



the partnership
for water sustainability in bc

Waterbucket eNews on October 3, 2023
<https://waterbucket.ca/wscblog/>

Living Water Smart in British Columbia:

***A window into the green
infrastructure journey in
the Metro Vancouver region***

Note to Reader:

Waterbucket eNews¹ celebrates the leadership of individuals and organizations who are guided by the vision for [Living Water Smart in British Columbia](#)².

The edition published on October 3, 2023 featured the clear thinking and innovation of Jim Dumont in evolving the Water Balance Methodology to the point where it underpins a risk reduction approach to protecting streams in a changing climate.

The umbrella for Partnership initiatives and programs is the [Water Sustainability Action Plan for British Columbia](#)³. In turn, the Action Plan is nested within [Living Water Smart, British Columbia's Water Plan](#).



¹ <https://waterbucket.ca/wscblog/>

² https://waterbucket.ca/wcp/wp-content/uploads/sites/6/2017/11/livingwatersmart_book.pdf

³ <https://www.waterbucket.ca/cfa/sites/wbccfa/documents/media/81.pdf>

One-Minute Takeaway

“Why have the practitioners of Rainwater Management in British Columbia fallen behind the West Coast states in protecting streams and reducing risk?”



“The West Coast experience of Washington State, Oregon and California is a counterweight to those who lean to Ontario and Northeastern USA for their experience. So, in British Columbia, we are on the right path. But that path seems to be a path less travelled.”

Jim Dumont, Water Resource Expert

Jim Dumont is a pioneer water resources professional who has served as the Partnership for Water Sustainability’s Engineering Applications Authority and has taught professional development courses for Engineers and Geoscientists BC for the past two decades. And to top it off, Jim Dumont is known across Canada and beyond for his knowledge and innovation.

Jim Dumont is an original and critical thinker. Original thinkers are non-conformists, have ideas and the courage to try to change the world. Critical thinking is the intellectually disciplined process of analyzing and synthesizing information.

In the first decade following the release of [Stormwater Planning: A Guidebook for British Columbia](#) in 2002, Jim Dumont evolved the Water Balance Methodology through a rigorously analytical approach. This work was founded on case study applications.

His methodical approach to applied research was keyed to a building blocks process. Jim Dumont systemically tested assumptions and verified the numbers to demonstrate how to reduce risk and protect streams.

"We must start and end with the stream for a true measure of success," says Jim Dumont

"While many advances have been made in managing rainwater on-site, BC communities are failing to utilize practices that directly benefit streams during droughts and floods," observes Jim Dumont.

"The needs of BC communities closely align with the other west coast areas that suffer from adverse stream flows rather than the degradation of water quality which is the case on the east coast."

"The western states of California, Washington, and the Oregon DOT require that stormwater management systems maintain **stream flow duration** to protect against stream erosion and flooding."



Editor's Perspective by Kim A Stephens

In his "story behind the story" essay that follows, Jim Dumont paints a broad-brush picture. He does this in a way that does not require a technical background to first comprehend and then take to heart. Jim is to the point in answering the question posed in the headline above:

“Why have the practitioners of Rainwater Management in British Columbia fallen behind the West Coast states?”

Jim Dumont's clear thinking, innovation and experience underpin the foundation for his risk reduction approach to maintaining "water balance" in a changing climate

Story of the Metro Vancouver region's Green Infrastructure Journey (1997-2023)

With the downloadable version of this edition of Waterbucket eNews, we include a BONUS FEATURE. It is a preview extract from [Create Liveable Communities and Protect Stream Health in the Metro Vancouver Region: Moving Along the Green Infrastructure Continuum](#). This legacy resource will be published early in 2024.

The past informs the future. In the downloadable version, Jim Dumont explains and reflects on how his science-based understanding evolved through case study applications in Surrey, Langley Township, North Vancouver District and beyond.

It is about looking back to see ahead. The preview weaves quotable quotes from a conversational interview with Jim Dumont. We hope readers will find the storyline informative as well as compelling.

What everyone ought to know

The Partnership for Water Sustainability process for understanding and then sharing oral history is one of “sifting, distilling, synthesizing and layering” the information so that others may learn from the knowledge and experience of these who lead by example. Having a written record of our oral history is essential for handing off as well as embracing the inter-generational baton for green infrastructure and everything else.

For three decades, we have known what we must do. So...

Why are streams still degrading?
Why has our region fallen behind Washington State, Oregon and California?

What are the RISKS when we FAIL to get it right?



STORY BEHIND THE STORY:

Why have the practitioners of Rainwater Management in British Columbia fallen behind? - an essay by Jim Dumont

BONUS FEATURE

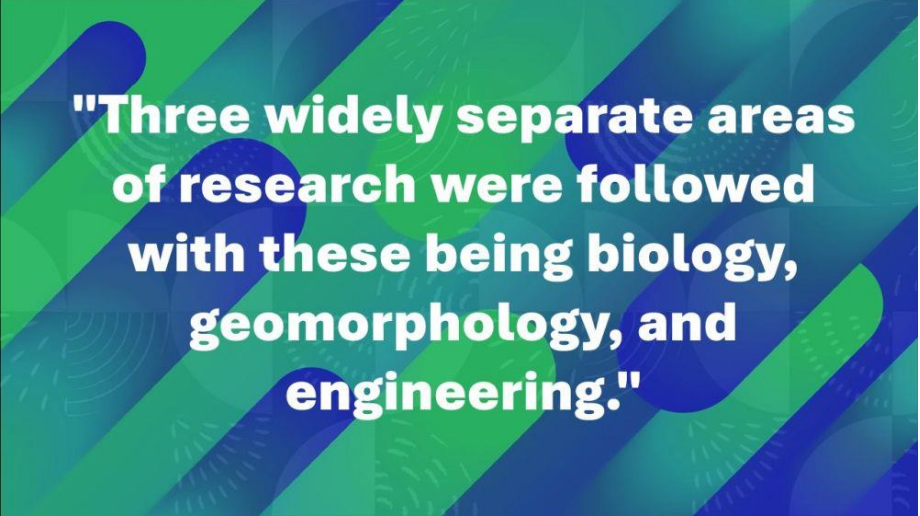
A conversational interview with Jim Dumont follows as Appendix A. He provides context and perspective for the green infrastructure journey in the Metro Vancouver region. This is a preview extract from a "legacy resource" to be published in early 2024.

Context and Perspective

"So, why have the practitioners of Rainwater Management in British Columbia fallen behind practitioners in Washington State, Oregon and California in protecting streams? In answering this question, one must understand how we arrived at this situation and then it will be easy to see a path forward," states Jim Dumont.

"At about the turn of the 21st century a catastrophic loss of salmon stocks occurred along the west coast. This resulted in job losses and additional stress was imposed on the venerable Orca."

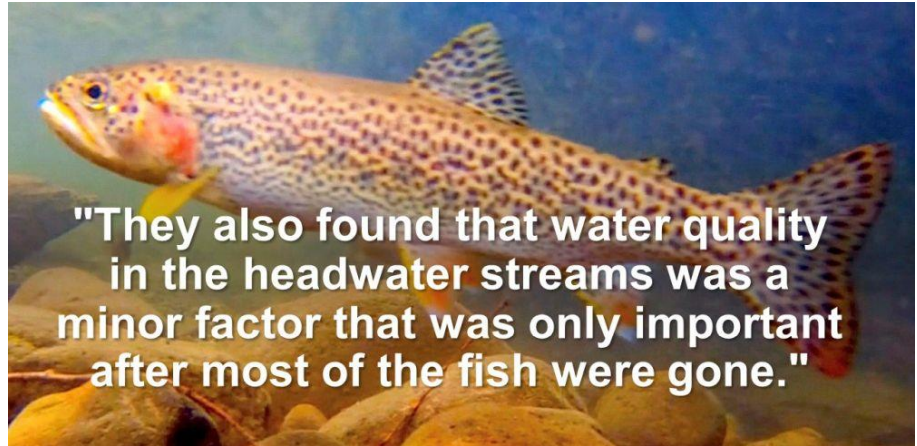
"Public sentiment and resources were focused on finding the causes and in providing solutions. The public demanded answers and a collaboration of researchers along the west coast added to our scientific knowledge."



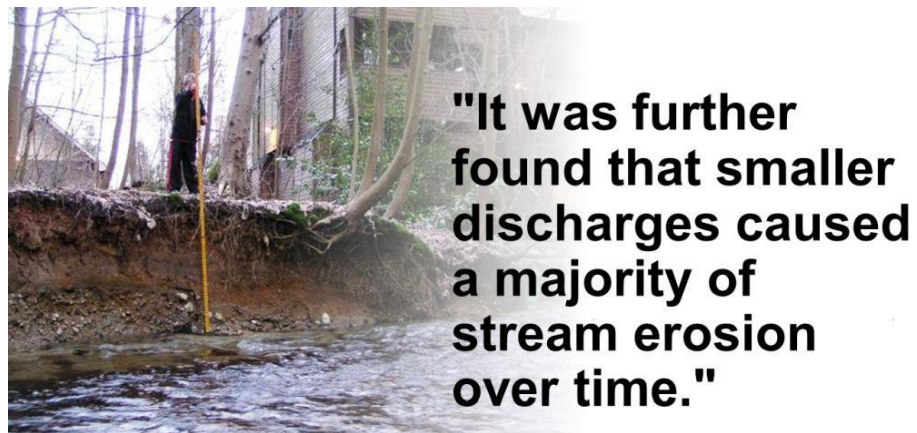
"Three widely separate areas of research were followed with these being biology, geomorphology, and engineering."

What we learned from the research in biology, geomorphology and engineering

"Biology researchers were searching for the root causes of the loss of salmon on the west coast. They identified the most important factor was the loss of aquatic habitat for fish and their food sources with a poorly understood connection to development intensity in a watershed."



"Research in geomorphology, the study of stream formation identified that rare floods were not the cause of all changes in a stream forms. It was found that major changes of stream form occurred during floods with a return period as small as a 2-year return period."



"Engineering research into stream erosion directly linked to friction (tractive force) and easily found that any increase in discharge duration would increase stream erosion. Additionally, development was found to increase the duration of erosion causing discharges in headwater streams, even with the inclusion of stormwater detention ponds."

"The advances in science led to different paths along the west coast for British Columbia, California, Oregon and Washington."



As a response to the "salmon crisis", BC adopted the Water Balance Methodology to protect streams and property

"In 2002, the provincial government released [Stormwater Planning: A Guidebook for British Columbia](https://waterbucket.ca/rm/sites/wbcmr/documents/media/242.pdf)⁴. The Guidebook demonstrated that changes in rainwater management could be made at a site level by establishing water balance performance targets."

"This led to significant changes to development practice with the inclusion of rainwater capture and infiltration systems with the sole objective to reduce surface runoff."



"For the municipal engineers this was accommodated with a simple addition of ground infiltration to their designs while following the existing regulations and bylaws that mandated drainage designs providing flood protection."

⁴ <https://waterbucket.ca/rm/sites/wbcmr/documents/media/242.pdf>

"Reliance was placed on the assumption that infiltration of rainwater would somehow mitigate development impacts without additional research or analysis that included the headwater streams."

"In practice, this approach follows that used in the more industrialized areas of the eastern portions of the continent where water quality is the most important factor in implementing rainwater management."



Meanwhile, in all three states on the United States West Coast

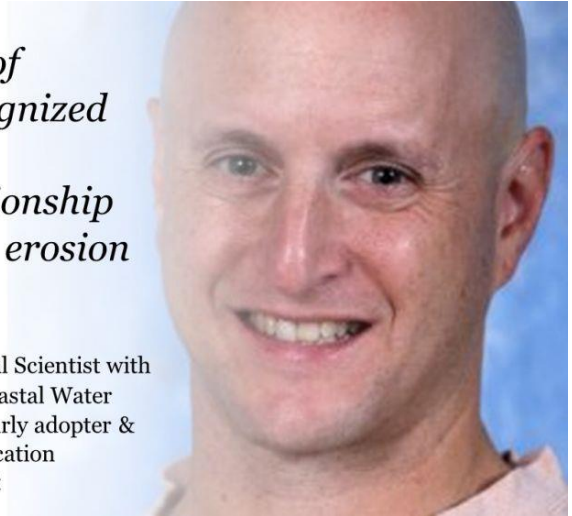
"California, Washington, and Oregon progressed further by encompassing the lessons of the three areas of research. In 2008 the California Water Resources Control Board concluded negotiations with the US Environmental Protection Agency and was able to include **stream discharge duration** in all new stormwater planning and designs."

"This provided a unique focus based upon the needs along the west coast to mitigate changes in streams while providing flood protection. The Oregon Department of Transportation (DOT) quickly followed with stormwater drainage requirements that included duration of discharges in their projects."

"Washington Ecology took a bit longer. After introducing the concept of discharge duration in 2001 they formulated an agreement with the US-EPA in 2012 that discharge duration would be included in stormwater planning and designs."

“In 2005, the State of California first recognized that replicating the flow-duration relationship is key to preventing erosion impacts.”

Dr. Eric Stein, Principal Scientist with the Southern California Coastal Water Research Project, and an early adopter & champion for Hydromodification Assessment & Management



BC's provincial government informed local governments about the methodology for "stream discharge duration"

"So, what happened in British Columbia?"

"Why did BC local governments not follow through and learn from the example of the three states along the west coast? In BC, in parallel with the US states we did continue to research the problems and to identify practical improvements to our practice of rainwater management."

["Beyond the Guidebook 2007: Context for Rainwater Management and Green Infrastructure in British Columbia"](#) laid out the basis for an evolution in the Water Balance Methodology to include flow duration."

"The Ministry of Community Development then sent out a circular to all Municipal and Regional District Chief Administrative Officers, Engineers and Planners regarding the Beyond the Guidebook provincial initiative."

Ministry Circular sent to all local governments in BC stated that...

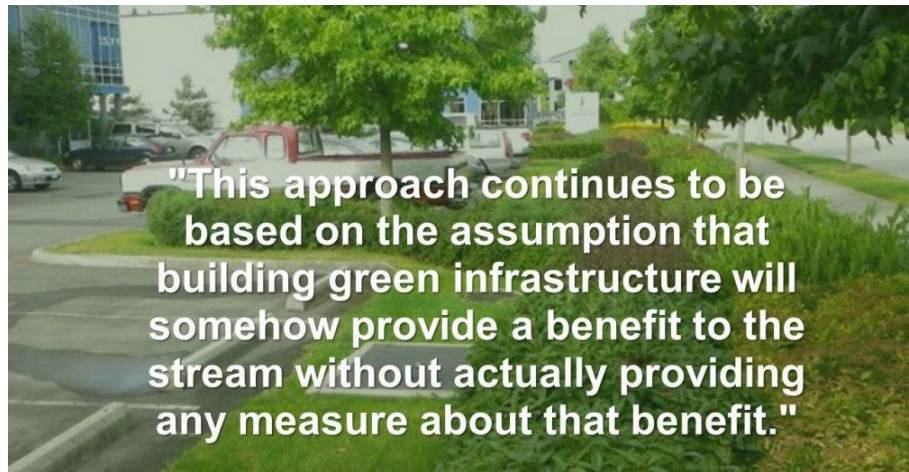
"Beyond the Guidebook introduces a methodology for correlating green infrastructure effectiveness in protecting stream health based upon rain water balance." – February 2009

Glen Brown, Executive Director
Ministry of Community Development



"For many practitioners it is far easier to simply add ground infiltration measures to existing drainage practices without any updating of regulations and drainage bylaws. This approach has a bias on pollution control through diversion away from the stream and into the ground, with more being better."

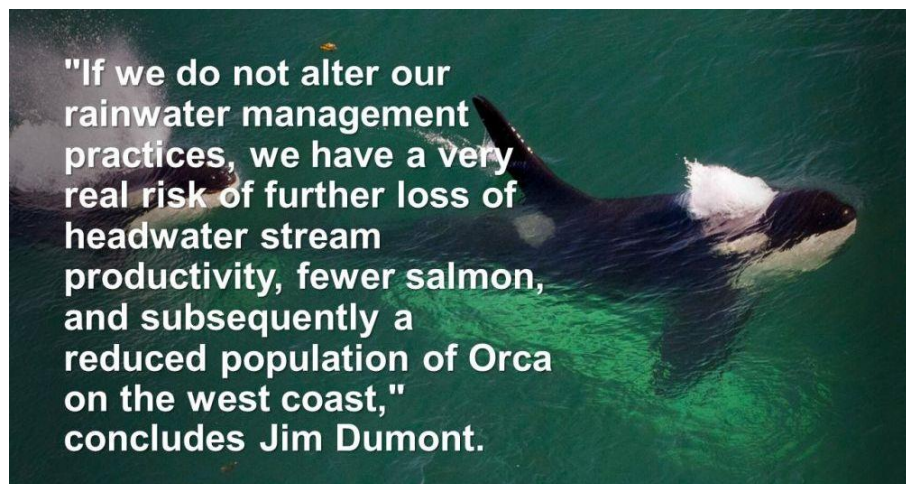
"The stream has not been included in any meaningful manner and the impacts have not been quantified, nor have the effects of any mitigation works."



What do we need?

"If the stream and ultimately the salmon and Orca are keys in our objectives then we must bring the stream back into our planning and design processes as did California, Washington, and Oregon."

"We must also update the regulations and bylaws to include flow durations in the stream. This approach has been well researched and documented by those regulators on the US west coast and by the Partnership for Water Sustainability in British Columbia."



APPENDIX A

A window into the green infrastructure journey in the Metro Vancouver region:

A conversational interview with Jim Dumont provides context and perspective



Jim Dumont, Water Infrastructure Specialist and Engineering Applications Advisor

Original and Critical Thinker

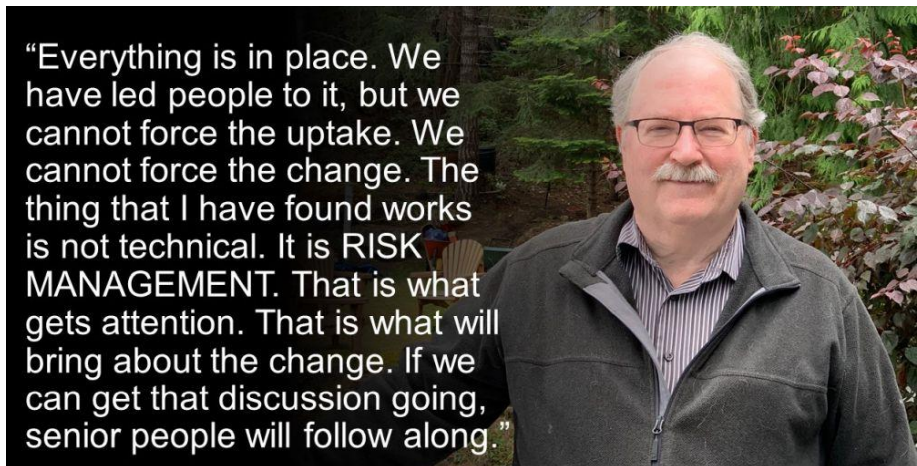
Original thinkers are non-conformists, have ideas and the courage to try to change the world.

Critical thinking is the intellectually disciplined process of analyzing and synthesizing information.

“You have a whole bunch of ISMP reports that are sitting on the shelf. They are cookie-cutter, check the box. It is paralysis by analysis. If the existing ISMPS are updated, I believe that local governments will get the same again.”

Jim Dumont is a pioneer water resources professional who has served as the Partnership for Water Sustainability’s Engineering Applications Authority for close to 20 years. He is known across Canada and beyond – for example, he contributed a chapter to the update of the classic textbook [Handbook of Applied Hydrology](#) by Ven te Chow.

Figure 1 provides an overarching context for reflections that follow. The companion images conceptualize evolution along a continuum.

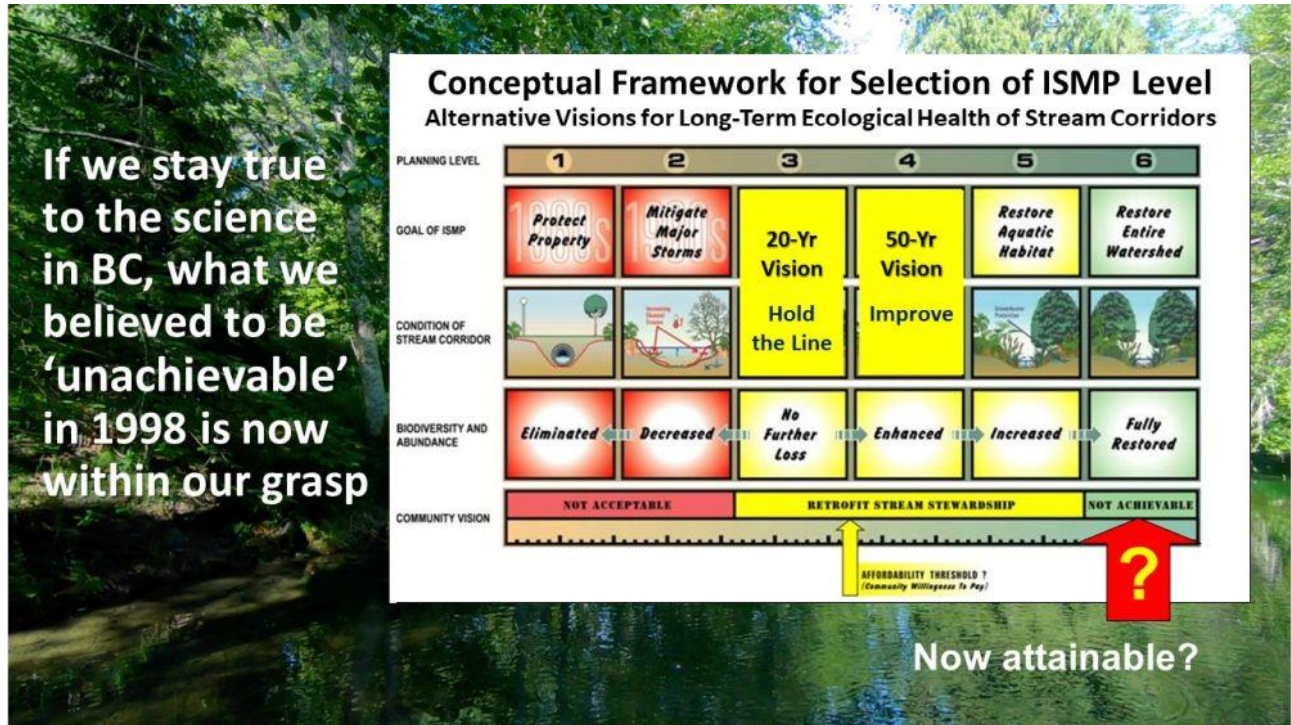


Voice of experience provides perspective

“Stormwater management has evolved incredibly over the past 40 years. But it would not have happened if we had relied on the big firms who follow the rules without ever providing innovation. It is obvious but nobody wants to say that. It is an elephant in the room,” states Jim Dumont when he comments on what he has observed over a career.

“Firms make a big deal about being ISO compliant. This means they follow the methodology and rules set down by any regulatory agency, even if those rules can be shown to be outdated. So, there is no more free-thinking or innovation. But it is more insidious than that. Corporations are driven by shareholder profit which means you get the work out the door as fast as you can. Often without asking: *What is the best solution?*”

Figure 1 – Drainage planning is moving along a continuum

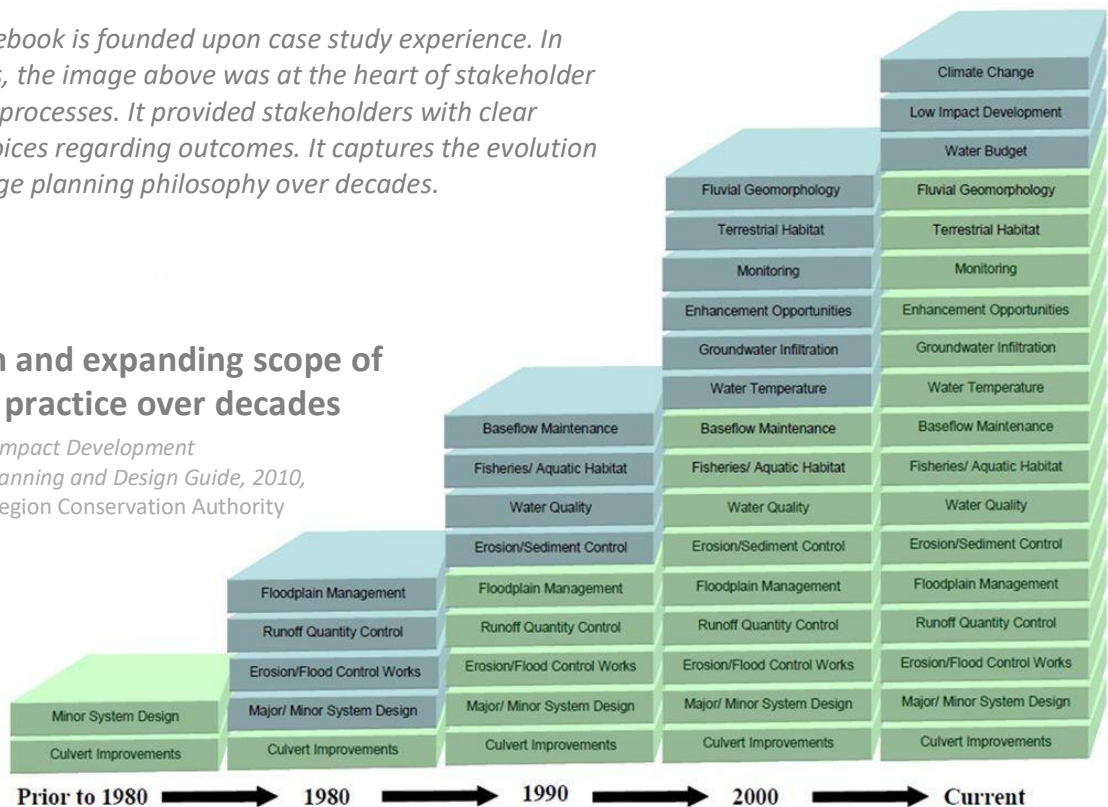


Source: Stormwater Planning: A Guidebook for British Columbia, 2002

The Guidebook is founded upon case study experience. In the 1990s, the image above was at the heart of stakeholder visioning processes. It provided stakeholders with clear visual choices regarding outcomes. It captures the evolution of drainage planning philosophy over decades.

Evolution and expanding scope of drainage practice over decades

Source: Low Impact Development Stormwater Planning and Design Guide, 2010, Toronto and Region Conservation Authority



Water Balance Methodology for Risk Management in Stream Systems

In 2002, British Columbia became the first jurisdiction in North America to adopt the Water Balance Methodology. This was in response to the “Coho salmon crisis”. The methodology is the technical foundation for [Stormwater Planning: A Guidebook for British Columbia](#).

“Back in the 1990s and 2000s, the risk was loss of salmon. So, there was a consensus that yes, we will do something. This was the driver for the Water Balance Methodology for protection of stream health. We did not specifically describe it as risk management at the time, but that was the underlying premise: *reduce the risks associated with changes in land use*,” recalls Jim Dumont.

Milestones in methodology evolution

In the first decade following the release of the Guidebook, Jim Dumont evolved the Water Balance Methodology through a rigorously analytical approach. This work was founded on case study applications in Surrey, Langley Township and North Vancouver District in the Metro Vancouver region. It was a building blocks process for Jim Dumont to systemically test assumptions and verify the numbers.

Understanding is lost over time

“Since then, a new group of people have come through the system. They do not have that foundational understanding. My sense is that many are just going through the motions now. How can we get our approvals? How can we get this development approved with the minimum effort? Do we really need all this stuff?”

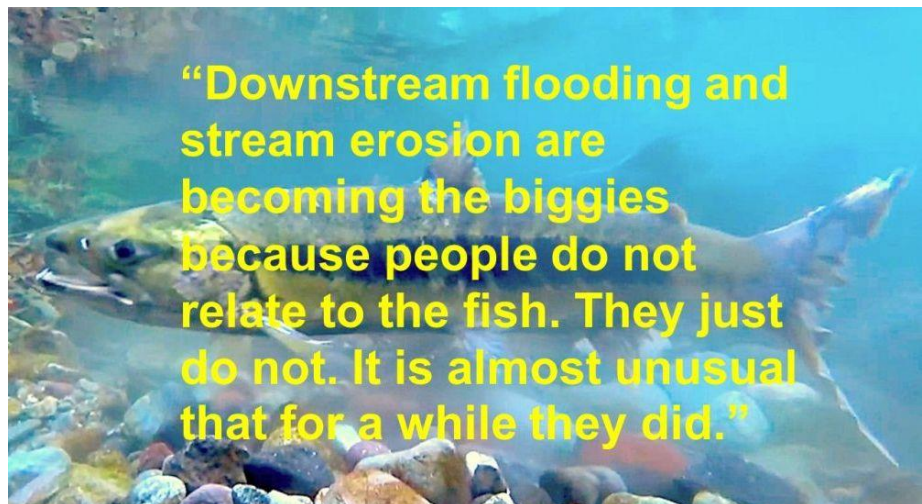
Year	Milestone	Reference
2002	How to reduce runoff volume from a site	<i>Stormwater Planning: A Guidebook for British Columbia</i>
2007	How to mimic the flow-duration pattern	<i>City of Surrey – Fergus Creek Watershed Plan</i>
2012	How to sustain deep infiltration	<i>Primer on Integrated Rainwater and Groundwater Management</i>
2014	How to integrate performance targets	<i>North Vancouver and Cowichan Valley region – case studies</i>
2014	How to downscale targets to a site level	<i>Primer on Water Balance Methodology for Protecting Watershed Health</i>
2015	How to view water balance pathways as infrastructure assets providing services	<i>Beyond the Guidebook 2015: Sustainable Watershed Systems, through Asset Management</i>

Choice of words is critical for framing the need

“The biggest hook that I have found the last few years in talking with senior people in local government is RISK MANAGEMENT. If I can get that discussion going, they will follow right along. If I do not, I lose them all the time,” continues Jim Dumont.

“I say to them, what is your risk. Downstream flooding is a big risk. Are you willing to take that on? In no case are they willing to take that on. BUT they have their tried-and-true design standards. However, it is easy to demonstrate those standards will increase downstream flood risks. How do we change them? Some people are thinking about it. Changes are coming.... if we keep pushing the risk management side of life.”

“There is a need for re-learning again. How do we educate all affected and responsible stakeholders while instilling an understanding of the need. In the 2000s, the risk was the loss of salmon. What are the risks now? Well, the risks I see are downstream flooding and stream erosion and continued loss of salmon populations along with the Orca who rely on salmon as a food source.”



“The Comox experience illustrates how to successfully move the land development industry and engineering profession in a new direction. It took almost a decade and a huge investment of effort and collaboration.”

Changing the rules in the Town of Comox: “Choice of words is critical. Look at how the Town of Comox implemented a new regulatory framework. Sediment and erosion control were framed as protecting municipal infrastructure.”

“It was not about the environment per se because the environment has lost its power. It is about doing the same thing but for different reasons. Choice of words is critical which is why risk management gets attention. There are not many places like Comox that are willing to change the rules.”

Establish Watershed Targets with Verifiable Calculations

Figure B2 includes an example to illustrate what a *flow-duration relationship* looks like

“The **flow-duration relationship** is the cornerstone of the Water Balance Methodology. By maintaining flow-duration, stream erosion is not increased during wet weather and ‘environmental flows’ are sustained during dry weather,” explains Jim Dumont.

“The methodology starts with the stream and ends with the stream, thereby providing a true measure of success for environmental protection through quantitative analyses, Unlike the current ‘best management practice’ that ASSUMES everything will be better.”

Start and end with the stream

“Evolving the Water Balance Methodology through case study experience commenced with release of the Guidebook. The first two building blocks were two land development projects: East Clayton Phase 1 in Surrey (2002) and Yorkson Phase 1 in Langley Township (2004). We learned by doing. And when science led us to a better way, we changed direction. Adapt is the operative word.”

“The East Clayton Neighbourhood Concept Plan was Surrey’s first water balance application. In the normal process of going from an over-arching plan that outlines the objectives, the next step is to go to a more detailed level where you start saying HOW and WHERE you are going to do things.”

“With the East Clayton project, we came to grips with the Guidebook recommendations for actually putting water back into the ground to reduce runoff volume. Our objectives were to understand what that did, how it worked in practice, and what the benefits were. And so, we worked at optimizing BMP’s and understanding how worked.”

Systems approach

“Understanding how precipitation makes its way to the stream via three pathways, each with a different time scale, allows one to assess how a watershed and stream operate while analytically demonstrating impacts of development and the effectiveness of mitigation works. Managing watersheds as an integrated Water Balance system means: establish watershed targets with verifiable calculations.”



“The designs were actually monitored. This showed they were actually working and could in fact infiltrate more volume. But we had gone to a lot of trouble and a lot of technical analysis to actually optimize the baseflow discharge to provide a benefit downstream as well as reduce volume. Our focus was not limited to the site by itself. It included what was happening in the streams.”

Different water pathways have different time scales

“We then did the Yorkson project with what we learned from East Clayton in mind,” continues Jim Dumont. “While we determined that we could infiltrate the target volumes, the groundwater people had concerns. And so, we backed it up and said, what would naturally happen? What would the natural hydrology be in the watershed?”

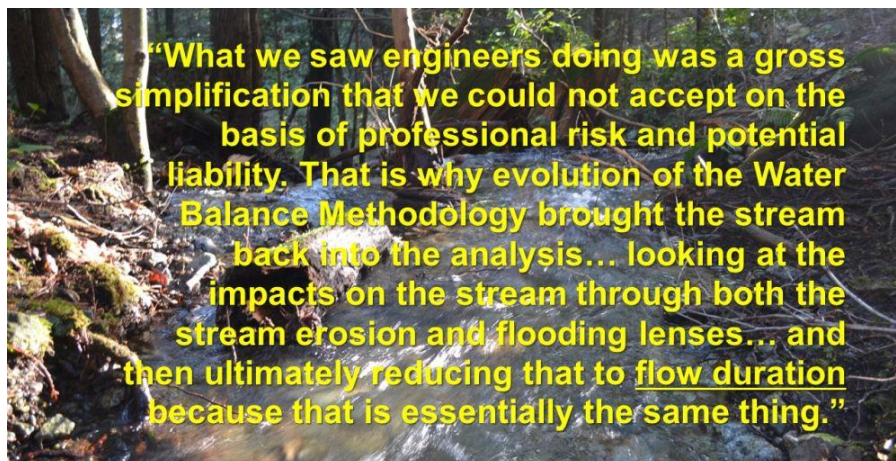
“Using that as the justification, we said that if a watershed is going to react a certain way, then we want to mimic that. And how do we mimic that? Well, we would not increase stream erosion; and we would not increase flow durations. That is when the stream came back into the analysis... as contrasted with looking at the site in isolation and focussing only on how big the retention system should be.”

“Matching flow durations is a very different approach than the generally overly simplified attempt to match rainfall and runoff, pre and post development, without having any understanding of what the watershed is actually doing and while assuming things will be fine.”

Three water balance pathways

*“The flow of rainwater from cloud to stream is via three Water Balance pathways: **surface runoff**, **interflow** which is shallow groundwater that flows horizontally, and **deep groundwater** which is fed vertically.”*

“An over-arching objective in applying the Water Balance Methodology is that urban development would maintain the proportion of flow via each pathway.”



“What we saw engineers doing was a gross simplification that we could not accept on the basis of professional risk and potential liability. That is why evolution of the Water Balance Methodology brought the stream back into the analysis... looking at the impacts on the stream through both the stream erosion and flooding lenses... and then ultimately reducing that to flow duration because that is essentially the same thing.”

“Twenty years ago, work by the US Geological Survey verified that we were on the right path with our focus on matching flow durations. The seasonal and decade time scales for interflow and groundwater are of a different magnitude to the time scale used in drainage design. The USGS said that groundwater models coupled with surface models do not work unless interflow is included.”

“When we started looking at subsurface flow paths, it became obvious that the standard design approach is just not appropriate for mitigation of changes in the water balance. This casts doubt on some of the tools being used for drainage design. But local drainage engineers were unwilling to change tools or to embrace a flow duration methodology.”

Flow-Duration Approach in BC Aligns with United States West Coast Practice

Figure 2 illustrates the three water pathways, each with a different time scale

Alignment up and down the West Coast contrasts with East Coast practice

“The experience of the three West Coast states is a counterweight to those who lean to Ontario and Northeastern USA for their experience. So, in British Columbia, we are on the right path. But that path seems to be a pass less travelled. Few in BC realize that, just like many do not understand why risk management is about mimicking flow duration. It baffles me why it is that way. Risk management is a really big deal.”

“This brings us to where we are now, with some people still trying very strictly to follow gross and poor assumptions into the future, with runoff volume and infiltration rate being the only factors they consider. That narrow approach is discounted by US West Coast experience,” Jim Dumont points out.

“Mandated design standard updates beginning with California in 2008, shortly thereafter Oregon DOT, and finally Washington State in 2012, all three West Coast states use flow-duration as the basis for all their stormwater system designs. Each region has its own terminology, yet the analytical methodologies have **a common flow-duration foundation** to achieve three watershed objectives: limit stream erosion, prevent flooding and improve water quality.”

“In 2005, the State of California first recognized that replicating the flow-duration relationship is key to preventing erosion impacts. Our collaboration with Derek Booth of Washington State University was critical to development of a research agenda to create tools and capacities.”

Dr. Eric Stein, Principal Scientist with the Southern California Coastal Water Research Project, and an early adopter & champion for Hydromodification Assessment & Management



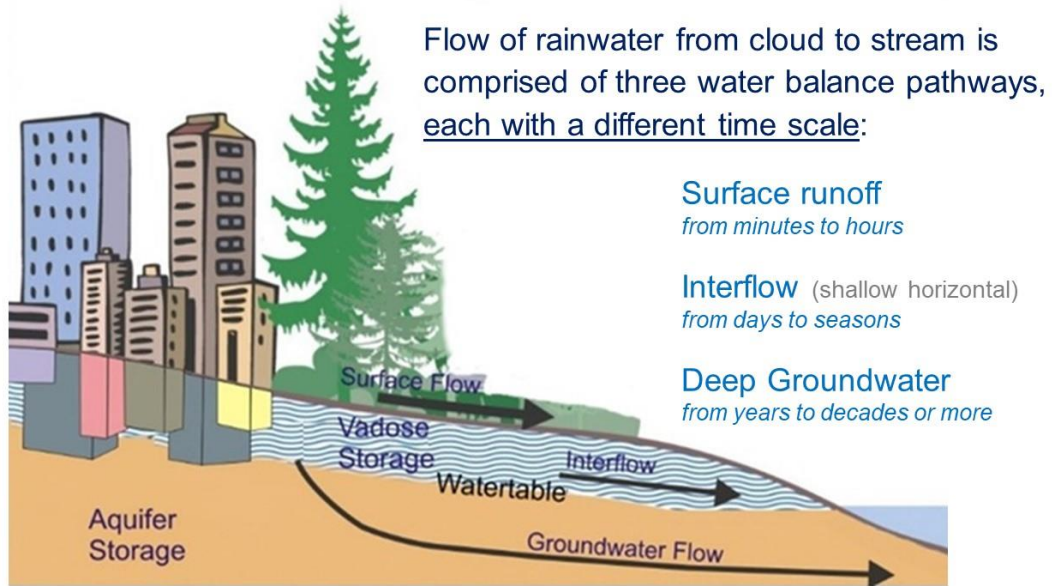
Municipal separate storm sewer systems, or MS4s

“The thing about Washington and California is that their approach is tied into MS4 permitting which is federal. And that is actually regulated by US Environmental Protection Agency. They had to negotiate with EPA to get that standard adopted for their projects.”

“To put this in context, MS4 applies to all separate stormwater systems in urban areas with a population of more than 50,000. It could be 3 or 4 cities, as long as the total population is more than 50,000. It is not a city of 50,000. It is an urban region of 50,000.”

“That is when it kicks in. For California, that covers pretty well all the developed areas. And for Washington State, it is also the majority of cities and developed areas.”

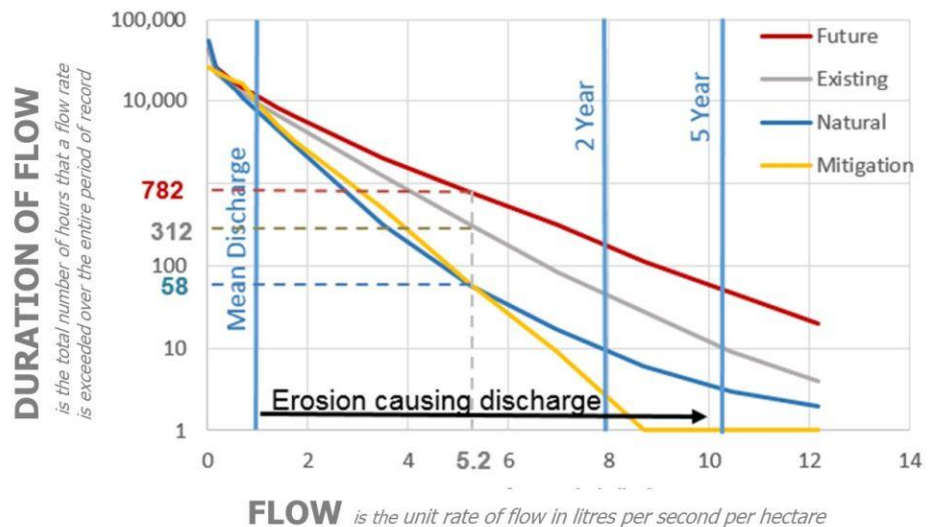
Figure 2 – Water Balance Pathways & Flow-Duration Relationship



“The innovation in BC’s Water Balance Methodology is found in the integration and application of proven scientific and engineering principles. The methodology provides a logical and straightforward way to assess potential impacts resulting from urban development; and analytically demonstrate the effectiveness of the methods proposed for preventing and/or mitigating those impacts. The methodology synthesizes fundamentals of hydrology, flood protection, aquatic ecology, geomorphology and hydrogeology.” - Jim Dumont

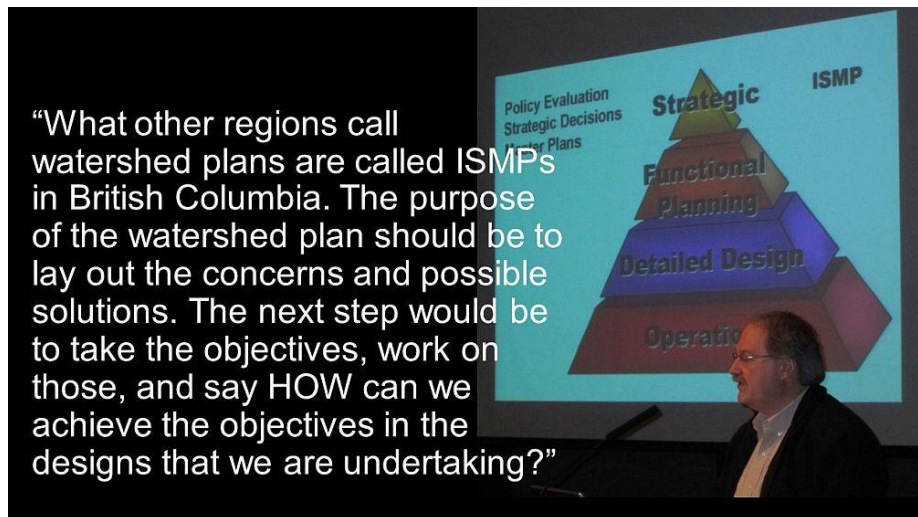
Illustration of the flow-duration relationship

“Analysis begins with calibration of continuous simulation models using long term climate records, not just selected storms or typical years. The effects of urban development are then estimated and required mitigation measures are sized and optimized.” – Jim Dumont



Course on the ISMP Course Correction

Jim Dumont was a member of the 8-person teaching team that delivered the 2-day [Course on the ISMP Course Correction](#) in 2011. His part of the curriculum addressed the planning hierarchy illustrated as **Figure 3** along with performance targets.



Watershed analysis and setting performance targets

“You establish performance targets through a watershed analysis. You pass the targets on to land development engineers, and they accept them rather than reinventing the wheel all the time. And that is the reason we developed the Water Balance Express... to set the watershed-specific targets so that each land development engineer would not have to.”

Get the framework right and then drill down

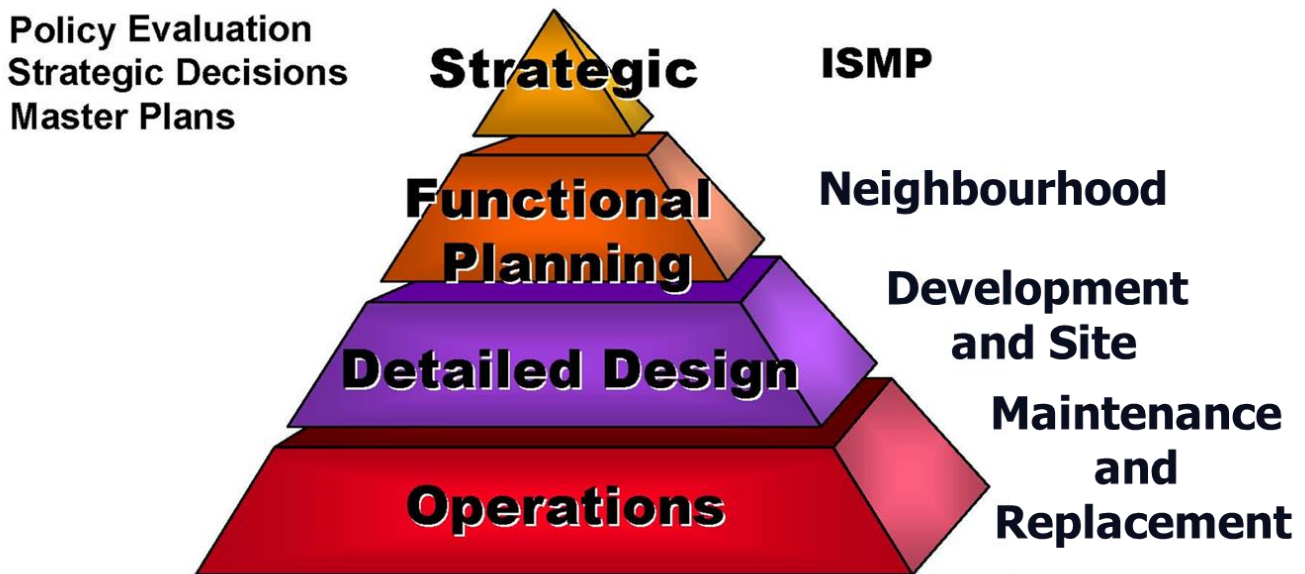
“You should not assume that an ISMP would provide all the answers. This is what I find different about BC. People here expect the initial planning document to have all the final answers. And that is simply impossible. There are too many unknowns,” states Jim Dumont.

“In the normal process of going from an over-arching plan that outlines the objectives, the next step is a more detailed level where you start asking HOW and WHERE you are going to do things. After that is where the detailed design comes in.”

“The BC Guidebook explains this using the triangle diagram. An ISMP should establish the framework and objectives. You never get all the answers in that layer. An ISMP is not the appropriate place. You get the objectives right before you drill down to the second layer and figure how you are actually going to implement something”.

“The third step is detailed design. In other words, there are several steps before you get the final answer. This basic concept is explained in every watershed planning manual. We took the layered approach seriously when we did the East Clayton and Yorkson case studies. If you follow this approach, which is adaptive management in action, you avoid paralysis through analysis,” concludes Jim Dumont.

Figure 3 – Cascading Levels of Planning & Modeling



Source: Stormwater Planning: A Guidebook for British Columbia, 2002

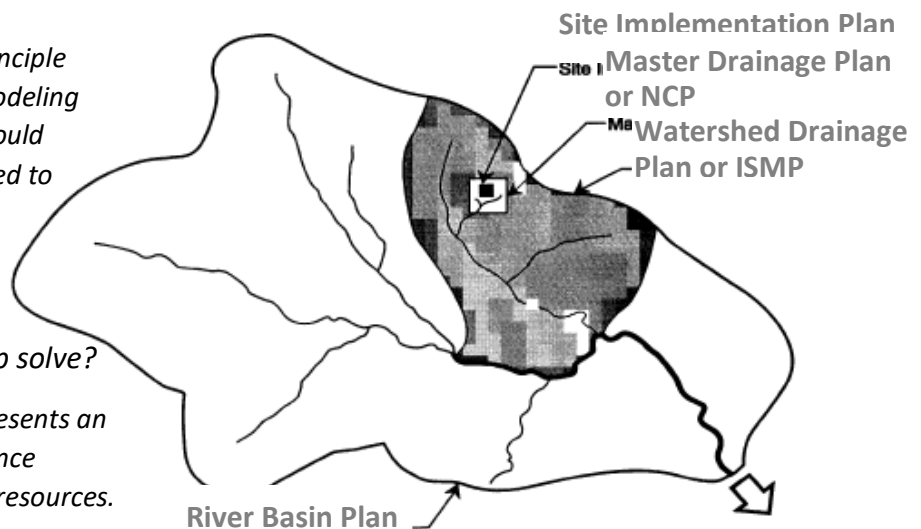
The hierarchy is based on the principle that the level and/or detail of modeling to support drainage planning should reflect what information is needed to make an informed decision:

1. Why build a model?
2. How will it be applied?
3. What problems will it help solve?

Moving down the hierarchy represents an increasing level of detail, and hence investment of local government resources.

The Guidebook stated that the modelling component of an ISMP “should be at a strategic (i.e. conceptual or overview) level to provide basic information that will support the local government decision process”.

In 2011, the **ISMP Course Correction** reaffirmed this core tenet.

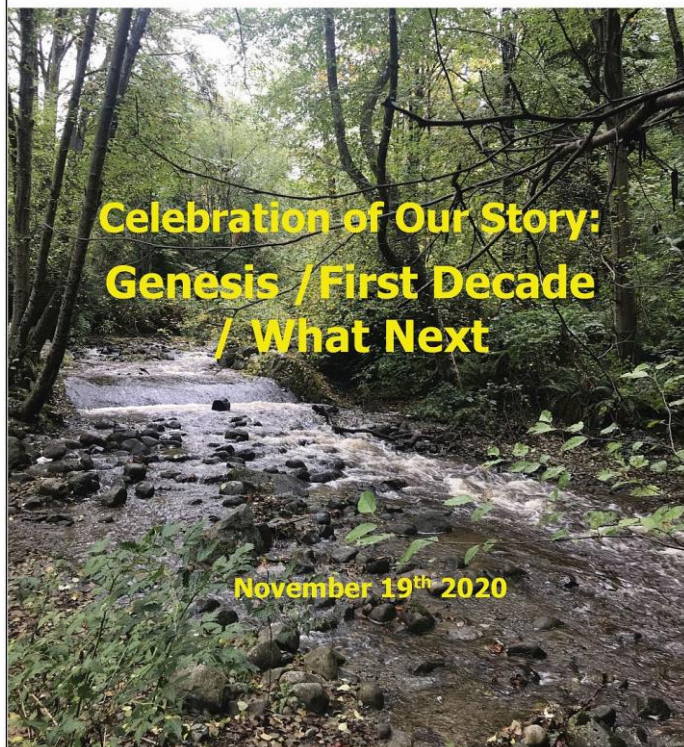


Drainage Planning Hierarchy:

- River Basin Plan
- Watershed Drainage Plan or ISMP
- Master Drainage Plan or Neighbourhood Concept Plan
- Site Implementation Plan



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TO LEARN MORE, VISIT:

<https://waterbucket.ca/about-us/>

About the Partnership for Water Sustainability in British Columbia

Incorporation of the Partnership for Water Sustainability in British Columbia as a not-for-profit society on November 19, 2010 was a milestone moment. Incorporation signified a bold leap forward.

Over two decades, the Partnership had evolved from a technical committee in the 1990s, to a “water roundtable” in the first decade of the 2000s, and then to a legal entity. The Partnership has its roots in government – local, provincial, federal.

The Partnership has a primary goal, to **build bridges of understanding** and pass the baton from the past to the present and future. To achieve the goal, the Partnership is growing a network in the local government setting. This network embraces collaborative leadership and **inter-generational collaboration**.

The Partnership believes that when each generation is receptive to accepting the inter-generational baton and embracing the wisdom that goes with it, the decisions of successive generations will benefit from and build upon the experience of those who went before them.



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