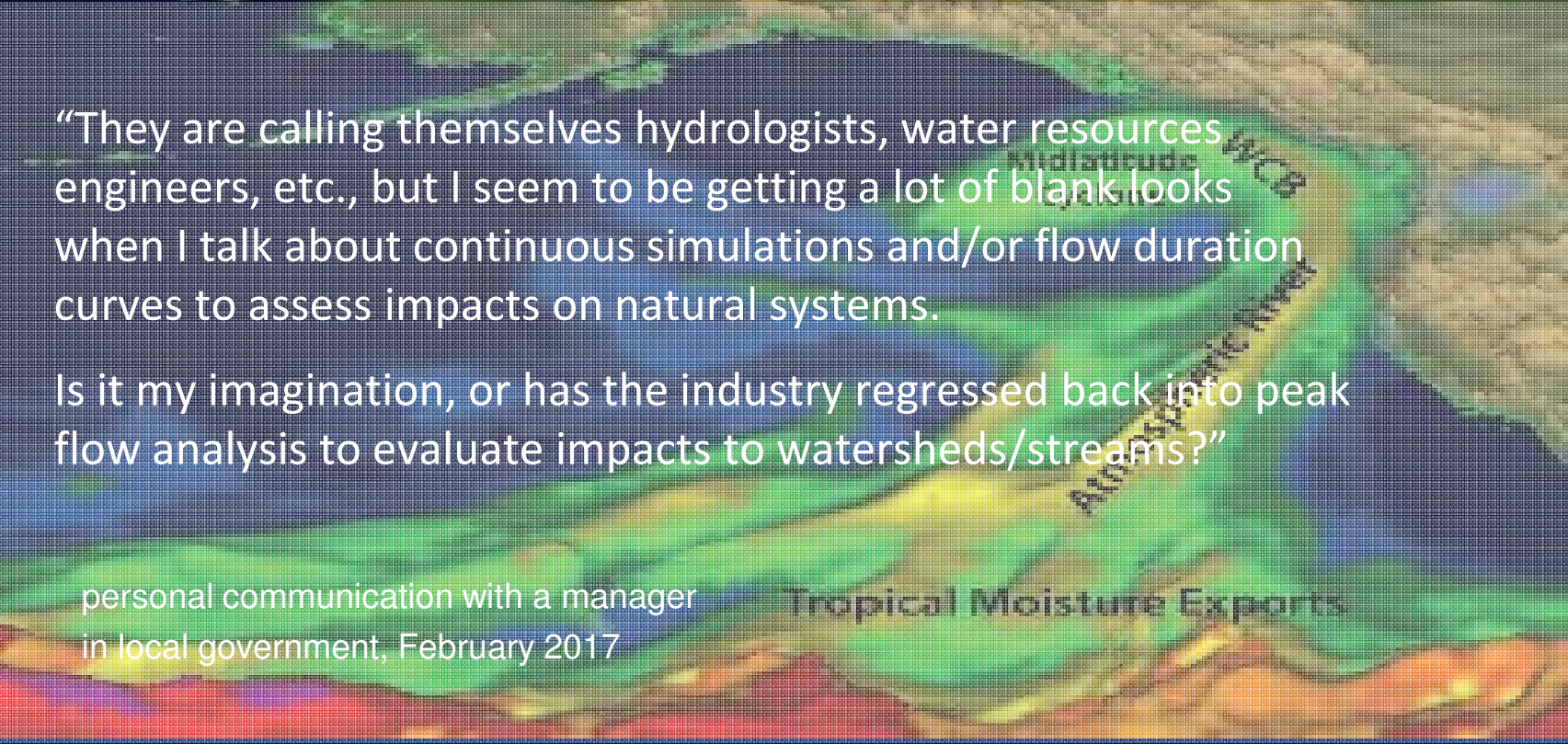
Opening Minds is a Challenge:

16 years later, entrenched beliefs and a reluctance to change are delaying implementation of the Water Balance Methodology



CHANGING CLIMATE & HYDROLOGIC INSTABILITY:

The risks are too high, and the margins for error too small, to view water and creeksheds only through narrow technical lenses



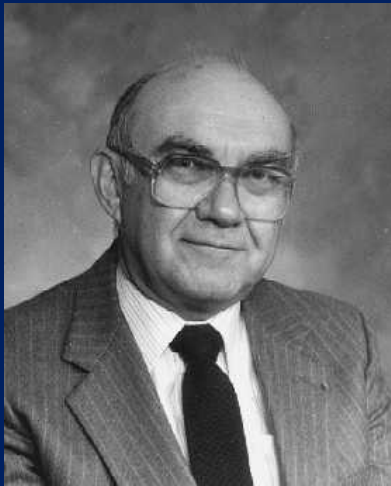
“They are calling themselves hydrologists, water resources engineers, etc., but I seem to be getting a lot of blank looks when I talk about continuous simulations and/or flow duration curves to assess impacts on natural systems.

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

Tropical Moisture Exports

“Hydrology remains a hybrid between the art and the science,” wrote Robert L Smith in 1990



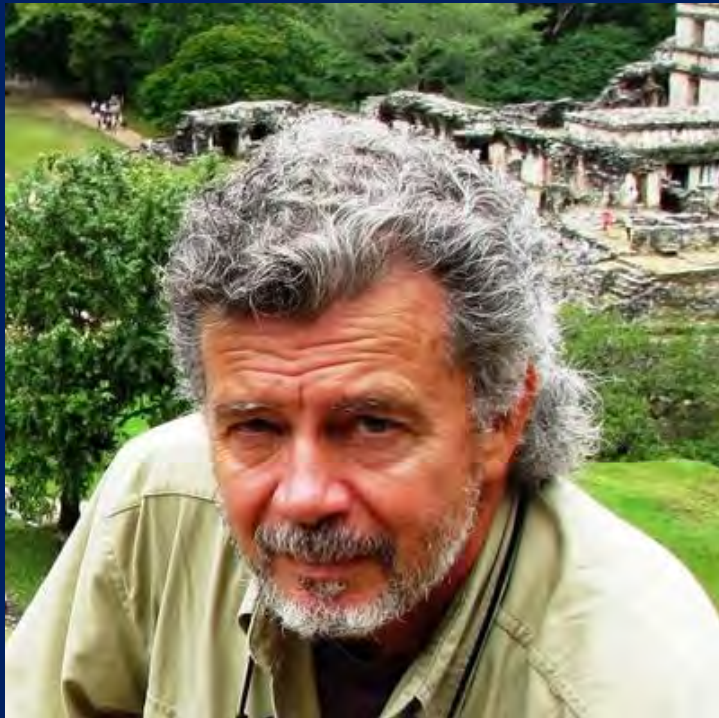
Robert L Smith (1923 – 1995)

Professor, University of Kansas

Presidential Science Advisor for Water Resources

1990 Ray Linsley Award

“Hydrology remains one of the few opportunities in technology where one's diagnostic capability is put to the test of both theory and experience.”



Storm Cunningham
Author & Futurist

Storm Cunningham coined the term
“Restorative Development” in his 2002
book, *The Restoration Economy*

“The process of restoring our planet
and revitalizing our communities is
finally becoming a rigorous
discipline, with the proper
education and tools.”

Google: “Storm Cunningham TED Talk”

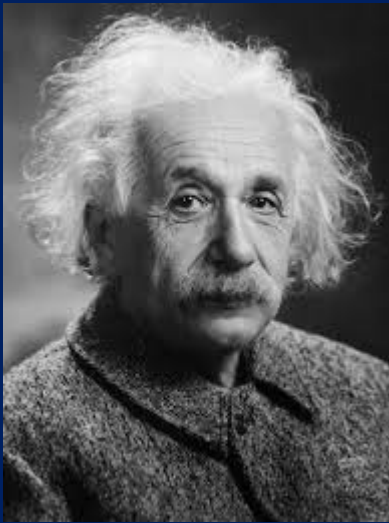
“B.C. is one of the last places on the planet where it is still possible to transcend the climate debate and create a better world.”



“We can make sustainable attainable if we work together. Restore. Restore. Restore. Let that be our imperative.”

Bob Sandford
September 2018

"Everything that can be counted does not necessarily count,
everything that counts cannot necessarily be counted"



Albert Einstein
(1879-1955)
Physicist, Scientist

*"No problem can be solved from the
same consciousness that created it. We
have to learn to see the world anew."*

Getting to restorative development depends on finding a balance between **Left Hemisphere** thinking (*short-term + pragmatic = 'show me the money'*) and **Right Hemisphere** thinking (*long-term + holistic = 'leap of faith'*)

“Our present global and societal problem is that short-term thinking governs much of what we do. In many organizations, the long-term view has somehow become excluded over many generations.”



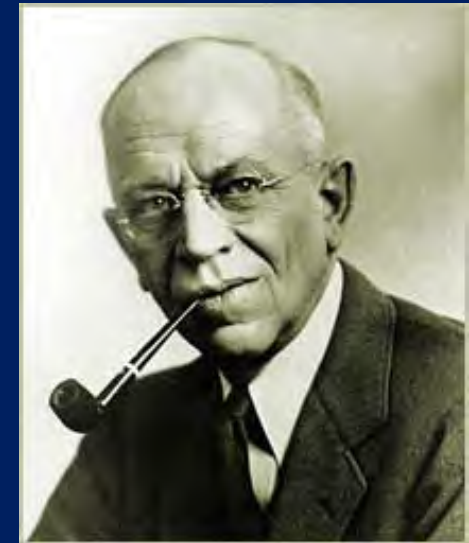
Eva Kras
Visionary, Scholar, Traveler and Author

Aldo Leopold captured the left brain / right brain challenge when he described our relationship with the land as follows:

“We abuse the land because we regard it as a commodity belonging to us. When we see the land as a community to which we belong, we may begin to use it with love and respect.”

Aldo Leopold (1887 -1948)

American professor, author, philosopher, scientist, ecologist, forester, conservationist, and environmentalist



Michael Blackstock developed the Blue Ecology ecological philosophy

“Hydrologists and water managers can help build a brighter future by rediscovering the meaning of water, and interweaving the predominant Western analytical models with the more intuitive indigenous models.”



Michael Blackstock
Scholar & Treaty Negotiator

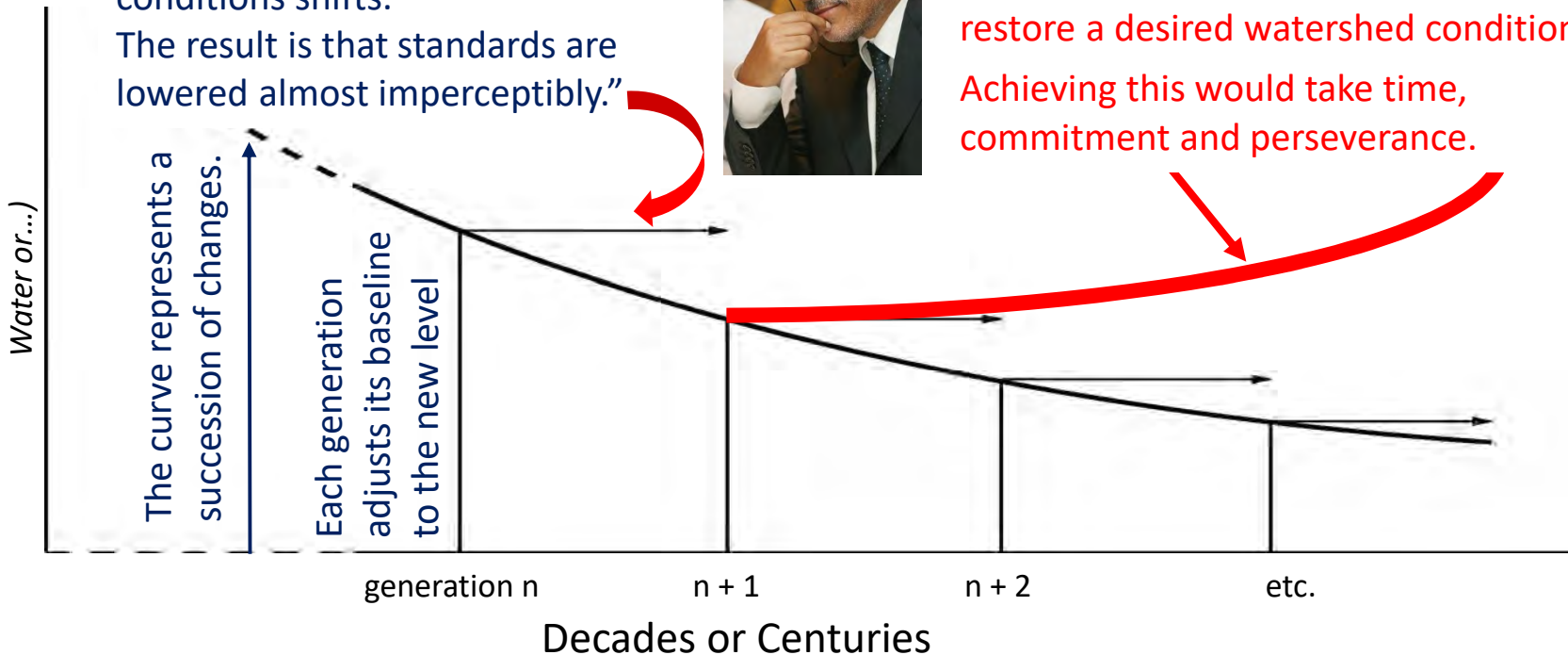
In 1995, Dr. Daniel Pauly coined the phrase
“Shifting Baseline Syndrome”

Some Good Thing = Driver for
Action (Aquatic Habitat, Salmon, Clean
Water or...)

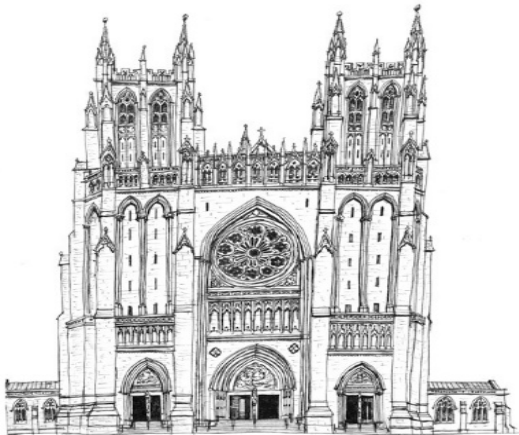
“With each new generation, the
expectation of various ecological
conditions shifts.
The result is that standards are
lowered almost imperceptibly.”



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.



“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

“Cathedral Thinking - collaborate, with a shared vision and cooperative endeavour to ensure that humanity can survive.”



Stephen Hawking
Theoretical physicist, cosmologist, author

“A shift in behaviour is inspiring some groundbreaking new ideas. Termed ‘cathedral ideas’, these are the modern equivalent of the grand church buildings. These ideas are started by one generation with the hope a future generation will take up these challenges.”

extracts from an Op-Ed published
in the Manchester Guardian
on July 30, 2016