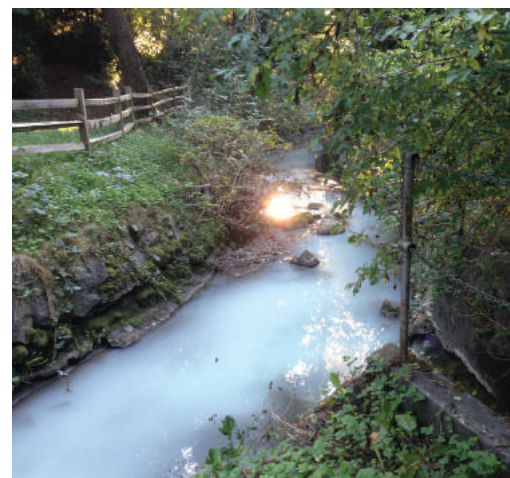




# Water Sustainability and the City

Leveraging B.C.'s Water Sustainability Act in Support of Urban Watershed Management



# Report Outline

<b>EXECUTIVE SUMMARY</b>	<b>page 4</b>
<b>1. INTRODUCTION: URBAN WATERSHED SUSTAINABILITY</b>	<b>page 11</b>
1.1. Overview and Purpose	
1.2. Approach	
1.3. Definitions	
<b>2. ENVIRONMENTAL CHALLENGES IN URBAN WATERSHEDS</b>	<b>page 16</b>
2.1 An Overview of Urban Watershed Challenges	
2.2 Assessing Environmental Challenges in B.C.'s Urban Watersheds	
2.2.1 Severity of Environmental Issues	
2.2.2 Different Concerns in Different Regions	
2.3 Causes and Culprits of Environmental Challenges in B.C.'s Urban	
2.3.1 Watersheds	
2.3.2 Prevalence of triggers	
2.3.3 Regional Differences	
<b>3. LOCAL WATERSHED MANAGEMENT: TOOLS AND CHALLENGES</b>	<b>page 28</b>
3.1 Existing Tools	
3.1.1 Bylaws, Zoning, and Development Permit Areas	
3.1.2 Water demand management programs	
3.1.3 Funding integrated water infrastructure	
3.2 Challenges to Sustainable Watershed Management	
3.2.1 Voluntary vs. mandated protections	
3.2.2 Long-term watershed planning vs. short term political cycles	
3.2.3 Piecemeal approach	
3.2.4 Lack of resources to support on-the-ground work	
3.2.5 Accountability of provincial government	
3.2.6 Fragmented water framework	
3.2.7 (Un)collaborative decision-making	
<b>4. LEVERAGING THE WATER SUSTAINABILITY ACT</b>	<b>page 44</b>
4.1 Leverage Points of the Act related to urban watershed management	
4.2 Recommendations for the Province to support urban watershed management	
4.2.1 Connecting land and water through Water Objectives	
4.2.2 Improving coordination and transparency decision-making	
4.2.3 Securing adequate funds for watershed management	
4.2.4 Ensuring water is protected for nature	
4.2.5 Monitoring and reporting on watershed health	
4.3 Practitioner feedback on recommendations	
<b>5. CONCLUSIONS</b>	<b>page 51</b>
<b>APPENDIX A</b>	<b>page 52</b>
<b>APPENDIX B</b>	<b>page 53</b>
<b>APPENDIX C</b>	<b>page 55</b>
<b>APPENDIX D</b>	<b>page 57</b>

© 2017 by the Canadian Freshwater Alliance - Tides Canada. *Water Sustainability and the City: Leveraging B.C.'s Water Sustainability Act in Support of Urban Watershed Management* is made available under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 Licence (international): <https://creativecommons.org/licenses/by-nc-nd/4.0/>

**Suggested Citation:** Mettler, C. (2017, November). *Water Sustainability and the City: Leveraging B.C.'s Water Sustainability Act in Support of Urban Watershed Management*. The Canadian Freshwater Alliance - Tides Canada, Canada.

## Acknowledgements

*This report was made possible through a partnership between the Canadian Freshwater Alliance and Evergreen with funding by the Real Estate Foundation of British Columbia and the Bullitt Foundation.*



The development of this document was guided by the thoughtful input of dozens of urban watershed professionals throughout British Columbia. To protect the anonymity of their contributions in the report, we do not name specific individuals who contributed. However, it should be noted that their observations and insights were invaluable, and form the basis of the findings and recommendations of this report.

The input and guidance of an advisory committee was also instrumental in shaping the scope and content of this report and feedback of peer reviewers helped to lend rigor and depth of expertise and experience to the final product. We acknowledge that the input of the advisory council and peer reviewers does not necessarily engender their full endorsement of the report's contents or conclusions. We specifically thank the following individuals for their input and suggestions:

**Oliver Brandes**, POLIS Project on Ecological Governance

**Deborah Carlson**, West Coast Environmental Law

**James Casey**, Bird Studies Canada

**Theresa Fresco**, Fraser Basin Council

**Amy Greenwood**, formerly of Fraser Basin Council

**Jordi Honey-Roses**, School of Community and Regional Planning, University of British Columbia

**Rosie Simms**, POLIS Project on Ecological Governance

**Lindsay Telfer**, Canadian Freshwater Alliance

### Cover Photo Credits (left to right)

Mill Creek in Kelowna. Photo Credit: Christine Mettler

Streetside rain garden. Photo Credit/ Green Communities Canada

Fraser River at New Westminster. Photo Credit/ waferboard. CC BY 2.0

Green development in Victoria. Photo Credit/ J. Scratchley CC-BY-ND 2.0

Photo Credit/ ephien. CC BY 2.0

Still Creek in Vancouver. Photo Credit/ Duncan Creamer. CC BY 2.0

# EXECUTIVE SUMMARY

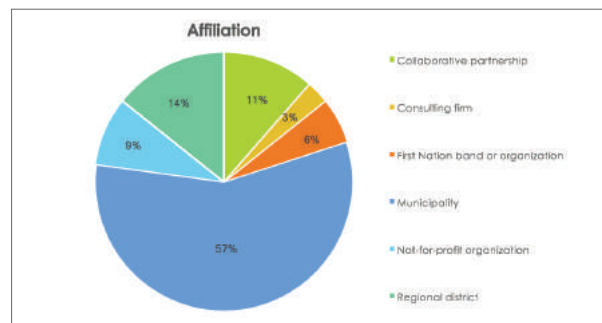
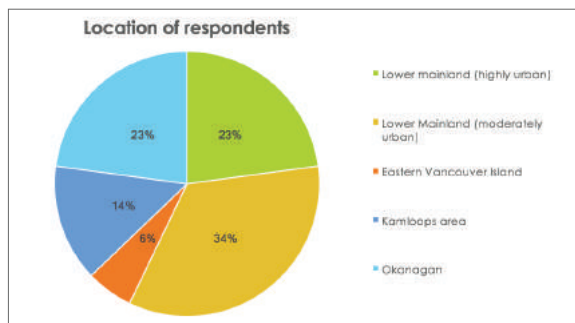
Over three-quarters of the population in British Columbia live in urbanized watersheds. These watersheds provide a variety of ecological, health, social, economic and cultural functions for the people and ecosystems that depend on them. Yet, despite the important role these watersheds play, they are some of the most degraded watersheds. Local governments are well-positioned to influence environmental outcomes in watersheds that fall within their jurisdictions. But many watershed practitioners working in local governments have expressed concern about their ability to mitigate environmental pressures that are resulting in watershed degradation in urban areas. Urban watershed sustainability—keeping watersheds in conditions to sustain the functions that contribute to human and ecological well-being for current and future generations—is a challenge.

B.C.'s new *Water Sustainability Act (WSA)* enables the development of regulatory and policy tools that, if effectively seized, could increase local governments' abilities to more sustainably manage local watersheds. Many of these tools have yet to be developed. This report identifies opportunities for the development and implementation of regulations, policies, and programs under the WSA that could address challenges hampering watershed sustainability in urban areas across B.C.

In order to identify these regulatory and policy interventions, we first needed to answer the following questions:

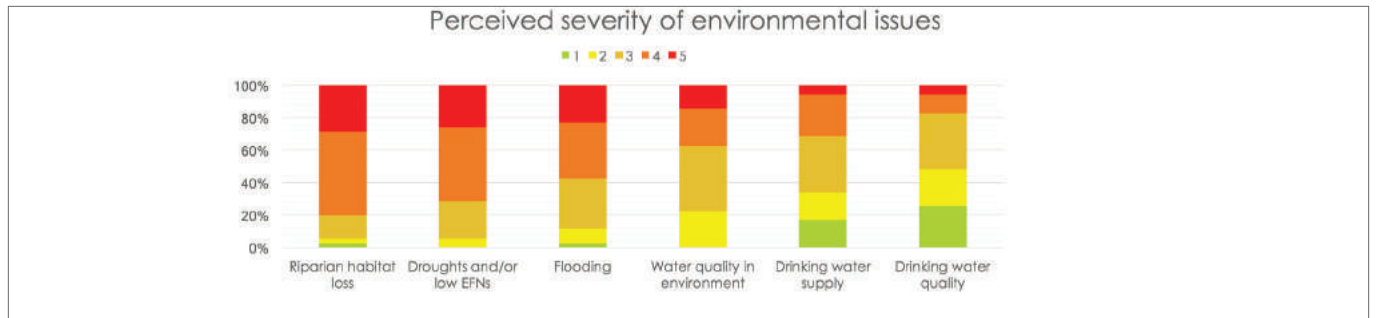
1. What environmental challenges are prevalent in B.C.'s urban watersheds and what activities are causing them?
2. What tools currently exist to address those challenges?
3. Why do local governments, despite the tools that currently exist, continue to experience challenges in addressing watershed degradation?

We sought to answer these questions by reviewing research and literature on urban watersheds, and by asking urban watershed practitioners for their perspectives. Specifically, we sent an online survey to 79 urban watershed practitioners throughout B.C. and conducted follow-up interviews with five survey respondents. Respondents were primarily from municipalities, followed by regional districts, governmental agencies or collaborative partnerships, not-for-profit organizations, First Nations, and consulting firms. They worked in urban watersheds in the Metro Vancouver area, Eastern Vancouver Island, the Okanagan and the Kamloops areas.



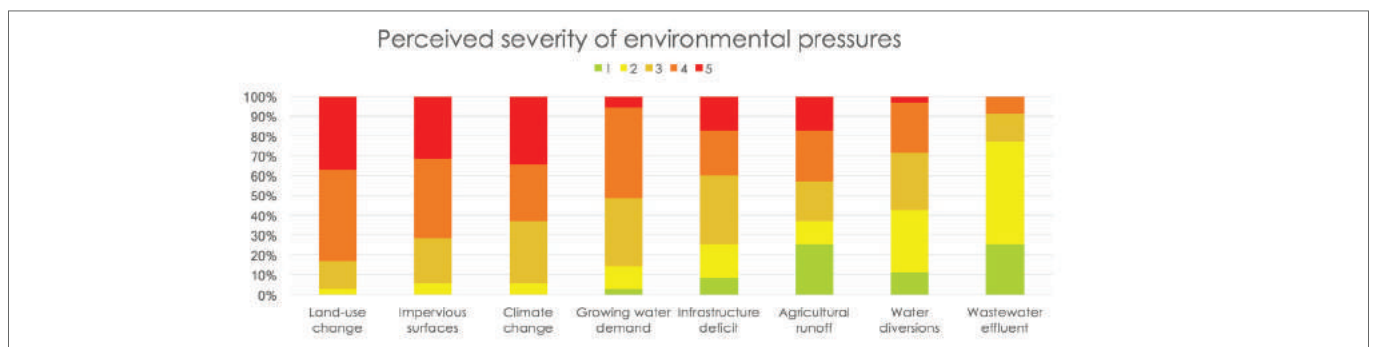
## Environmental Challenges

Respondents were particularly concerned about riparian habitat loss and degradation: 80% of respondents said this was either a “notable” (4 out of 5 in severity) or “very significant” (5 out of 5 in severity) concern. Drought and low streamflow (71% of respondents said this was a “notable” or “very significant” concern) was the second largest concern, followed by flooding (57% of respondents said this was a “notable” or “very significant” concern). Generally speaking, respondents in the Metro Vancouver area were most concerned about riparian habitat degradation. Respondents in the Okanagan and Kamloops area were much more concerned about their drinking water quality and quantity than their counterparts from the Metro Vancouver area and Eastern Vancouver Island.



## Environmental Pressures

Land-use change was rated as the most significant pressure causing environmental degradation. 83% of respondents said this was a “notable” or “very significant” threat. Only one respondent said it was a mild threat (2 out of 5 in severity) and no one said it was “not at all” a threat. Impervious surfaces was identified as the second most prevalent pressure (71% of respondents said it was a “notable” or “very significant” threat), followed by climate change (63% said this was a “notable” or “very significant” threat). Respondents from urban areas with high population densities (i.e. with an average population density of over 1,000 people per square kilometer) thought impervious surfaces were a bigger challenge than land-use change. Respondents from “moderately urban” (250-999 inhabitants per square kilometer) municipalities in Metro Vancouver were the most concerned about land-use change, with 100% of respondents identifying land-use change as either a “notable” or “very significant” threat.

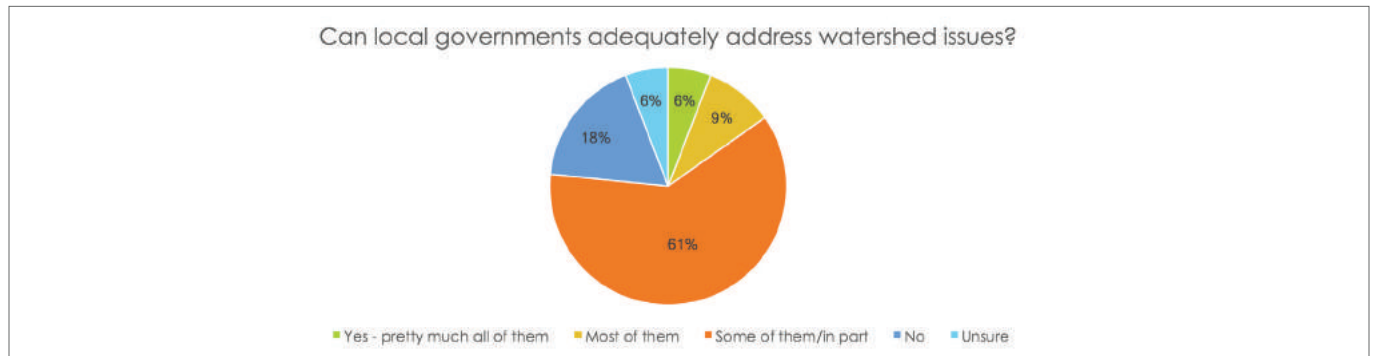


## Existing Tools

Local governments have a number of tools at their disposal to address the environmental issues—and pressures that give rise to them—identified above. Although not an exhaustive list, this report identified three categories of tools that are commonly deployed by local governments. These tools are not necessarily exclusive from one another and may be used in combination.

- 1. Bylaws and Development Permit Areas.** Provincial legislation gives local governments authority to regulate in a number of areas such as land-use change, drainage, and in some matters related to the natural environment. In the vast majority of the cases, while provincial legislation does give authority to local governments to regulate, it does not require regulation to protect environmental values (with some exceptions, e.g. local governments must comply with the federal Fisheries Act). When and if local governments do create regulations intended to improve watershed outcomes, it cannot violate provincial legislation (e.g. the Right to Farm Act).
- 2. Water demand management programs.** Local governments may use a combination of bylaws and other measures—such as economic and financial measures—to encourage water conservation. For example, they may establish bylaws that require efficient plumbing and fixtures in new developments or bylaws to minimize run-off volumes generated by developments. Economic and financial levers include establishing conservation-oriented pricing for water delivery services or requiring water meters for commercial and/or domestic users.
- 3. Infrastructure funding.** Governments across Canada are reinvigorating their commitment to infrastructure investment, after several decades of underinvestment has led to a large “infrastructure gap.” In addition to traditional “grey” infrastructure (e.g. engineered works such as pipes, sewers, and detention ponds), there is an increasing recognition of the role that “green” infrastructure (e.g. natural and constructed features, such as urban forests, park space, wetlands and riparian zones, green roofs, rain gardens, bioswales, and retention ponds) can play in improving urban watershed health—for example by minimizing run-off from precipitation events. Local governments may apply to federal or provincial grants to help with these infrastructure investments. Despite this financial aid, local governments pay a much larger share for funding infrastructure today than they did several years ago. To fund these investments, some have opted to institute cost-recovery programs such as stormwater or drainage fees.

## Management Challenges



Despite the tools that local governments have to address the environmental challenges and pressures that give rise to them, many watershed practitioners working in—or closely with—local government have expressed that there remain significant barriers to protecting watershed health in B.C.'s urban areas. When asked “Can local governments adequately address watershed issues,” the vast majority said “some of them/in part”, while just under one fifth of respondents said “no.”

Using data collected in the survey and through one-on-one interviews, we identified seven barriers that impede the ability of local governments to plan for and manage watersheds sustainably.

- 1. Voluntary vs. mandated protections.** Provincial legislation has enabled local governments to make regulations to protect environmental and watershed health, but, by-in-large, has not required local governments to do this (with some exceptions). Survey and interview respondents expressed concern that this has resulted in a large discrepancy between local governments with regard to policies and actions that protect urban watersheds. Some noted how, without provincial standards, local decision-makers may resist enacting protections, or there is an increased likelihood of special interests influencing decision-making. The notion that many local governments lacked “political will” was brought up by several participants.
- 2. Long-term watershed planning vs. short term political cycles.** Restoring healthy watershed processes can take a long time. The beneficial impacts of a restoration project might not reveal themselves for as little as a few months to a year, to as many as over a hundred years. However, local governments are under pressure to show their constituencies how public funds are benefitting the community on a much shorter term, or risk losing elections. Survey and interview respondents noted that this sometimes results in other priorities—where benefits manifest themselves on a much shorter term—taking precedence over sustainable watershed management.
- 3. Piecemeal approach.** Many of the tools that exist for local governments to influence activities that impact watershed health are tools intended to prevent future degradation (i.e. they are aimed at mitigating harm caused by new developments) and are site specific (i.e. they are enacted on a lot-by-lot basis). Although these interventions may help to stop or slow harm, they are typically not enough to restore the impacts of past degradation. This lead some participants to express that it is hard to make gains on overall watershed health— in some cases necessary for watersheds to function sustainably.

4. **Lack of resources to support on-the-ground work.** Survey participants identified a lack of financial resources as the largest challenge to being able to sustainably manage watersheds, with 71% of respondents saying this was either a “large” or “very large” barrier. Survey and interview participants indicated that constrained resources inhibited their ability to perform activities such as implementing and enforcing rules and policies, monitor watershed health, conduct education and outreach, and ensure the continuity of watershed programs in general. Participants noted that constrained resources not only affects local governments, but that it also hampers provincial government staff from fulfilling its duties with regard to watershed management and protection (e.g. conducting water monitoring and science, issuing and reviewing licenses, enforcing rules). This in turn can make put more of a burden on local governments.
5. **Accountability of provincial government.** Several interview and survey participants noted, without prompting, that they perceived an accountability gap among higher levels of government with regard to fulfilling their duties and enforcing their own rules. Participants identified this barrier as most salient with regard to the provincial government, although some participants did identify the federal government as well. This was noted in particular with regard to enforcement, especially in regards to oversubscription of water, illegal water withdrawals, unmonitored discharges into water bodies, and activities on crownland that compromise watershed health. Some participants shared a concern that this undermined local governments’ abilities to protect or restore watersheds within their jurisdictions.
6. **(Un)collaborative decision-making.** Participants identified a need for collaborative watershed decision-making between different levels of governments, but many noted that current mechanisms and supports were not adequate. There is no overarching policy for collaborative or delegated decision-making in B.C., and consequently there is a large variation across the province with regard to what kind of mechanisms exist and who is involved in decision-making. Some regions have formal watershed entities with legal status and funding, others have informal groups with some funding but little capacity, others have *ad hoc* committees with little funding and capacity for collaborative watershed decision-making. In some regions, representatives from multiple levels of government are at the table. In other regions, local governments make decisions largely without conferring with provincial and federal governments or First Nations. Some participants relayed that First Nations are often excluded from local watershed decision-making altogether, and that when they are included, it is in a consultative, not collaborative, manner.
7. **Fragmented water framework.** In B.C., there are a number of laws and regulations that pertain to or have impacts on urban watershed management (e.g. the Drinking Water Protection Act, the Forest Range Practices Act, the B.C. Building Code, etc.). Some participants expressed concern that requirements under other laws or regulations inhibit their ability to protect urban watershed health due to conflicting indications. Other participants noted how the current framework is difficult to navigate, and hard to know which statute takes legal precedence when making decisions. Several participants relayed the need for the Water Sustainability Act to consider and build upon previous watershed planning work done at the local level.



## Towards Solutions: Leveraging the Water Sustainability Act

Although the above are not insignificant challenges, there are interventions that can help to address them. The new *Water Sustainability Act* (WSA) presents a timely opportunity to do this. As provincial staff continue to develop regulations, policies, and programs to support implementation of the Act, local governments would do well to seize this opportunity. This report suggests that watershed practitioners working in or with local governments would be much better positioned to sustainably manage urban watersheds if the Province were to develop regulatory and policy tools that:

1. Connect land and water through Water Objectives
2. Improve coordination and transparency in decision-making
3. Secure adequate funds for watershed management
4. Ensure water is protected for nature
5. Facilitate monitoring and reporting on watershed health

Specifically, the report outlines 14 recommendations (and several sub-recommendations) in these areas that, if effectively implemented, will increase the capacity of local governments to address and reverse urban watershed degradation. We suggest that local governments advocate to the Province to take action on those recommendations.

### These recommendations are:

1. Develop regulations that use performance-based criteria to establish objectives for water quality, quantity and ecosystem health.
2. Develop Water Objectives to apply to urbanized watersheds.
3. Monitor and review implementation of Water Objectives.
4. Develop guidance and processes for local governments on how watershed decision-making will be affected by implementation of the Water Sustainability Act.
5. Develop watershed governance pilots in priority areas, which could form the basis for 'watershed entities.'
6. Establish a third-party, capacity-building entity to coordinate and facilitate knowledge transfer within and between watershed entities and different levels of government.
7. When Water Sustainability Plans are designated, ensure plans consider and incorporate the efforts of previous watershed planning efforts (e.g. Watershed Assessment & Response Plans, Water Use Plans, etc.) and local government Community Plans and bylaws.
8. Review the current fees and rates structure set out in the Water Sustainability Fees, Charges and Rentals Regulation to determine whether current structure is high enough to procure necessary funds to fully implement the Act.
9. Work with a Sustainable Funding Taskforce to explore and test implementation of other sustainable funding mechanisms for watershed management at the provincial and watershed

- level, such as increasing revenue from local tax bases, Crown resource rentals, etc.
10. Establish legally enforceable regulations to protect environmental flows.
  11. Develop an Environmental Flows Taskforce with participation of local government, First Nations, and the federal government to establish whether existing water allocations are sustainable.
  12. Identify opportunities to coordinate and streamline water data from different monitoring operations to enhance knowledge-sharing and reduce duplication of efforts.
  13. Require all water users to monitor water withdrawals and report their use to government.
  14. Compile a summary of water data into a State of Our Waters report, a publicly accessible report issued every five years.

The recommendations were presented to over 50 watershed practitioners at a one-day forum in October 2017 for input. This feedback, while valuable, does not constitute official consultation. There was general agreement that the recommendations above would be helpful. Those present reiterated that a need for resources, collaboration and sharing of responsibility, clarity and direction and continuing education as key elements to support the successful implementation of the Act.

# 1. INTRODUCTION: URBAN WATERSHED SUSTAINABILITY

## 1.1. Overview and Purpose

Urban watersheds have specific challenges that require tailored solutions. Although the vast majority of British Columbia's landmass is classified as rural, over three quarters of the province's population lives in highly urbanized watersheds.<sup>1</sup> The vast majority of B.C.'s residents, therefore, are dependent on a small number of watersheds for a variety of ecological, economic, social and human health functions that are vital to human well-being. However, urban watersheds also tend to be the most degraded watersheds.<sup>2</sup> As population pressures grow in B.C. in the coming years and the impacts of climate change become more apparent, these watersheds will come under more strain. Developing effective, comprehensive strategies to conserve and rehabilitate urban watersheds is a timely and important task.

In British Columbia, all levels of government play a role in watershed management, but local governments have a unique and significant role in overseeing activities that impact watershed health. The legal framework in British Columbia provides tools that facilitate local governments' ability to influence such activities in their jurisdiction. However, despite these tools, many local watershed managers have expressed concern that the current framework and the way in which it operates has significant gaps that compromise their ability to ensure the sustainability of urban watersheds in their communities.

The *Water Sustainability Act* provides an opportunity to address some of these challenges. Called into force in February of 2016, the *Water Sustainability Act* (WSA) is the province's principal legislation governing water use, replacing the Water Act of 1909. The new Act expands the scope of the legal framework for water in British Columbia. For example, it expands the regulation of water use from surface to groundwater, requires that decision-makers consider environmental flow needs when considering applications for new water licenses, and provides for the creation of regulatory authority in several areas, including linking land-use with watershed outcomes.<sup>3</sup>

The vast majority of detail concerning the implementation of the WSA is and will be contained in regulations and operating policies. An initial set of regulations was released in February 2016, when the Act was called into force. However, there are many areas of regulations that have yet to be developed. The scope of the Act also provides a variety of opportunities for new operating policies and programs to be developed.



<sup>1</sup> Rothwell, Neil. Canada's Watersheds: *The Demographic Basis for an Urban-rural Dialogue*. Statistics Canada, Agriculture Division, 2006.

<sup>2</sup> Hughes, Robert M., et al. "A review of urban water body challenges and approaches:(1) rehabilitation and remediation." *Fisheries* 39.1 (2014): 18-29, citing Stanfield et al. 2006 and Strank et al. 2008.

<sup>3</sup> Brandes, Oliver; Carr-Wilson, Savannah; Curran, Deborah and Simms, Rosie. *Awash with Opportunity: Ensuring the sustainability of British Columbia's new water law*. The POLIS Project on Ecological Governance (November 2015).

**The purpose of this report is to identify opportunities for the development and implementation of regulations, policies, and programs under the *Water Sustainability Act* that could improve environmental outcomes in urban watersheds across B.C.** It is intended for two principal audiences: (1) urban watershed managers<sup>4</sup> within local governments (defined as municipalities, regional districts and irrigation districts) and First Nations<sup>5</sup> in British Columbia and (2) key staff working on policy development of the *Water Sustainability Act* within the provincial government. The report is laid out accordingly:

- Section 2 discusses environmental challenges in urban watersheds, and evaluates the extent to which these challenges are prevalent in cities in British Columbia;
- Section 3 provides an overview of tools that currently exist to improve urban watershed sustainability, challenges that impede this pursuit, and potential solutions.
- Section 4 assesses how the *Water Sustainability Act* could be leveraged to address the identified environmental and management challenges through the development of regulations, policies and programs. This section draws from and builds upon the solutions listed in section 3.

## 1.2 Approach

The report authors used a multi-pronged research and engagement approach that was used to inform the findings and recommendations contained in the report. Specifically, the author and advisory committee undertook a literature review, conducted an online survey and interviews with water managers, sought expert advice, held an online workshop and organized a forum with the participation of approximately fifty urban watershed professionals.

### Literature Review

In the literature review, we examined academic articles, grey literature (including toolkits, guidance materials; and reports from non-profit associations, various levels of government, academic and research institutions, and consulting firms), news articles, relevant legislation, regulation, and policy documents in order to:

- Identify key environmental issues affecting urban watersheds in general, and B.C.'s urban watersheds in particular;
- Contextualize B.C.'s complex jurisdictional framework with regard to urban watershed management, including existing tools and mechanisms in place to address environmental challenges;
- Identify success factors for effective urban watershed management, which are integrated into recommendations in Section 4.



<sup>4</sup> Urban watershed managers include: land-use and environmental planners, public works managers and staff in public works, water policy analysts and related professions whose work could be impacted by the implementation of the *Water Sustainability Act*.

<sup>5</sup> Rights and responsibilities of First Nations with regard to water management are unique and differ from those of local governments. The governance and management context described in this paper applies most specifically to local governments. However, since many First Nations are involved in local watershed management, the findings of this paper may be of interest to staff and council of First Nations as well.

## Online Survey and Interviews

To glean more specific information regarding the scope and severity of environmental challenges in B.C.'s urban watersheds, we engaged individuals working in urban watershed management in urban areas in the province.

An online survey that contained questions regarding urban watershed management challenges was shared with individuals working in urban watershed management around the province. We focused on those working in:

- The Metro Vancouver area;
- The Okanagan region, specifically individuals whose work is relevant to watersheds in Penticton, West Kelowna, Kelowna and Vernon;
- The Kamloops area; and
- Eastern Vancouver Island, with a focus on the Nanaimo and Victoria areas.

These areas were chosen as they correspond to the definition of “urban” chosen for the purposes of this research (see section 1.3, “Definitions”). The survey was sent to 79 individuals. In the end, 35 individuals from 25 organizations responded to the online survey. The majority (80%) of respondents were from local governments organizations (municipalities or regional districts) and First Nations governments, however there were some participants from non-profit organizations and consulting firms who work extensively on urban watershed management. Appendix A provides a demographic breakdown of survey respondents.

In addition to the online survey prepared for the purposes of this project, we also analyzed an earlier survey on urban watershed challenges administered by the non-profit organization, *Evergreen*, in 2016. The research contained in this report itself builds upon Evergreen’s previous work regarding urban watershed sustainability. The *Evergreen* survey contained responses from 13 individuals in the nonprofit stewardship community and local government. Although the survey contained sufficiently different questions from the official project survey, relevant and related themes emerged from responses, which helped to validate or add breadth to the analysis.

In order to hone in on and deepen analysis of information collected in the literature review and the online survey, we conducted interviews with urban watershed managers and knowledge holders from different urban areas in B.C. In total, we conducted five follow-up interviews. We also had conversations with four prominent B.C. water experts to further guide the analysis.

In the report, responses of survey and interview participants are anonymized. Anonymity was chosen so that participants would feel comfortable speaking freely about challenges they face in and outside of their organization with regard to urban watershed management.

## Expert advice

In order to ensure a rigorous analysis of environmental, legal, and governance factors, advice was sought from practitioners who hold in-depth knowledge of the various subject areas this report covers. Specifically, an advisory council of five individuals from four organizations guided the development of the research and report. In addition to those on the advisory council, this report was also reviewed by two content experts.

## Online Workshop

To triangulate the findings from the literature review, online survey and interviews and ensure the analysis contained here is consistent with the experiences of local government, we held a webinar to present the work to date and to gather feedback. Ten urban watershed practitioners were present. Feedback from participants during the webinar confirmed the findings. Participants also expressed an interest in seeing the findings mobilized into actionable items.

## Water Sustainability and the City forum

Finally, we invited watershed professionals from different organizations including municipalities, regional districts, First Nations, non-profit organizations and the B.C. provincial government to a forum to discuss findings of this report and recommendations for actions, as well as to provide an opportunity for peer learning on addressing urban watershed challenges. During the forum, we held a one-hour workshop session where participants provided feedback on the recommendations contained in Section 4. A discussion of this feedback is provided in section 4.3. It is important to note that this feedback, while valuable, does not constitute consultation with regard to regulatory development of the Act and should be construed as such.



*Rain in Coquitlam. Photo Credit: Jason V. CC BY 2.0*

## 1.3 Definitions

### Urban

For the purposes of this report, we chose an operational definition of “urban” based on criteria used by Statistics Canada in census analysis. Although Statistics Canada uses a population density of 400 people per square kilometer when defining a “population centre” (formerly, an “urban centre”)<sup>6</sup>, we opted for a broader definition of 250 people per square kilometer. This allowed for growing municipalities such as the District of West Kelowna, the Township of Langley and the Township of Maple Ridge to be included in this analysis. This research also focused on areas that have populations of 10,000 or more residents.<sup>7</sup> “Cities” is often used interchangeably with “urban areas” throughout the report.

Urban water professionals whose work applies to watersheds within Metro Vancouver and the Okanagan region, as well as Kamloops, Nanaimo and Victoria were engaged for this research. Although there are areas (e.g. Nelson and Prince George) that meet the criteria of the operational definition of “urban” in this research, we decided to limit the scope of the research to the aforementioned areas. Nonetheless, the outcomes of this report are likely to have relevance for other urban areas both inside and outside of British Columbia.

### Watershed Sustainability

“Watershed sustainability” does not easily lend itself to an operational definition. Instead, the definition here serves as a conceptual frame that gives context to the challenges identified in the report. Following the Brundtland Commission, sustainability requires that environmental resources and ecosystems are maintained in conditions such that the needs of both current and future generations can be met.<sup>8,9</sup> This can extend to non-human (e.g. ecological) needs as well as human (e.g. economic, social, cultural, health-related) needs. Water systems are dynamic and able to renew themselves if they maintain a baseline of ecological and hydrological integrity. Ensuring sustainable watersheds may require both preventing and reversing degradation so that they can sustain the functions that contribute to human and ecological well-being.

When the ecological and hydrological integrity of watersheds is threatened, we can assume that the watershed’s ability to sustain itself and meet ecological and human needs—i.e. watershed sustainability—is also threatened. Appendix B contains more discussion of considerations related to watershed sustainability.



<sup>6</sup> Statistics Canada, “Population Centre.” (2015). Retrieved from: <http://www12.statcan.gc.ca/census-recensement/2011/ref/dict/geo049a-eng.cfm>

<sup>7</sup> Statistics Canada defines populations centres with 10,000 residents or more as a “core agglomeration” in its census.

<sup>8</sup> Brundtland, G., & Khalid, M. (1987). UN Brundtland Commission Report. *Our Common Future: Report of the World Commission on Environment and Development* <http://www.un-documents.net/our-common-future.pdf>

<sup>9</sup> Although the Brundtland Commission definition is widely used in discussions regarding environmental sustainability, it should be noted that the definition does not adequately encompass First Nations cultural and legal concepts. A more integrated definition that includes First Nations perspectives on “sustainability” could lend more robustness to this definition and to its operationalization.



Flooded residential neighbourhood. Photo Credit: Center for Neighbourhood Technology. CC BY-SA-2.0

## 2. ENVIRONMENTAL CHALLENGES IN URBAN WATERSHEDS

### 2.1 An Overview of Urban Watershed Challenges

Population trends associated with urbanization put pressure on watersheds. High population densities in urban areas give rise to dense built environments that are often extensively altered from natural states. Further, the large number of people living in cities means that there are greater demands on natural resources in a given area. This section discusses four principal environmental challenges associated with urbanization, as identified in a literature review: land-use change and “urban stream syndrome”, wastewater and emerging contaminants of concern, competing demands on water, and climate change.

#### i) Land-use change, “urban stream syndrome” and lost streams

Land-use changes that displace natural features with agricultural or urban land cover are a major factor that leads to “urban stream syndrome”<sup>10</sup>. Urban stream syndrome includes symptoms such as:

- Increased variability in streamflows (most urban streams become “flashier”, i.e. experience more and more sudden instances of high flows; some urban streams also experience more prolonged low flows<sup>11</sup>);
- Impaired water quality (e.g. increased turbidity and presence of chemical and/or biological contaminants);
- Loss of complex ecological features (e.g. stream meanders, wetland and riparian areas) that results in physical habitat loss for fish and wildlife and overall loss of biodiversity;
- Higher water temperatures due to “urban heat island” effect.<sup>12</sup>

<sup>10</sup> Walsh, Christopher J., Allison H. Roy, Jack W. Feminella, Peter D. Cottingham, Peter M. Groffman, and Raymond P. Morgan II. “The urban stream syndrome: current knowledge and the search for a cure.” *Journal of the North American Benthological Society* 24.3 (2005).

<sup>11</sup> Konrad, Christopher P., and Derek B. Booth. “Hydrologic changes in urban streams and their ecological significance.” *American Fisheries Society Symposium*. 47 (2005).

<sup>12</sup> Somers, Kayleigh A., et al. “Streams in the urban heat island: spatial and temporal variability in temperature.” *Freshwater Science* 32.1 (2013).



These symptoms occur because of land-use changes in or close to streams, but also due to land-use changes throughout the watershed. Urbanization both compacts soil, lessening its ability to infiltrate and retain water, and displaces natural features with impervious elements. Consequently, stormwater runoff from precipitation events enters water bodies from all over the catchment area, often without treatment. Not only does stormwater put volume pressures on urban water bodies (increasing the risk of flooding and streambank erosion), but, in its overland flow course, it often picks up contaminants and sediment on the ground that end up in urban streams, rivers, ponds or lakes. These contaminants can affect the physical, chemical and biological properties of urban water bodies. For example, flooding in the spring of 2017 in B.C.'s interior prompted warnings about water quality in both surface and groundwater sources.<sup>13</sup>

There is a strong relationship between the total area of impervious surfaces in a watershed and urban stream degradation. The more surface area of the watershed is impervious surface, the more impaired stream health tends to be.<sup>14</sup> However, even relatively minimal impervious surface cover can have notable impacts on stream health. Studies have found that stream biodiversity declines rapidly in watersheds with more than 5-15% impervious cover. In one such, researchers found that salmonids were eliminated from streams in Ontario and Maryland in watersheds with only 4-9% of impervious cover.<sup>15</sup> Typically, urban areas contain between 20-60% impervious cover.<sup>16</sup> How urban stream syndrome manifests around the globe has been characterized as "strikingly similar", despite regional variations in climate, geology, biota and urban infrastructure.<sup>17</sup> Land-use change in urban watersheds also makes them less resilient to withstand extreme events, hastened by climate change.

Land-use change not only negatively impacts streams in urban settings, but in some cases totally displaces them. In the Vancouver area, the vast majority of pre-settlement streams have been buried or culverted.<sup>18</sup> These "lost streams" have effectively been eradicated of their ecological and hydrological functions. Some cities in B.C. and have undertaken daylighting projects to bring lost streams back to more natural conditions.



<sup>13</sup> Britten, Liam. "Flooding raises water quality concerns in B.C. Interior". CBC News. (2017, May 12). Retrieved from: <http://www.cbc.ca/news/canada/british-columbia/interior-flooding-water-quality-1.4114039>.

<sup>14</sup> Wenger, Seth J., et al. "Twenty-six key research questions in urban stream ecology: an assessment of the state of the science." *Journal of the North American Benthological Society* 28.4 (2009).

<sup>15</sup> Hughes, Robert M., et al. "A review of urban water body challenges and approaches:(1) rehabilitation and remediation." *Fisheries* 39.1 (2014), citing Stanfield et al. 2006 and Strank et al. 2008.

<sup>16</sup> Nowak, David J., and Eric J. Greenfield. "Tree and impervious cover change in US cities." *Urban Forestry & Urban Greening* 11.1 (2012).

<sup>17</sup> Booth, Derek B., et al. "Global perspectives on the urban stream syndrome." *Freshwater Science* 35.1 (2016).

<sup>18</sup> Fisheries & Oceans Canada. "Threatened, Endangered and Lost Streams of the Lower Fraser Valley." Summary Report. *Lower Fraser Valley Stream Review 3* (1997). Retrieved from: [http://publications.gc.ca/collections/collection\\_2017/mpo-dfo/Fs23-304-8-1997-eng.pdf](http://publications.gc.ca/collections/collection_2017/mpo-dfo/Fs23-304-8-1997-eng.pdf)



## ii) Wastewater, Emerging Contaminants of Concern (CECs) and microplastics

Another problem of urbanized watersheds is the release of wastewater effluent into receiving bodies. This might come as controlled (and most often, treated) or uncontrolled (and untreated) releases. Uncontrolled releases often occur because of combined sewer overflows (CSOs), whereby sewers that collect both raw sewage and stormwater overflow in times of heavy rain or snowmelt. In such cases, stormwater infrastructure that is designed to drain excess water may actually exacerbate pollution into receiving water bodies by mixing with sewage. This effect is further amplified when stormwater drainage pipes are routed directly to surface water bodies, as is the case in many urban areas. Old and aging infrastructure in cities, combined with impervious surfaces that generate large volumes of stormwater runoff, are two major culprits leading to CSOs. CSOs can cause serious damage to wildlife populations and habitat, release high levels of dangerous bacteria into receiving waters, and contribute to harmful algal blooms.<sup>19</sup>

There is increasing concern about the presence of unregulated chemical and organic substances and microplastics in wastewater and stormwater, and the impact these contaminants are having on ecological values and drinking water quality. Even when wastewater is treated and released at water treatment plants, many do not have the technology to adequately filter them. There are hundreds of emerging contaminants in waterways, many of which are unregulated<sup>20</sup>, and there remain significant knowledge gaps with regard to how these contaminants interact over time and space and how they impact water quality and ecological and biological functions.<sup>21</sup> A 2011 report conducted per recommendations of the Cohen Commission suggested there is a strong possibility that over 200 CECs in the Fraser River could be responsible for decline and abnormalities in sockeye salmon.<sup>22</sup> Because they are unregulated, monitoring for these contaminants is not commonplace in many urban areas. Recent studies also confirm the presence of microplastic fibers in forage fish in seabirds in the Salish Sea. Wastewater effluent is believed to be a notable source of these plastics entering waterways.<sup>23</sup>

<sup>19</sup> Wenger et al. (2008).

<sup>20</sup> Hughes et al. (2014).

<sup>21</sup> Pal, Amrita, et al. "Impacts of emerging organic contaminants on freshwater resources: review of recent occurrences, sources, fate and effects." *Science of the Total Environment* 408.24 (2010).

<sup>22</sup> MacDonald, Don et al. "Potential Effects of Contaminants on Fraser River Sockeye Salmon." *The Cohen Commission of Inquiry into the Decline of Sockeye Salmon in the Fraser River Technical Report 2*. (February 2011). Retrieved from: <https://www.watershed-watch.org/wordpress/wp-content/uploads/2011/08/Exh-826-NonRT.pdf>


<sup>23</sup> Bertram, D., Robinson, C., Henneks, M., Galbraith, M., Dangerfield, N., Gauthier, S., & Woo, K. "Plastic ingestion by Pacific Sand Lance (*Ammodytes personatus*) in the Salish Sea." *Salish Sea Ecosystem Conference. Vancouver, BC*. (April 2016). Retrieved from: [https://www.eopugetsound.org/sites/default/files/Bertram\\_SSEC\\_Plastics%20in%20Pacific%20Sand%20Lance%2013%20April%202016.pdf](https://www.eopugetsound.org/sites/default/files/Bertram_SSEC_Plastics%20in%20Pacific%20Sand%20Lance%2013%20April%202016.pdf)

### iii) Competing demands on water

Urban areas are major water consumers. Water demand, combined with high population densities, can put strain on water supply. Water in urban areas may be used for a variety of purposes: domestic use, commercial or industrial use, agricultural use, ecological uses and more. As a result of these many demands on water, many urban centres around the world are experiencing water shortages and B.C. is not exempt from this trend. Smaller communities in particular have found themselves vulnerable to water shortages. For example, during the dry summer of 2015, the Sunshine Coast suffered severe water shortages, coming within 30 days of running out of water.<sup>24</sup> In the summer of 2017, reservoirs in Summerland were nearly emptied when residents turned on sprinklers to protect their properties from a nearby wildfire.<sup>25</sup> Water shortages raise questions about monitoring and measuring water use in cities. Few water purveyors in B.C. have mandatory water metering policies, and three quarters of residential water connections in the province are unmetered. The absence of water meters limits the ability of municipal governments to manage demand, price water appropriately, penalize excessive consumption or identify water leaks.<sup>26</sup>

In addition to water withdrawals, urban land-use change is a factor that can further strain water supplies. For example, groundwater depletion—a global phenomenon in agricultural and urban areas<sup>27</sup>—is hastened by water withdrawals, but also by development that inhibits aquifer recharge (e.g. impervious surfaces). Because groundwater feeds streams and wetlands, particularly in the summer months, depletion of groundwater can result in sustained low flows. In B.C., evidence points to declining groundwater levels in areas of intensive urban development, such as in the Lower Mainland, the Okanagan, the southeast coast of Vancouver Island, and the Gulf Islands.<sup>28</sup>

Strained water systems can result in significant ecological harm, for example, by compromising survival rates of fish, and may potentially provoke conflict between users. Ensuring a supply of water when it is needed, where it is needed and at a sufficient quality, without compromising the ecological and hydrological integrity of the watershed, is a significant challenge for urban watershed sustainability.

  
<sup>24</sup> Simms, R. & Brandes, O.M. (2016, September). Top 5 Water Challenges that will Define British Columbia's Future. Victoria, Canada: POLIS Project on Ecological Governance, Centre for Global Studies, University of Victoria.

<sup>25</sup> Bouey, Kate. (2017, September 4). "Alarmed & using up water." *Castanet.net*. Retrieved from: <https://www.castanet.net/news/West-Kelowna/205769/Alarmed-using-up-water>.

<sup>26</sup> Honey-Rosés, J., J. Bailey, O. Brandes, D. Gill, L. Harris, J. Janmaat, D. Klein, C. Pareja, H. Schreier, S. Shah. 2016. Drought Preparedness in BC: Workshop Summary. Water Planning Lab. School of Community and Regional Planning. University of British Columbia. Retrieved from: <http://hdl.handle.net/2429/57910>

<sup>27</sup> Howard, Ken WF, and Rauf G. Israfilov, eds. *Current problems of hydrogeology in urban areas, urban agglomerates and industrial centres*. Vol. 8. Springer Science & Business Media (2012).

<sup>28</sup> Nowlan, Linda. "Out of sight, out of mind? Taking Canada's groundwater for granted." *Eau Canada: The Future of Canada's Water*. UBC Press. Vancouver, British Columbia (2007).



Mill Creek flood in Kelowna. Photo Credit: Christine Mettler

#### iv) Climate Change

Climate change is anticipated to exacerbate the above environmental challenges. Because climate change in the Pacific Northwest is expected to bring increased and more severe precipitation, more stormwater runoff is likely to be produced, which could in turn make urban stream syndrome more severe. There is also mounting evidence that combined sewer overflows are becoming increasingly common due to climate change.<sup>29</sup> More and more intense precipitation has been documented in the City of Surrey. In 2016, the city revised their Intensity-Frequency-Duration curve for rainfall, and found that rainfall volume in the city had increased by an average of 30% since 1991.<sup>30</sup> A recent study by the Fraser Basin Council estimated that changing weather patterns are increasing the risks and impacts of significant flooding in the Lower Fraser River. They estimate that damages from a major flood in the region could cost \$20-30 billion or more.<sup>31</sup>

On the other hand, evidence suggests that climate change is resulting in less precipitation and more evapotranspiration in the summer and autumn months in the Pacific Northwest<sup>32</sup>, and that there are “strong and significant declines” in annual streamflow in many Pacific Northwest streams.<sup>33</sup> This will put greater strain on water systems that provide water for multiple needs and uses.

<sup>29</sup> Fortier, Claudine, and Alain Mailhot. “Climate change impact on combined sewer overflows.” *Journal of Water Resources Planning and Management* 141.5 (2014).

<sup>30</sup> Personal Interview, August 2017.

<sup>31</sup> Fraser Basin Council. “Lower Mainland Flood Management Strategy, Phase 2.” *Flood Strategy Briefing: Bulletin 1* (September 2017). Retrieved from: [http://www.fraserbasin.bc.ca/Library/Water\\_Flood\\_Strategy/lmfms\\_fsb\\_sept\\_2017\\_web.pdf](http://www.fraserbasin.bc.ca/Library/Water_Flood_Strategy/lmfms_fsb_sept_2017_web.pdf).

<sup>32</sup> Abatzoglou, John T., David E. Rupp, and Philip W. Mote. “Seasonal climate variability and change in the Pacific Northwest of the United States.” *Journal of Climate* 27.5 (2014).

<sup>33</sup> Luce, Charles H., and Zachary A. Holden. “Declining annual streamflow distributions in the Pacific Northwest United States, 1948–2006.” *Geophysical Research Letters* 36.16 (2009).

## 2.2 Survey Responses: Environmental Challenges in B.C.’s Urban Watersheds

The previous section describes major watershed challenges associated with urbanization, and gives some more extreme examples of times those challenges have affected communities in B.C. In this research, we aimed to identify not just extreme manifestations of these environmental challenges, but also how they affect urban watersheds on a more ordinary basis.<sup>34</sup> In order to assess this, we invited water professionals in urban areas to participate in an online survey. Follow-up interviews were also conducted with six individuals who participated in the survey.

### 2.2.1 Severity of environmental issues

We asked respondents to rank from a scale of 1-5 the severity of six environmental challenges in their watersheds. 1 was “not a concern”, 2 was “mild concern”, 3 was “moderate concern”, 4 was “notable concern” and 5 was “very significant concern”. Survey participants reported several concerns regarding the sustainability of urban water bodies. The top three concerns were:

- Riparian habitat loss. This was rated as the most significant concern, with mean response value of 4.00. 80% of respondents said this was either a “notable” or “very significant” concern.
- Drought and/or low streamflow, with a mean value of 3.91.
- Flooding, with a mean value of 3.66.

Respondents were the least concerned about drinking water quantity and quality, with a mean rating of 2.86 and 2.49 respectively.

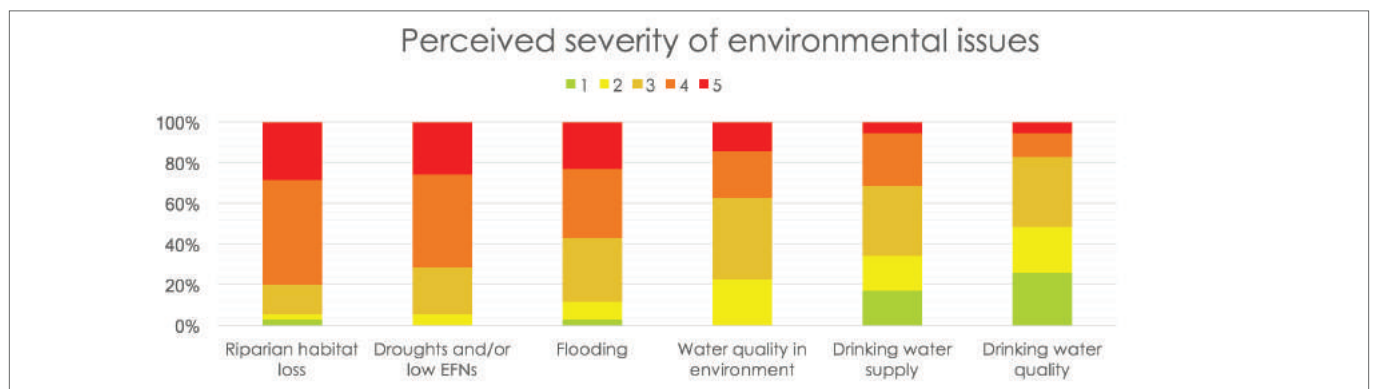


Figure 1: Perceived severity of environmental issues

The survey also included questions where participants could indicate environmental challenges or concerns that were not directly listed in the survey. One participant noted that “in stream habitat



damage, especially dredging” was the most significant challenge in their watershed. Another said “loss of habitat along lake shorelines and foreshore.” One respondent noted that invasive species was an issue of notable concern in their watershed. The remaining comments largely reiterated, in other words, issues included in the survey. For example, there were a number of responses that reiterated the perceived challenge of loss of riparian areas and habitat.

## 2.2.2 Different Concerns in Different Regions

Breaking down these responses by geographic area yields some variation in responses. For the purposes of analysis, respondents are broken down into three regional groups: Metro Vancouver - highly urbanized<sup>35</sup>, Metro Vancouver - moderately urbanized<sup>36</sup>, and Southern Interior (specifically, urban areas in the Okanagan and Kamloops).<sup>37</sup>

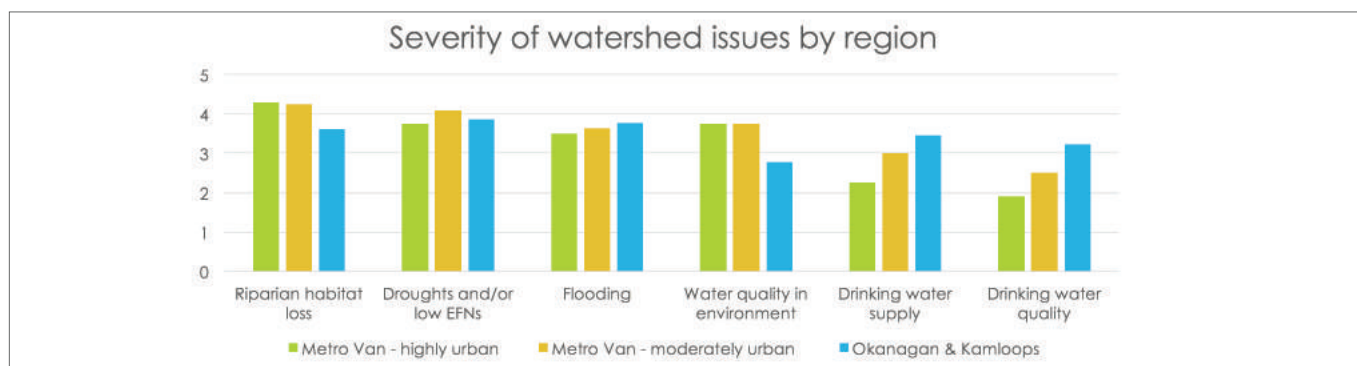


Figure 2: Perceived severity of watershed issues by region

### i) Metro Vancouver - moderately and highly urbanized

Responses only varied slightly between survey participants in highly urban and moderately urban areas of Metro Vancouver, so we have grouped them together for this portion of the analysis. For this group, riparian habitat remained the most significant concern, and drinking water quality and quantity remained the lowest concerns. That drinking water concerns would be listed low in severity is not surprising, since the municipalities of Metro Vancouver enjoy drinking water from the Capilano, Seymour and Coquitlam watersheds, which are source protected.<sup>38</sup> Although respondents in Metro Vancouver were confident in the quality of their drinking water, this group was the most concerned about water quality in the environment, ranking degraded water quality a full point higher than respondents from the Okanagan and Kamloops area.



<sup>34</sup> This information is revealing because it points to the extent to which ecological and hydrological integrity are compromised in urban watersheds and, consequently, the resilience of watersheds to withstand extreme events. The more compromised a watershed’s functions, the less able it is to withstand extreme events.

<sup>35</sup> Includes respondents working in municipalities with population densities of greater than 1000 people per km<sup>2</sup>.

<sup>36</sup> Includes respondents working in municipalities with population densities of less than 600 people per km<sup>2</sup>.

<sup>37</sup> Since there were only two respondents from Vancouver Island, it is difficult to infer with any confidence whether geography was a significant factor in response variation. Therefore, we do not expand upon response variation of respondents from that region.

<sup>38</sup> The Greater Vancouver Water District (GVWD) has sole use and control of the lands surrounding Metro Vancouver’s three watersheds per the Land Act, which entitles the Water District to a 999 year lease of the lands. In 1999, the GVWD Administration Board passed a resolution to protect the watersheds from uses that would threaten water quality. See: <http://www.bctwa.org/AboutGreaterVanWatersheds.pdf>.

## ii) Southern Interior (Okanagan and Kamloops area)

For those respondents in the Southern Interior, drinking water concerns were rated as notably more significant than their counterparts in Metro Vancouver. Here, respondents noted that drinking water quality and quantity was a moderate to notable concern. Drinking water in these regions does not enjoy source protection as do the watersheds that provide Metro Vancouver's drinking water.

While respondents in Southern Interior urban areas were more concerned about drinking water than their counterparts in Metro Vancouver, they were less concerned about water quality in the environment, rating it 2.77 or a mild to moderate concern. This is likely because there are more intact natural areas within the boundaries of urban centres in the Southern Interior and, on average, notably less urban density and impervious surfaces. Respondents in the interior were also less concerned about riparian degradation and habitat loss, rating it as a "moderate to notable" concern (3.67 for interior respondents as opposed to an average rating of 4.03), ostensibly for similar reasons. Droughts and floods were rated as the greatest concerns, on average, among respondents in the interior. These concerns are particularly pertinent in 2017, where the spring initially brought severe flooding to the Okanagan and Kamloops regions, followed by prolonged drought.

## 2.3 Survey Response: Causes and Culprits of Environmental Challenges in B.C.'s Urban Watersheds

### 2.3.1 Prevalence of environmental pressures

Survey participants were asked to identify the factors they thought were contributing to the above environmental challenges by rating the severity of various environmental pressures<sup>39</sup> out of 5, where 1 was "not at all a threat", 2 was "minor threat", 3 was "moderate threat", 4 was "notable threat" and 5 was "very significant threat." Overall, the most salient threats were:

- Land-use change. This was identified as the largest threat, with a mean score of 4.17 out of 5.
- Impervious surfaces, with a mean score of 3.97 out of 5.
- Climate change, with a mean score of 3.91 out of 5.

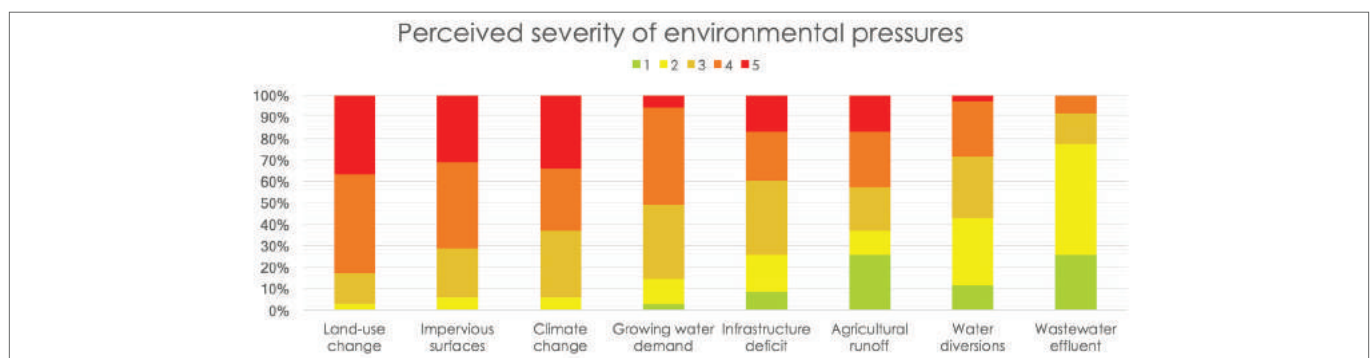


Figure 3: Perceived severity of environmental pressures

<sup>39</sup> Following the United States Environmental Protection Agency's DPSIR Framework, "pressures" are defined as human activities...that induce changes in the environment." An environmental pressure is an activity that implies a cause-and-effect relationship between that activity and the impact. See: U.S. EPA. "Using the DPSIR Framework to Develop a Conceptual Model: Technical Support Document." EPA/600/R-15/154 (August 2015). Retrieved from: [https://cfpub.epa.gov/si/si\\_public\\_record\\_report.cfm?dirEntryId=311236](https://cfpub.epa.gov/si/si_public_record_report.cfm?dirEntryId=311236).

In an open-ended question regarding the biggest threat to watershed health in their area of work, 27 out of 35 respondents identified land-use change, development and/or impervious surfaces.

On the other hand, respondents indicated that they were not particularly concerned about the release of wastewater effluent into receiving water bodies, rating it only a minor threat (mean score 2.06). Although survey respondents rated droughts and low stream flows as one of the most significant challenges in their urban watersheds, most did not link this with impacts of water diversions, rating it a minor to moderate threat (mean value: 2.86).

## 2.3.2 Regional Differences

Some interesting differences emerged when breaking down perceived threats by region of respondents.

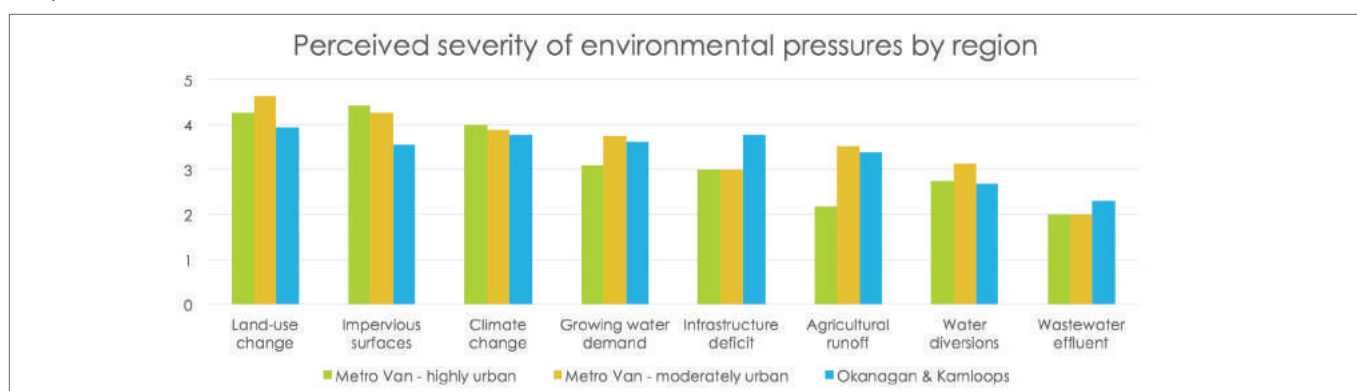


Figure 4: Perceived severity of environmental pressures by region

### i) Metro Vancouver - highly urbanized

Responses among participants in Metro Vancouver varied based on whether they worked in highly urbanized watersheds, or moderately urbanized watersheds. Those in highly urbanized watersheds indicated that:

- Impervious surfaces were the largest threat to watershed health, with all participants but one indicating that this was a notable or very significant threat (mean value 4.42).
- Land-use change was also rated as a concern of note, with a mean value of 4.25.

That respondents here placed greater emphasis on the threat of impervious surfaces than on land-use change is not surprising, since highly urbanized areas like the City of Vancouver and the City of North Vancouver are nearly entirely ‘built out.’ Therefore, it may not be a *change* in land-use that is the most concerning in these highly urbanized areas so much as impervious areas that already exist.

Relative to respondents from other regions, participants from highly urbanized watersheds in Metro Vancouver rated growing water demand as less of a concern. This is perhaps because there are not many *new* demands on water in highly urbanized, built out areas since the vast majority of land that can be developed has already been developed. Nonetheless, respondents here did still rate this concern as moderate (mean value 3.08).



## ii) Metro Vancouver - moderately urbanized

In moderately urbanized municipalities, land-use change and impervious surfaces were once again rated as the most salient threats, but their order of precedence was the inverse from respondents in highly urbanized municipalities. That is to say, respondents here rated:

- Land-use change as the most significant threat (mean value of 4.63),
- Impervious surfaces as the second largest threat (mean value of 4.25).

Respondents in this category rated land-use change as a more significant threat than respondents from other categories rated any other threat. This suggests that land-use change is a significant concern in moderately urbanized areas in Metro Vancouver. This result makes sense in the context of population pressures in Metro Vancouver, particularly in areas outside of Vancouver. To illustrate, the District of Langley's population grew by 12.6% between 2011-2016 and Maple Ridge grew by 8.2%.<sup>40</sup> Although agricultural runoff was ranked as one of the lowest concerns, as a whole, by respondents in highly urbanized areas of Metro Vancouver, those whose work applies to moderately urbanized watersheds indicated this threat is much more prevalent (mean value 3.50 for moderately urbanized watersheds vs 2.17 for highly urbanized watersheds). This is not particularly surprising, since agricultural operations are marginal in most highly urbanized municipalities, but prevalent in the less urbanized municipalities on the periphery of Metro Vancouver. Regardless of density, for those respondents who work in municipalities with more than 10% of land mass in the Agricultural Land Reserve (Port Coquitlam, Surrey, Delta, the Township of Langley and Maple Ridge<sup>41</sup>) concerns about agricultural runoff are even more pronounced: a mean value of 4 out of 5, or a notable concern.

Survey participants in moderately urbanized areas also appear to be more concerned about increasing demands on water than their counterparts in highly urbanized areas, with an average response value of 3.75 compared to 3.08. Since all municipalities in Metro Vancouver get their drinking water from the Greater Vancouver Water District, this discrepancy is likely due to the prevalence of agricultural licenses in the less urbanized municipalities.



<sup>40</sup> Although these areas were classified as “highly urban” for the purposes of this analysis, the Cities of Surrey, Coquitlam and North Vancouver also experienced significant growth between 2011 and 2016, with growth rates of 10.6%, 9.8%, and 9.8% respectively. See: Statistics Canada. *Census Profile, 2016 Census*. (2016). <http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E>

<sup>41</sup> See: Agricultural Land Commission. *Land Within the ALR by Regional District and Municipality*. (2000). [http://www.alc.gov.bc.ca/assets/alc/assets/library/land-use-planning/planning\\_for\\_agriculture\\_resource\\_materials\\_part\\_4\\_appendices.pdf](http://www.alc.gov.bc.ca/assets/alc/assets/library/land-use-planning/planning_for_agriculture_resource_materials_part_4_appendices.pdf)



*Streetside sprinklers. Photo Credit: Arlington County. CC BY-SA 2.0*

## ii) Southern Interior (Okanagan and Kamloops)

Land-use change was rated as the most significant threat by respondents in the Okanagan and Kamloops area (mean value of 3.92). However, respondents did not consider it as significant a threat as did their peers in Metro Vancouver. This may be because, although these urban areas are also experiencing notable growth rates<sup>42</sup>, there is not the same level of competition for land in Kamloops and the Okanagan as there is in Metro Vancouver. Similar to respondents from less urbanized areas in Metro Vancouver, survey participants from the interior similarly indicated impervious surfaces to be less of a threat to watershed sustainability than their peers in highly urbanized Metro Vancouver watersheds (mean value: 3.54).

Interestingly, survey participants from the Interior rated the second most salient threats facing watersheds as “climate change” and “infrastructure deficit” (mean value of 3.77). While respondents from all regions thought climate change to be a moderate to notable threat, infrastructure deficit was rated as a higher by participants in the Interior. Here as well, growing water demand was higher than the group average.



<sup>42</sup> In the City of Kamloops, the population grew by 7.2% between 2011 and 2016; the population grew by 4.2% in Vernon; by 5.7% in the District of West Kelowna; by 8.4% in Kelowna; and by 2.4% in Penticton.

## 2.4 Connecting watershed degradation and pressures

The environmental challenges laid out in section 2.2 do not have a linear relationship with any one pressure in section 2.3. Rather, the relationship is complex, multifaceted and overlapping. The table below summarizes watershed challenges in B.C.'s urban areas and some principal pressures. This is not an exhaustive list, but rather an overview of key activities and contexts that may bring about the aforementioned environmental challenges in watersheds.

\*Scale (severity out of 5)

4-4.5	3.5-4	3-3.5	2.5-3	2-2.5	1.5-2

Watershed Issue	Level of concern*			Pressures and Stressors
	MV - HU	MV - MU	Interior	
Riparian degradation and habitat loss				<ul style="list-style-type: none"> <li>Land-use change in foreshore areas and riparian zones, which may directly displace natural features</li> <li>Impervious and hardened surfaces in watershed, which produces more runoff that could hasten streambank erosion</li> <li>Changes in and about streams (channelization, dikes, dams) which may directly alter habitat or increase volume and therefore erosion</li> </ul>
Low streamflows and droughts				<ul style="list-style-type: none"> <li>Land-use change that displaces natural features with agriculture and built environments, changing the ecosystem's ability to hold onto water in the dry season</li> <li>Impervious and hardened surfaces in watershed, which inhibit groundwater infiltration resulting in lower flows in dry season</li> <li>Water withdrawals from surface water and connected groundwater sources for domestic, agricultural, industrial and commercial uses, which put pressure on water supplies</li> <li>Changes in and about streams (channelization, dikes, dams) which may impede or decrease stream discharge</li> <li>Climate change, which is bringing about longer, hotter and drier summer seasons</li> </ul>
Flooding				<ul style="list-style-type: none"> <li>Land-use change that displaces natural features with agriculture and built environments, changing the ecosystem's ability to absorb excess water</li> <li>Impervious and hardened surfaces in watershed, which inhibit infiltration and produce more runoff that overwhelms the carrying capacity of natural water bodies</li> <li>Old and aging infrastructure, which pipe stormwater directly into natural water bodies</li> <li>Changes in and about streams (channelization, dikes, dams) which may increase stream discharge</li> <li>Climate change, which is bringing about more intense precipitation events that produce large volumes of stormwater in short time frames</li> </ul>
Degradation of water quality in environment				<ul style="list-style-type: none"> <li>Land-use change that displaces natural features with agriculture and built environments, changing the ecosystem's ability to filter contaminants in runoff</li> <li>Impervious and hardened surfaces in watershed, which generates stormwater runoff that carries pollutants on its overland flow course to natural water bodies</li> <li>Old and aging infrastructure, where combined sewer overflows introduce untreated waste and stormwater into natural water bodies</li> </ul>
Strained drinking water supply				<ul style="list-style-type: none"> <li>Water withdrawals for domestic, agricultural, industrial and commercial uses, which put pressure on water supplies</li> <li>Climate change, which is bringing about longer, hotter and drier summer seasons</li> </ul>
Degradation of drinking water quality				<ul style="list-style-type: none"> <li>Land-use change that displaces natural features with agriculture and built environments, changing the ecosystem's ability to filter contaminants in runoff</li> <li>Multiple activities (logging, resource extraction, recreation) in source water areas, which may produce sedimentation and other concerns that compromise water quality.</li> </ul>

## 3. LOCAL WATERSHED MANAGEMENT: TOOLS AND CHALLENGES

### 3.1 Existing Tools

A variety of tools exist to help watershed planners and managers working in local government to address and mitigate the environmental problems and underlying causes outlined in the previous section. However, despite these tools, watershed practitioners have indicated that there remain significant challenges that compromise sustainable watershed management in B.C.'s urban areas. These challenges will be discussed in section 3.2.

In this section of the report, we provide an overview of some tools that exist to address the aforementioned watershed challenges and their underlying causes. There are many tools available and this list is not exhaustive<sup>43</sup>, but rather provides a summary of tools that are more commonly deployed by local governments. These tools are not necessarily exclusive from one another and may be used in combination. Of course, these tools only apply in areas where local government have jurisdiction and authority to effect change, in particular land-use planning, oversight of development, servicing and drainage, flood protection, and in water and wastewater systems. Although it is not discussed in its own right here, public education and outreach is a tool that can (and should) be used in combination with the tools described below. It should be noted that municipalities and regional districts have different—although often overlapping—jurisdiction and procedures.<sup>44</sup> To avoid delving into this complexity, we do not distinguish between these two here.

#### 3.1.1 Bylaws (including zoning), and Development Permit Areas

**Pressures potentially addressed:** *land-use change, impervious surfaces, growing water demand, climate change*

Provincial legislation in B.C. gives local governments the authority to regulate activities pertaining to land use in their jurisdictions.<sup>45</sup> Local governments primarily regulate land-use with zoning bylaws—rules that establish what kind of development can and cannot take place on a given parcel of land—and Development Permit Areas—tools that allow local governments to require special permits before development takes places in environmentally sensitive areas. In addition to regulatory authority related to land-use, municipalities may also create bylaws to “regulate, prohibit and impose requirements in relation to the natural environment,”<sup>46</sup> as well as public places, trees, animals, buildings and other



<sup>43</sup> For an extensive summary of tools available to local governments, see D. Curran, E. Krindle & M. Hulse. *Bylaws Toolkit for Conserving Sensitive Ecosystems*. (2016). Retrieved from: <http://www.greenbylaws.ca/>.

<sup>44</sup> Fraser Basin Council. “Rethinking our Water Ways.” Vancouver, BC, Canada. (2011); Curran, Krindle & Hulse (2016).

<sup>45</sup> This authority is given through the *Local Government Act*.

<sup>46</sup> Per section 8(3)(b), (c), (j), (k), (l) and (m) of the Community Charter. Related authorities for the City of Vancouver are also delegated via the *Vancouver Charter*.



Kelowna Marsh. Photo Credit: OBWB/Okanagan WaterWise

structures, and the removal or deposit of soil.<sup>47</sup> Therefore, local governments may influence a variety of activities, such as land-use change, where and how development can take place, building and plumbing requirements, water use, and activities that could impact watershed health, like the application of pesticides on private land or the obstruction of a watercourse. As such, bylaws can be effective interventions to address concerns related to land-use change, impervious surfaces, and growing water demand, which can in turn build local resilience to climate change related impacts.

The adoption and application of these tools are often determined by larger policy directions, laid out in documents such as Regional Growth Strategies, Official Community Plans, neighborhood and other plans (e.g. liquid waste and stormwater management plans<sup>48</sup>) or strategies. Provincial legislation gives local governments discretionary authority in establishing these rules and regulations, and therefore whether and how local governments use these tools varies quite a bit from one local government to another. However, there does exist legislation that requires local governments to adhere to its stipulations when conducting business. An example of this is the Riparian Areas Regulation (RAR), provincial regulations that require local governments to protect riparian corridors in fish bearing streams from impacts of development.<sup>49</sup> Many local governments adhere to these stipulations by incorporating them into bylaws or DPAs.<sup>50</sup>



<sup>47</sup> Overlapping, or concurrent, jurisdiction between municipalities and the Province with regard to the natural environment means that municipalities may sometimes need ministerial approval before enacting bylaws. Areas where permission is not needed include pesticide control, alien invasive species and watercourse protection.

<sup>48</sup> In Metro Vancouver, member municipalities have collectively agreed to prepare and adopt Integrated Stormwater Management Plans for watersheds within municipal boundaries that are 20% or more developed. These plans may trigger commitments from decision-makers to fund specific projects (e.g. rain gardens, bioswales, reforestation, etc.), develop or amend bylaws, or require developers to adhere to certain standards.

<sup>49</sup> The RAR was designed to meet concurrent obligations under the federal Fisheries Act. The regulation requires municipalities to follow a process so that proposed developments within 30m of water bodies that support fish habitat do not cause harmful alteration, disruption, or destruction of natural features that support fish. Local governments may adopt rules that exceed the requirements of the RAR—for example, by establishing bylaws that forbid any development within a riparian corridor of a given area (e.g. 15m on either side of a stream).

<sup>50</sup> B.C. Ministry of Forests, Lands and Natural Resource Operations. *Review of Local Government Implementation of the Riparian Areas Regulation*. (2015). Retrieved from: [http://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/fish-fish-habitat/riparian-areas-regulations/lg\\_rar\\_implementation\\_compliance\\_report\\_september\\_14\\_2015\\_r.pdf](http://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/fish-fish-habitat/riparian-areas-regulations/lg_rar_implementation_compliance_report_september_14_2015_r.pdf)

Despite the ability of local governments in B.C. to regulate activities related to the natural environment and other areas, such rules must not supersede provincial or federal legislation. For example, the Farm Practices Protection (Right to Farm) Act prohibits local government regulation from interfering with “normal farm practices,”<sup>51</sup> a constraint on local governments’ ability to curb agricultural practices that affect watershed health.

### 3.1.2. Water demand management programs

**Pressures potentially addressed:** *growing water demand, climate change*

Local governments may encourage prudent use of water through a variety of mechanisms. As detailed above, they may do this through the establishment of bylaws. For example, they may establish bylaws related to landscaping requirements around new developments that serve to minimize the volume of water needed to irrigate the land, bylaws that require efficient plumbing and fixtures in new developments, or bylaws that allow the local government to restrict water use at certain times.<sup>52</sup>

Local governments may also use economic and financial measures to encourage lower demand on water supplies, such as instituting conservation-oriented pricing and rate structures for water delivery, or offering rebate programs to residents who install water-efficient fixtures in their homes or businesses. They may also consider programs such as greywater recovery and rainwater harvesting in order to reduce the volume of blue water that is diverted from surface or groundwater sources for non-drinking, cooking or hygienic use. Installing water meters has been shown to reduce water use by 10-40%, even without changes to the rate structure.<sup>53</sup>

This suite of tools can be framed and prioritized with the use of a water conservation plan. Such plans have recently been made a requirement in order to receive capital grants from the Province for drinking water and wastewater infrastructure.<sup>54</sup>

### 3.1.3 Funding integrated water infrastructure

**Pressures potentially addressed:** *land-use change, impervious surfaces, wastewater effluent, growing water demand, climate change*

There is an increasing recognition among urban watershed practitioners of the need to understand and plan for infrastructure holistically, and that in addition to traditional “grey infrastructure” (e.g. engineered works such as pipes, sewers, and detention ponds), water managers should also view natural assets as “green infrastructure” (e.g. natural and constructed features, such as urban forests,



<sup>51</sup> Curran, Krindle & Hulse (2016).

<sup>52</sup> Belzile et al. (2013). Belzile et al. (2013). Belzile, J. with M. Martin, L. Edwards, G. Brown, L. Brandes, A. Warwick Sears. Water Conservation Guide for British Columbia. Victoria: BC Ministry of Community, Sport & Cultural Development, POLIS Project on Ecological Governance, Okanagan Basin Water Board. (2013).

<sup>53</sup> Ibid.

<sup>54</sup> Ibid.

park space, wetlands and riparian zones, green roofs, rain gardens, bioswales, and retention ponds) and incorporate this into water planning. Green infrastructure can help remove strain from traditional infrastructure by minimizing runoff and helping to infiltrate stormwater where it falls. The B.C. Stormwater Guide recommends that local governments plan for development and infrastructure that infiltrates 90% of stormwater where it falls.<sup>55</sup>

In communities across the country, including B.C., there has been a reinvigoration in infrastructure investment after decades of underinvestment leading to an “infrastructure gap” valued at approximately \$145 billion.<sup>56</sup> The Federal Government has committed to doubling infrastructure spending, with a plan to spend \$180 billion on infrastructure over 12 years.<sup>57</sup> Many communities are upgrading their traditional water infrastructure (water and wastewater treatments, pipes and drains, etc.) as well as making significant investments in green infrastructure. In some cases, this includes riparian restoration projects and urban retrofits. These infrastructure investments can slow and in some cases reverse land-use change and the prevalence of impervious surfaces; make drinking water systems more efficient, taking pressure off demand; and improve the quality and quantity of stormwater and wastewater releases.

In B.C., local governments typically fund infrastructure with assistance from the provincial and federal governments. In particular, the B.C. Framework for Sustainable Asset Management outlines criteria by which local governments can apply for funding from the Province for infrastructure upgrades. Despite grants that exist, an increasing burden to fund infrastructure projects has fallen to local governments over the past several decades. Whereas in 1950 local governments contributed on average 27% to infrastructure investments, by 2010 they were paying for over 48%.<sup>58</sup> Therefore, local governments have had to find additional ways to fund infrastructure improvements and maintenance. Some are turning to fees, levies or taxes to do this. For example, the Cities of Victoria and the Surrey have established specialized utilities to oversee stormwater infrastructure. Each municipality funds their utility through different fee models.

### 3.2 Challenges to Sustainable Watershed Management

The environmental challenges outlined in Section 2 and the fact that they impact B.C.’s urban watersheds to varying degrees is not new knowledge. Indeed, many of the issues contained within this report have been identified by local governments themselves and a variety of organizations and individuals. Several of these organizations and individuals have developed materials and interventions to help address these issues. For example, while conducting research for this report, we identified over



<sup>55</sup> British Columbia Ministry of the Environment. Stormwater Planning: A Guidebook for British Columbia. (2003). Retrieved from: <http://www2.gov.bc.ca/gov/DownloadAsset?assetId=FA2C4B4B9B9F47F5981272B98894655D>

<sup>56</sup> MacKenzie, H. Canada’s Infrastructure Gap: Where it Came From and Why it Will Cost so Much to Close. (2013). *Canadian Centre for Policy Alternatives*. Retrieved from: [https://www.policyalternatives.ca/sites/default/files/uploads/publications/National%20Office/2013/01/Canada%27s%20Infrastructure%20Gap\\_0.pdf](https://www.policyalternatives.ca/sites/default/files/uploads/publications/National%20Office/2013/01/Canada%27s%20Infrastructure%20Gap_0.pdf).

<sup>57</sup> Infrastructure Canada. Investing in Canada Plan. (August 2017). Retrieved from: <http://www.infrastructure.gc.ca/plan/about-invest-apropos-eng.html>

<sup>58</sup> MacKenzie, H. (2013).

30 toolkits, guideline documents, and manuals prepared by a variety of authors (e.g. the Government of British Columbia, researchers and legal analysts, local governments, environmental organizations, etc.) in the past ten years to help local governments in British Columbia staff make sound decisions for watershed sustainability. Appendix C lists those documents.

Notwithstanding, the availability of information does not always build knowledge or translate into action. One survey respondent remarked on this in an open comment: “Information is good, but if we don’t know how to apply it then unintended outcomes arise. We need to build knowledge. And we need to communicate decision making.” In response to the survey question “do you think local governments are able to adequately address the issues and threats you noted above”, only 2 of 35 respondents chose “yes.” Six participants chose “no”, 21 participants chose “some of them / in part”, and 4 chose “most of them.”

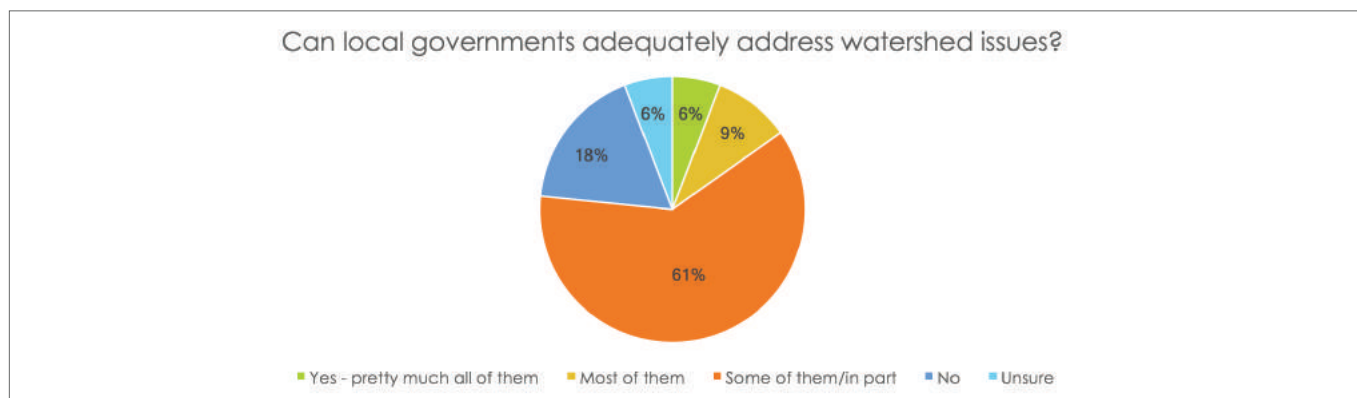


Figure 5: Can local governments adequate address watershed issues?

In a follow-up interview with a participant who selected “yes” to this question, they clarified that their response meant that they believe local governments have the knowledge and technical ability to improve watershed outcomes, however that knowledge and ability does not always translate into action for a number of reasons.

Participants were asked to rate what they thought to be the largest barriers to sustainable urban watershed management, with 1 being “not a barrier” and 5 being “a very large barrier.” Results are presented in Figure 7.

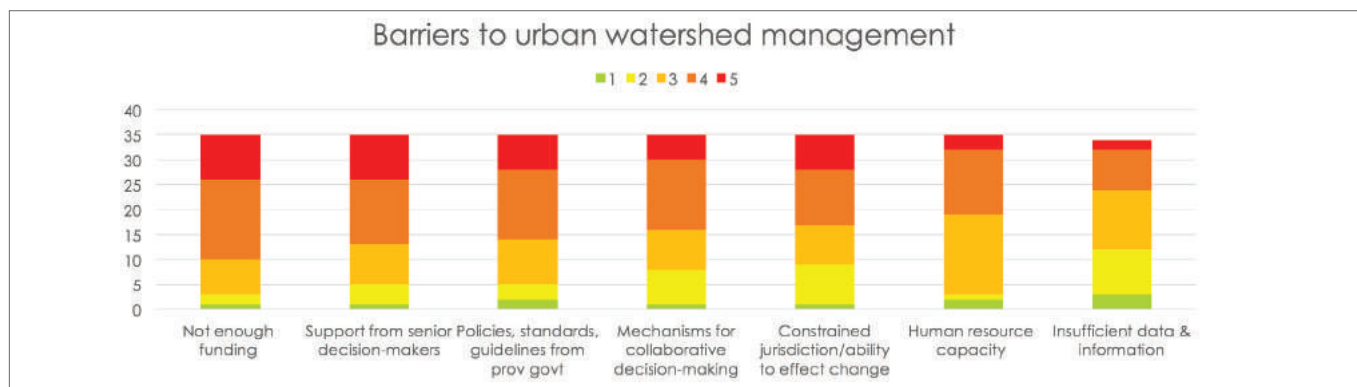


Figure 6: Barriers to urban watershed management



These responses, in combination with interview responses and key themes deduced from the literature review, allowed us to identify seven key themes that hinder local governments' abilities to manage watersheds sustainably. Each barrier is accompanied by a "solutions box", informed by ideas from interviewees, survey respondents, and the literature, regarding ways in which the barrier could be addressed.

## 1. Voluntary vs. mandated protections

According to the Partnership for Watershed Sustainability,

*BC is perhaps the least prescriptive province, and BC local government is among the most autonomous in Canada. The Province enables local government by providing policy and legal tools in response to local government requests. [...] The enabling approach means the onus is on local government to take the initiative and implement.<sup>59</sup>*

In other words, provincial legislation has made it possible for local governments to enact their own rules, but has, by and large, not required governments to adopt rules for the protection of environmental values, with some exceptions (e.g. the Riparian Areas Regulation). Further, there are no overarching provincial standards for environmental water quality, quantity (including environmental flows) and protecting ecosystem values to which local governments must adhere.<sup>60,61</sup>

While some have heralded B.C.'s framework of enabling instead of requiring action as one that allows for flexibility in adopting responses to local concerns and needs, this research revealed a lack of standardization can make for uneven implementation of protections. To this point, in the survey, participants rated "insufficient policies, guidelines and standards from higher levels of government" as a "moderate" to "large" barrier (mean value 3.60 out of 5) to addressing watershed issues at the local level.

One survey participant noted that "local government cultures vary widely with respect to priority of watershed issues. Some take environmental issues very seriously and are quite pro-active. Others care about flood control and view species at risk, fisheries and other environmental values with ambivalence or even disdain." When asked what they thought about a standardized approach compared to a voluntary, enabling approach, an interviewee stated that "enabling' is a fancy word for 'downloading'." They elaborated that they believed an inflexible, one-size-fits all approach is not the answer and that the provincial government needs to respect local concerns and take them into consideration. However, they emphasized the need for regulation that could allow local governments to meet standards. The interviewee expressed concern that corruption is more likely without standardized approaches, since one or a few individuals could have a disproportionate influence on development or other decisions at the local level.



<sup>59</sup> Partnership for Water Sustainability. *Beyond the Guidebook 2010: Implementing a New Culture for Urban Watershed Protection and Restoration in British Columbia*. (2010).

<sup>60</sup> Nowlan, L, and Bakker, K. *Delegating water governance: Issues and challenges in the BC context*. (2007). Vancouver: Program on Water Governance, University of British Columbia.

<sup>61</sup> Although there are not standards for water in the environment, there are federal standards for wastewater effluent releases. However, as noted in Section 2, these regulations do not extend to contaminants such as CECs and microplastics.

In a similar vein, some participants expressed that decisions-makers can be resistant to taking action on protecting environmental values when they are not required to do so. Survey respondents rated “support from senior decision-makers” as the second most salient barrier when it comes to sustainable watershed management (mean value 3.71, or between “moderate” to “large” barrier). In an interview, one participant described how an important waterway in the city did not qualify for an integrated stormwater management plan because, even though the lower part of the watershed was extensively urbanized and has experienced considerable environmental degradation, the watershed as a whole did not reach the development threshold necessary to require a plan. As a result, decision-makers have not supported the creation of an integrated management plan for this watershed. Voluntary protections require a certain political will to implement. However, two survey participants named, unprompted, ‘political will’ as a significant barrier to sustainable watershed management. This is further exemplified by survey respondents rating “support from senior decision-makers” as the second most salient barrier when it comes to sustainable watershed management (mean value 3.71, or between “moderate” to “large” barrier).

Even when there are requirements for local government to have plans in place, it might not necessarily spur action. An interviewee spoke about how having a requirement for a plan does not always result in outcomes. When asked how well integrated stormwater management plans have translated into outcomes, they noted that senior decision-makers may sometimes respond that “it’s a plan, it doesn’t mean it’s a ‘have to.’” In other words, the requirement was to develop a plan. This does not necessarily mean that the plan will be acted upon.

### Towards Solutions

Developing provincial standards, or objectives, that require communities across the province to meet established baselines for watershed health would address the issue of political will. Including performance measures in the standards—i.e. measuring success by outcomes, rather than solely by process requirements—could address the unevenness with which watershed protections are implemented and acted upon in B.C. while also allowing for flexibility and adaptation to local context.<sup>62</sup> More than one participant familiar with the *Water Sustainability Act* noted how Water Objectives could be an effective mechanism by which to do this. One survey participant plainly noted: “We need to get a process rolling with the explicit outcome of setting a legally binding water objective related to either water quality or quantity.”

Although legally enforceable standards were identified as desirable by many participants, this would also require a level of oversight and dedicated resources to ensure compliance.



<sup>62</sup> Cf. Curran, Krindle & Hulse (2016).

## 2. Long-term watershed planning vs. short term political cycles

Restoring healthy watershed processes can take a long time. The beneficial impacts of a restoration project might not reveal themselves for as little as a few months to a year, to as many as over a hundred years.<sup>63</sup> However, local governments are under pressure to show their constituencies how public funds are benefitting the community on a much shorter term, or risk losing elections. This may mean that other priorities—where benefits manifest themselves on a much shorter term—take precedence over sustainable watershed management.

An interview participant discussed this tension, remarking how budgets and public agendas can be determined by what is most politically palatable, not necessarily what is best for the community. They noted how crises or public attention might cause council to divert resources from watershed management to emerging priorities of public concern. This concern was also echoed by a survey participant: “We are not taking advantage of every redevelopment opportunity to help restore a natural water balance. We have the technology and capability to do this. We are sensitive to what our residents and council feel are higher priorities and therefore moving very slowly.”

### Towards Solutions

The tension described above is not specific to watershed management in B.C., but is a well-documented tension in environmental management more generally. However, there are interventions that could help to mitigate the issue. For example, an interviewee suggested that third-party organizations that are not influenced by political pressure could lend accountability and stability to long-term watershed management and planning. For example, in Ontario, Conservation Authorities are designed as non-political, non-profit organizations that are funded through tax levies, provincial and federal grants, and self-generated revenues that are responsible for watershed management, enforcement, and related tasks.<sup>64</sup> The “Solutions” box in challenge 7 further discusses possibilities for third party organizations such as watershed decision-making entities that could address this challenge.

Adopting structured decision-making processes could also lend consistency and transparency to watershed decision-making. Structured decision-making is a method that follows a process to evaluate potential options, and the consequences and trade-offs involved for each option. Structured decision-making has been widely credited as a key factor in the success of many of B.C. Hydro’s water use planning process.<sup>65</sup>

  
<sup>63</sup> Hughes et al. (2014).

<sup>64</sup> Conservation Ontario. Conservation Authorities of Ontario. (n.d.) Retrieved from: <http://conservationontario.ca/about-us/conservation-authorities>

<sup>65</sup> Mattison, J., Nowlan, L., Lebel, M., and Orr, C. “Water for Power, Water for Nature: The Story of BC Hydro’s Water Use Planning Program.” Vancouver: WWF Canada. (2014). Retrieved from: [http://awsassets.wwf.ca/downloads/wup\\_report\\_r04.pdf](http://awsassets.wwf.ca/downloads/wup_report_r04.pdf).

### 3. Piecemeal approach

Many of the tools that exist for local governments to influence activities that impact watershed health are tools intended to prevent future degradation (i.e. they are aimed at mitigating harm caused by new developments) and are site specific (i.e. they are enacted on a lot-by-lot basis). For example, they may require developers to infiltrate stormwater on site, or to leave ample setbacks from a watercourse. Although these interventions are necessary, they may not be sufficient. Tools to restore past degradation, and which allow rehabilitation at the watershed scale may be necessary to recover lost or degraded hydrological connectivity, geomorphological complexity, and ecological function of watersheds.<sup>66</sup>

One interview participant elaborated on this when they described how, despite meaningful efforts to improve urban watershed management in the local government where they work, the tools at their disposal are “slowing down loss” but are not helping to make gains. For example, they said it was “very hard to move the needle forward” on things like increasing watershed forest cover or rehabilitating degraded riparian areas. This reality might explain why, despite tools such as the Riparian Areas Regulation in effect, local watershed practitioners are quite concerned about the welfare of riparian areas—particularly in highly urbanized watersheds. The current suite of tools at best help to prevent future degradation and at worse slow down the rate of degradation. They are only able to address past riparian degradation or large swathes of impervious surface areas when a parcel of land is re-developed, which happens sporadically.

#### Towards Solutions

Strategies that advance basin-scale watershed processes are much more likely to bring about positive environmental outcomes than site-specific improvements.<sup>67</sup> Complete restoration of ecological and hydrologic integrity in an urban context is not possible, but it is possible to rehabilitate watersheds to support desirable water qualities, quantities and ecosystem function. Some jurisdictions employ regulatory tools that facilitate existing developments and infrastructure to be retrofitted. For example, Massachusetts and New Hampshire require permits for urban drainages that release into impaired watersheds. These permits may require retrofits in order to ensure the discharges meet the Total Maximum Daily Limit of contaminants entering water bodies.<sup>68</sup> The U.S. Environmental Protection Agency has found that a combination of incentives, compliance assistance and regulations were together effective at retrofitting urban areas with green stormwater infrastructure.<sup>69</sup>



<sup>66</sup> Hughes et al. (2014).

<sup>67</sup> Ibid.

<sup>68</sup> United States Environmental Protection Agency (U.S EPA). Stormwater Retrofit Techniques for Restoring Urban Drainages in Massachusetts and New Hampshire. Technical Document. (April 2011). Retrieved from: <https://www3.epa.gov/region1/npdes/stormwater/assets/pdfs/BMPRetrofit.pdf>

<sup>69</sup> U.S EPA. Managing Wet Weather with Green Infrastructure Municipal Handbook: Green Infrastructure Retrofit Policies. (2008). Retrieved from: [https://www.epa.gov/sites/production/files/2015-10/documents/gi\\_munichandbook\\_retrofits.pdf](https://www.epa.gov/sites/production/files/2015-10/documents/gi_munichandbook_retrofits.pdf).

#### 4. Lack of resources to support on-the-ground work

A lack of resources was identified by survey participants as the foremost challenge to watershed sustainability. The majority of respondents rated it to be a “large barrier” (16 out of 35 respondents) or a “very large barrier” (9 out of 35 respondents). When asked to elaborate on their response to management barriers, one survey respondent simply wrote, “Huge watershed. So many stakeholders. No time. No funds.” Survey and interview participants indicated that insufficient funds were available for activities such as implementing and overseeing rules and policies, data collection and monitoring, education and outreach, and ensuring the continuity of watershed programs more generally. Others noted, as indicated above (in section 3.2.2), that funding for watershed management may be diverted to competing priorities.

An interviewee reflected on how, despite the regulatory necessity to do so, some municipalities in Metro Vancouver have not implemented their integrated stormwater management plan because they did not have the funds or capacity to do so. This observation was also noted in relation to uptake and implementation of Riparian Areas Regulation requirements among local governments. A review by the Ministry of Forests, Lands and Natural Resource Operations noted that “a number of local governments raised concerns about their capacity to evaluate RAR standards and take action on contraventions, which [...] often relates to available resources.”<sup>70</sup>

The lack of resources for watershed management is not only a barrier for local government, but also for provincial government operations. More than one survey and interview participant noted that government offices are understaffed, and that their ability to conduct watershed monitoring and science, issue and review licenses, and enforce rules is routinely strained. A survey respondent noted how the lack of capacity of provincial staffers to respond to requests was in turn hampering local government. The respondent noted that local governments and nonprofit organizations often ended up filling the gap and taking on work that is under the province’s mandate. They noted that “while I applaud the recent changes to the Act, I feel the Province will be hard pressed to respond to the new work it will generate.” An interview participant affirmed this point, noting how the province often takes a long time to approve licenses necessary for local governments to do works such as improvements in and about a stream.



<sup>70</sup> B.C. Ministry of Forests, Lands and Natural Resource Operations. *Review of Local Government Implementation of the Riparian Areas Regulation*. (2015). Retrieved from: [http://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/fish-fish-habitat/riparian-areas-regulations/lg\\_rar\\_implementation\\_compliance\\_report\\_september\\_14\\_2015\\_r.pdf](http://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/fish-fish-habitat/riparian-areas-regulations/lg_rar_implementation_compliance_report_september_14_2015_r.pdf)

## Toward Solutions

Although a lack of resources was identified as the largest barrier by survey respondents, it is, arguably, one of the easiest problems to address. At the local level, targeted levies or fees are increasingly being adopted by governments to raise funds for green infrastructure, restoration, or related projects. For example, an interviewee discussed how their organization administers a drainage parcel tax that funds a drainage utility. The funds raised through this tax are sufficient to fund a variety of innovative stormwater and flood protection projects and studies. For this interviewee, resources was only a minor barrier to sustainable urban watershed management.

At the provincial level, the new *Water Sustainability Act* provides an excellent opportunity to procure resources to fund important watershed management initiatives—both at the local and provincial levels. For example, new groundwater fees enabled by the Act, if set at an adequate and sufficient rate, could fund more staff hours, monitoring programs, and other supports to make watershed management more robust and effective. Establishing new funding levers could put provincial investment in water management on par with provinces like Ontario and Alberta, which allocate notably more resources for this purpose.<sup>71</sup>

## 5. Accountability of provincial government

An issue that may be, in part, related to constrained resources is a perceived accountability gap of higher levels of government with regard to fulfilling their duties. This issue was brought up several times, unprompted, both in the survey and in the interviews. Although this trend was observed with regard to both the provincial and federal governments, participants more frequently named this as a provincial issue, likely because the Province is the lead jurisdiction for managing water resources in British Columbia. Participants noted how this perceived lack of accountability undermined local government efforts to protect and restore their watersheds. One survey respondent directly linked the idea of underwhelming enforcement efforts at the provincial level with being understaffed: “there are not enough enforcement officers allocated to protect water in a proactive manner. It has become a reactive system in response to calls, long after the damage is done.” Another noted that “the Province needs to better enforce existing water licenses (irrigation withdrawal and pumping back) as well as illegal [water] withdrawals. Many of our rivers do not flow in the summer due to oversubscription of the water. Water quality provision should also be better enforced when it comes to private land discharging into the receiving environment.” A third lamented “higher levels of government not enforcing their mandates ... [such as] water allocations (over allocating water for irrigation or not chasing illegal withdrawals), not enforcing riparian or fisheries infractions or pollution events.”



<sup>71</sup> Nowlan and Bakker (2007).

Two interview participants also brought up the issue of provincial accountability with regard to enforcing rules. One noted that “We [British Columbia] do actually have a good culture of rule-making. However, we have a poor track record of enforcement.” Another noted that enforcement was particularly underwhelming on crown land areas in the upper watersheds that provide source water for drinking. The interviewee noted that there are not enough Conservation Officers to adequately monitor threats to water quality (e.g. such as the use of motorized off-road vehicles in source water areas), which can have downstream effects.

## Towards Solutions

In this research, a strong desire was expressed for the Province to reinsert itself in watershed management after a perceived withdrawal from its duties. As discussed above, ensuring adequate resources are allotted to the Ministries of Environment and Forests, Lands, Natural Resource Operations and Rural Development for watershed management and enforcement was seen as an important step toward this. As one respondent of the Evergreen survey noted, “The province is mostly absent except as a regulatory body. [...] I believe the Province could be a valuable partner if we could bring them to the table.”

To build trust with local government and other community-based watershed actors, the Province could also renew its commitment to fulfilling its water management duties. One aspect where the Province could improve accountability is to prepare and release a “State of Our Waters” report, a commitment made in their 2008 Living Smart Water Plan. The Plan outlined the intention to release an initial report by 2012, and every five years after. To date, no such report has been released. Reporting is an important way to demonstrate transparency and a commitment to accountability, two cornerstones of good governance.<sup>72</sup>



<sup>72</sup> Brandes, Oliver M., and Deborah Curran. “Changing currents: A case study in the evolution of water law in Western Canada.” In S. Renzetti & D. Dupont [Eds.] *Water Policy and Governance in Canada*. Springer International Publishing. (2017).

## 6. (Un)collaborative decision-making

Because watershed boundaries cross jurisdictional boundaries, effective watershed management requires organized coordination between jurisdictions. In recent years, many jurisdictions have moved away from a strictly “top-down” approach toward a more collaborative, “bottom-up” approach to watershed management. One way in which this collaborative trend has manifested is through locally based watershed partnerships.<sup>73</sup> This sometimes involves the delegation of decision-making power from higher levels of government to the local level.

Across Canada, including in B.C., there has been an increasing trend toward delegating watershed decision-making to more local levels. However, there is no overarching policy or law that guides delegated watershed-level efforts and a lack of guidance on which level of government retains the authority to make water decisions.<sup>74</sup> Consequently, there is quite a bit of variation across the province with regard to what kind of watershed decision-making mechanisms exist and who is involved in decision-making. In some watersheds, there are watershed entities—although they vary in terms of their legal formality, mandates, human and financial resources. In other watersheds, there are no formal watershed entities, although there may exist multi-governmental committees that coordinate decision-making related to watershed issues.

A number of survey participants and interviewees attested to their frustration at the current mechanisms that exist for collaborative management in their watershed. One interviewee lamented how forums for collaborative decision-making in their watershed are very ad hoc, and that there is little capacity or political support. They noted how there was formerly a committee through which watershed-related decisions were made, but the provincial and federal governments stopped participating and the committee was dissolved. Another interviewee recounted a similar story of lack of participation from higher levels of government, however their committee continues to exist, largely to share information between departments in their organization.

Some participants noted how coordination is particularly important due to the nature of shared responsibilities for watershed management. One shared that “cities only have limited powers [and] DFO and MFLNRO need to step in and help at times. Also, some higher levels [are] allowed to do more than others, especially when large infrastructure projects are involved.” An interviewee noted how a stormwater project their organization was undertaking was derailed when, even though they had been coordinating with a section in the B.C. Ministry of the Environment, another section did not give final approvals right before the project was to go to construction. A lack of effective mechanisms for coordination within and between governments was named as an issue that ultimately creates more work for all involved.



<sup>73</sup> Koontz, Tomas M., and Jens Newig. “From Planning to Implementation: Top-Down and Bottom-Up Approaches for Collaborative Watershed Management.” *Policy Studies Journal* 42, no. 3 (2014).

<sup>74</sup> Ibid.



A further issue that was raised was that First Nations are often excluded from watershed decision-making, and that when they are included, it is often in a consultative—not collaborative—way. A participant lamented that First Nations participation in urban watershed decisions is often on the terms of colonial governments, and that issues are still primarily framed with Western values. They wrote:

*Our watershed issues tend to be focused on traditional European values: property protection, water for consumption, water for industry (economic opportunities), water for recreation, etc. First Nation heritage values are overlooked as municipalities do not feel it is their duty to consult and accommodate (and therefore will not pay for it) and leave it to the province, even if there is no trigger for this process. Issues related to all values should be identified.*

## Towards Solutions

Many participants expressed a desire for a provincial framework that offers sustained support for collaborative watershed decision-making. An *Evergreen* survey participant related that “a collaborative approach with as many partners as possible to provide diversity and expertise as well as sustain initiatives [over the] long term” was, in their view, an important step to increasing resilience and sustainability in urban watersheds. Three interviewees discussed how they thought watershed entities were the best way to facilitate collaborative decision-making. This suggestion is supported by recent B.C. research by the *POLIS Project on Ecological Governance* that indicates that some 85% of those working in watershed management and protection in B.C. agree that local watershed entities are necessary to implement the WSA to its fullest potential.<sup>75</sup> One interviewee discussed the potential of nesting bottom-up (e.g. watershed-scale entities) with top-down (e.g. a province-wide body) approaches to watershed decision-making. They suggested that a province-wide organization could facilitate the sharing of knowledge and resources with and between watershed entities. The aforementioned POLIS report demonstrated notable support for a “central, province-wide capacity-building organization for watershed governance,”<sup>76</sup> which could potentially fill this mandate.<sup>77</sup>

An interview participant noted the necessity of ensuring watershed entities enable collaboration between First Nations and other levels of government—an important step, they noted, to advancing reconciliation and moving beyond the centrality of colonial watershed decision-making. The recent example where Indigenous and non-Indigenous governments negotiated the *Mackenzie River Basin Bilateral Water Management Agreements* using a “collaborative consent” approach could serve as a model for structuring collaborative decision-making.<sup>78</sup>

<sup>75</sup> Brandes, Oliver, et al. *Illumination: Insights and perspectives for building effective watershed governance in BC. POLIS Project on Ecological Governance*. (2016).

<sup>76</sup> Ibid.

<sup>77</sup> Despite the promise of watershed entities, Bakker and Nowlan warn that research suggests watershed entities do not always lead to improved environmental outcomes. They identify setting clear parameters for collaborative processes, ensuring science is given sufficient weight in decision-making, and allotting adequate financial and human resource supports as important conditions for success. This sentiment is supported by the POLIS report, which indicates some 91% agree that long-term funding for watershed entities is desirable. One survey participant suggested that funding for collaborative watershed decision-making could be “funded through water fees from groundwater extraction operators.”

<sup>78</sup> Phare, M-A., Simms, R., Brandes, O.M., Miltenberger, M. Collaborative Consent and British Columbia's Water: Towards Watershed Co-Governance. POLIS Project on Ecological Governance and Centre for Indigenous Environmental Resources. (2017). Retrieved from: <http://poliswaterproject.org/polis-research-publication/collaborative-consent-british-columbias-water-towards-watershed-co-governance/>



Bioswales in a parking lot. Photo Credit: Green Communities Canada

## 7. Complex and fragmented water framework

Although the Water Sustainability Act is B.C.'s central piece of legislation governing the use and protection of water in the province, there are several other laws and regulations that apply to water management and affect what kind of decisions and activities can be taken. Among these are the *Drinking Water Protection Act*, the *Local Government Act*, the *Water Protection Act*, the *Dike Maintenance Act*, the *Environmental Management Act*, the *Forest Range and Practices Act*, the *Land Act*, the *Building Act* and more. All of these Acts and corresponding regulations enable authorities and set out requirements regarding issues that impact watershed management. Some of these Acts enable the creation of a variety of plans related to watershed management.<sup>79</sup>

Several survey and interview participants expressed concern about the complexity of this framework, and how provisions in some of these Acts hamper their ability to engage in sustainable watershed management. A survey participant commented about perceived conflicts of interest between different pieces of the legislation: "Regulations are often in conflict with water and the resource it is regulating, [for] example... [the *Forest Range Practices Act*], *Mining Act*, [and] Agriculture waste regulations." Other participants discussed how this framework provides often conflicting mandates for local governments. For example, a survey participant noted how "there are conflicting mandates for local governments to add source controls and enforce the [*B.C. Building Code*]," because the code requires infrastructure such as eavestroughs to be connected to storm drains, which undermines the ability of local governments to encourage infrastructure that infiltrates stormwater at the source.<sup>80</sup>

An interviewee expressed that they found the intersections between the *Dike Maintenance Act* and *Water Sustainability Act* confusing. They noted how the *Dike Management Act* is out of date, and does not appear to allow for green infrastructure along shores. They expressed the need to bring this Act up to date and to synchronize it with other legislation. A survey participant also related the need for synchronization between the authorities and requirements under different Acts. They asked: "How will Water Sustainability Plans intersect with Watershed Assessment & Response Plans? ... [L]ocal governments are already challenged to achieve regulatory requirements so these planning processes need to be coordinated to avoid duplication." An interview participant lamented how a Water Use Plan had recently expired and was no longer in effect, and wondered what would happen next.

<sup>79</sup> See Appendix C for a list of different kinds of water-related plans in B.C.

<sup>80</sup> A review of empirical studies on "lessons learned" from watershed partnerships noted that "adequate funding" was identified as the most important key to success. The second most important factor was participation by an effective leader or facilitator. See: Leach, William D., and Neil W. Pelkey. "Making watershed partnerships work: a review of the empirical literature." *Journal of water resources planning and management* 127.6 (2001).



*Downspout to permeable rocks. Photo Credit: Centre for Neighbourhood Technology. CC BY-SA-2.0*

## **Towards Solutions**

The fragmented nature of B.C.'s water framework further underlines the need for increased collaboration and cooperation between actors involved in watershed management. As noted above, a framework to facilitate consistent and sustainable collaborative watershed decision-making across the province could be particularly useful in furthering this goal. Sustainable funding is key to ensuring the success of delegated watershed decision-making.

Additionally, guidance materials that outline authorities and responsibilities of different levels of governments, current legal and policy tools that impact watershed management, clarification on how and when tools are employed and which take legal precedence could lend significant clarity to the complex watershed management framework. Developing new tools that take legal precedence over other enactments could ensure that watershed protection is not sidelined by stipulations in other natural resource legislation. New tools could recognize and build upon previous watershed planning processes undertaken at the local level.

## 4. LEVERAGING THE WATER SUSTAINABILITY ACT

### 4.1 Leverage Points

*The Water Sustainability Act (WSA)* presents a timely opportunity to address some of the environmental and management challenges discussed above. Local governments have many tools at their disposal, and it is possible for local governments to address some of the issues above without the additional supports potentially offered by the WSA. Local governments should increase their understanding of what can be accomplished within their purview and take action accordingly. However, given that provincial staff are currently developing regulations, policies, and programs to support implementation of the Act, there exists a rare opportunity to improve watershed management across B.C. Local governments should seize this opportunity by asking the Province to develop tools that address challenges to urban watershed sustainability.

The Act largely enables powers pertaining to the licensing and allocation of water resources, but there are some areas in the Act that also pertain to water quality and ecological health. Some of these areas could also be leveraged to address the environmental and management barriers discussed above and offer support for effective management for urban watershed sustainability in B.C. We have identified the following areas of the Act as priority areas for further development:

- Provisions that enable the consideration of water in land-use decisions, in particular Water Objectives (enabled in section 43 of the Act) and Water Sustainability Plans (enabled in Division 4);
- Provisions that enable delegated decision-making, in particular section 126 (“Regulations respecting administration and governance”) and Division 4;
- Provisions that enable the appropriation of fees and charges, which could be channeled for financial support for watershed management, in particular section 118;
- Provisions that protect environmental uses of water, in particular section 15 (“Environmental flow needs”) and sections 86-88 (“Declarations of significant water shortage”, “Critical environmental flow protection orders”, and “Fish population protection orders”); and
- Provisions that enable reporting and monitoring requirements for water users, as laid out in sections 15, 17 (“Sensitive streams mitigation”), 23 (“Thirty-year review of licence terms and conditions”), 30 (“Beneficial use”) and 131 (“Regulations respecting measuring, testing and reporting”) of the Act.

There are more areas of the Act that could pertain to and have ramifications for urban watershed management, however, we have focused on areas where we think there are the most obvious opportunities to address the environmental and management challenges identified in this report.

## 4.2 Recommendations for the Water Sustainability Act in support of urban watershed management

In section 3, we outlined management challenges that impede urban watershed sustainability and potential interventions that could mitigate those challenges. The recommendations below build on the ideas contained in the “solutions boxes” in section 3 by suggesting ways the Water Sustainability Act could support—either through regulatory, policy or funding levers—decision-makers to surpass those challenges. We also suggest some implicit areas for potential development that are related to but beyond the specific authority set out in Act. We suggest that, should these recommendations go forward, local governments would be in an improved position to make decisions that protect and improve the health of urban watersheds in the province. **Therefore, we suggest that local governments advocate to the Province to take the actions listed below when developing aspects of the Act.**

### 4.2.1 Connecting land and water through Water Objectives

**Management challenges potentially addressed: *voluntary vs. mandated protections, long-term watershed planning vs. short term political cycles, piecemeal approach, fragmented water framework.***

5. Develop regulations that use performance-based criteria to establish objectives for water quality, quantity and ecosystem health
  - a) Involve local governments and First Nations to identify values and desired outcomes to inform these objectives
  - b) Give legal precedence to Water Objectives despite any other enactment
  - c) Make Water Objectives applicable to all waters across the province, but allow for flexibility and customization at the watershed level
  - d) Ensure objectives are specific enough to operationalize and develop criteria for evaluation
  - e) Ensure objectives apply to all activities in the watershed that impact watershed health
  - f) Incorporate parameters from existing Ambient Water Quality Objectives into Water Objectives
  - g) Include objectives related to most common contaminants of emerging concern
  - h) Require all relevant decision-makers to consider objectives when issuing water licenses, permits or other authorizations that may impact watershed health
  - i) iSupport local governments to ensure Water Objectives are integrated into local planning processes (Official Community Plans, Regional Growth Strategies, liquid waste and stormwater management plans, etc.)
  - j) Give a timeframe for compliance that spurs action but is realistic and achievable (e.g. five years)

- k) Ensure adequate supports are available for local governments to be able to act on Water Objectives (see: Section 4.2.3 for recommended ways to strengthen supports)
6. Develop Water Objectives to apply to urbanized watersheds
    - a) Trigger funding for restoration/retrofits, where necessary to meet objective (see 4.2.3 for suggested funding source)
    - b) Enshrine minimum run-off control targets in regulation
    - c) Develop infiltration objectives for aquifers connected to surfaces waters
    - d) Identify how Water Objectives can be linked to green infrastructure and support funding request for capital grants
  7. Monitor and review Water Objectives
    - a) Delegate authority to a third-party entity (see recommendation 10) to review and report on objectives every five years to ensure consistency in implementation and enable evaluation of program outcomes
    - b) Include specific indicators relevant to urban watersheds, such as changes in impervious surfaces and adoption of green infrastructure
    - c) Include highlights of monitoring in *State of Our Waters* report (see section 4.2.5)

#### 4.2.2. Improving coordination and transparency in watershed decision-making

**Management challenges potentially addressed: *Long-term watershed planning vs. short term political cycles, piecemeal approach, lack of resources to support on-the-ground work, fragmented water framework, (un)collaborative decision-making***

8. Develop guidance and processes for local governments on how watershed decision-making will be affected by implementation of the *Water Sustainability Act*
  - a) Outline how requirements and programs under the Act will intersect with other legislation, policies and programs
  - b) Indicate processes for coordination between different levels of government
  - c) Develop and communicate a clear outreach strategy that (i) outlines the process for engaging local government on regulatory development, and (ii) includes timelines and processes for regular implementation updates
  - d) Adopt a structured decision-making process for provincial water-related decisions to increase consistency and transparency and communicate this process clearly to different levels of government and stakeholders
9. Establish a third-party, capacity-building entity to coordinate and facilitate knowledge transfer within and between different levels of government
  - a) Ensure local governments are meaningfully involved
  - b) Involve First Nations in a co-governance role
  - c) Ensure adequate and sustained funding is available (see section 4.2.3.)
  - d) Include a framework that ensures consideration of science and traditional ecological knowledge in decision-making

- e) Consider integrating structured decision-making processes into pilots
  - f) Draw from these pilots to develop a strategy that outlines consistent parameters for the creation and operation of watershed entities across the province
10. Establish a third-party, capacity-building entity to coordinate and facilitate knowledge transfer within and between watershed entities and different levels of government
- a) Include participation from different levels of government in the governance of this entity
  - b) Allow this entity to oversee the delivery of Division 4 (Water sustainability plans) and monitoring and evaluation related to Water Objectives (see recommendation 3)
11. When Water Sustainability Plans are designated, ensure plans consider and incorporate the efforts of previous watershed planning efforts (e.g. Watershed Assessment & Response Plans, Water Use Plans, etc.) and local government Community Plans and bylaws.
- a) Require Water Sustainability Plans to “meet or beat” watershed health objectives detailed in Water Objectives

### 4.2.3. Securing adequate funds for watershed management

**Management challenges potentially addressed: *lack of resources to support on-the-ground work, accountability of provincial government, (un)collaborative decision-making***

12. Review the current fees and rates structure set out in the *Water Sustainability Fees, Charges and Rentals Regulation* to determine:
- a) Whether the current structure is able to adequately fund provincial responsibilities and commitments related to watershed management, including enforcement duties
  - b) Whether the current structure reflects the value of water resources, promotes conservation and drives technological innovation
  - c) Assess how the current rate structure could be altered to raise revenue for a Water Sustainability Fund that would dedicated ongoing funding for watershed management, including watershed entities and other water stewardship efforts
  - d) Alter water rates, if necessary, to adequately fund provincial responsibilities and commitments, and support the creation of a Water Sustainability Fund
13. Work with a Sustainable Funding Taskforce to explore and test implementation of other sustainable funding mechanisms for watershed management at the provincial and watershed level, such as increasing revenue from local tax bases, Crown resource rentals, etc.
- a) Ensure funding sources do not compromise or potentially lead to a conflict of interest between revenue and watershed health objectives
  - b) Work with Infrastructure Canada to streamline infrastructure stimulus spending to green infrastructure projects and urban retrofits

#### 4.2.4 Ensuring water is protected for nature

**Management challenges potentially addressed: *Long-term watershed planning vs. short term political cycles, piecemeal approach***

14. Establish legally enforceable regulations to protect environmental flows
  - a) Base these regulations on a presumptive provincial standard
  - b) Require Water Sustainability Plans for watersheds that do not meet the presumptive standard
  - c) In collaboration with local government and First Nations, establish the aquatic values to be included in the decision-making process for the consideration of Environmental Flows Needs
  
15. Develop an Environmental Flows Taskforce with participation of local government, First Nations, and the federal government to establish whether existing water allocations are sustainable
  - a) Identify streams of concern where environmental flows or critical environmental flows are threatened and review how licenses are affecting flow regimes
  - b) Identify which groundwater licenses could be connected to streams and work with partners to develop transition strategies for those licenses
  - c) Conduct actions to reduce withdrawal volumes if necessary
  - d) Determine whether additional streams should be designated as “sensitive” per section 128 of the Act

#### 4.2.5 Monitoring and reporting on watershed health

**Management challenges potentially addressed: *Accountability of provincial government, (un)collaborative decision-making***

16. Identify opportunities to coordinate and streamline water data from different monitoring operations to enhance knowledge-sharing and reduce duplication of efforts
  - a) Create a centralized data hub that houses data from monitoring operations by different levels of government
  - b) Enable data collected from citizen science and community-based water monitoring operations to be included in this hub
  - c) Make hub accessible to staff and decision-makers at all levels of government
  
17. Require all water users to monitor water withdrawals and report their use to government
  - a) Include this information in data hub
  - b) Spatialize data by creating a map layer with coordinates of all “points of diversion” associated with withdrawals
  - c) Phase this requirement in over five years, starting with water scarce basins
  
18. Compile a summary of water data into a State of Our Waters report, a publicly accessible report issued every five years



- a) Include information pertaining to water use (as in recommendation 12), Water Objectives (as in recommendation 3), and enforcement actions taken by the provincial government under the authority of the Act

### 4.3. Practitioner feedback on recommendations

At the *Water Sustainability & the City forum* in October of 2017, approximately 50 individuals whose work is relevant to urban watershed management gathered to assess these recommendations and to learn from the collective knowledge of attendees. Participants included planners, engineers, watershed managers, environmental technicians, researchers, policy analysts, environmental education specialists and more from B.C. municipalities, regional districts, First Nations, the Provincial government, non-profit organizations and academic institutions.

After presenting a summary of the findings contained in this report, participants took an hour to discuss the recommendations in small groups. They were asked to consider whether they supported the recommendations, what kind of supports might be needed should these recommendations be implemented, and what role they would like to see different organizations play in the continued development of the *Water Sustainability Act*. We assessed this feedback, and grouped input into major themes, detailed below. It should be noted that this input, although revealing, does not constitute official consultation on matters related to the development or implementation of the Act and should not be construed as such.

#### 4.3.1 Reiterating the need for resources

There was strong support in the group for the recommendations pertaining to “securing adequate funds for watershed management” (section 4.2.3). Participants identified adequate funding as an overarching issue that fed into the successful implementation of other aspects of the Act. They noted that funding was an important factor in ensuring the participation of different groups in collaborative watershed decision-making and in the successful implementation of Water Objectives. Participants also noted the importance of increased funding to support First Nations in responding to consultation requests and process applications. One group wondered whether funding from increased license fees would be channeled only into provincial operations, and noted that a watershed fund that could provide resources at the local level could be desirable.

#### 4.3.2 Collaboration and sharing of responsibility

Participants reiterated the need for collaboration from multiple levels of government, and reinforced the idea that effective urban watershed management required the Province to resume an active role in local watershed management, particularly with regard to monitoring activities and enforcement of rules and violations. They also noted the importance of the Province supporting collaborative watershed decision-making—as opposed to facilitating pilot projects and stepping back from involvement in that process. Participants noted how creating information infrastructure for sharing water data across jurisdictions was an important step forward to collaborative decision-making.

Municipalities voiced the need for shared risk and liability because they are the ones that are charged with reconciling on-the-ground activities with regulatory requirements, and bear consequences when and if these come into conflict with each other. Participants also indicated the need to involve senior local government decision-makers in collaborative watershed processes, as this gives greater legitimacy to the process.

First Nations participants spoke about the need to be involved in decision-making earlier on in the process—for example, being included in how decisions are made as opposed to being consulted after a course of action has already been proposed. Some felt that input from consultation, as it currently happens, is not meaningfully integrated into decisions. There was also a concern that First Nations voices were not acknowledged within the Act itself. For example, the “First In Time, First In Right” approach to water licenses does not recognize traditional uses of water.

### 4.3.3 Clarity and direction

Participants emphasized the need for clarity and direction from the Province as the WSA continues to be rolled out. Many were unclear of how the Act would apply in urban watersheds and how it could affect local operations. They wondered if and how regulations like Water Objectives would take legal precedence over other legislation and what that would mean in practice. There was a desire for future regulations and planning efforts to build upon previous efforts and knowledge (for example, *Integrated Stormwater Management Plans* that have been adopted by Metro Vancouver municipalities).

Forum participants also indicated a desire for clear communication on processes for decision-making. For example, one group noted how actions related to “emergency works” did not require consultation, but it was not clear what constituted an “emergency.”

### 4.3.3 Investing in education

Finally, participants highlighted the need for education in order to ensure implementation of the Act and its regulatory requirements are successful. They noted a need for education geared both toward the broader public, but also for frontline staff and decision-makers within local governments. Some attendees noted that many staff in their organizations do not have a strong understanding of provincial and federal requirements with regard to decisions that affect watersheds. Others noted that a broad, public education strategy is necessary to engage constituencies in conversations about the value of freshwater and the necessity of action to protect it—which may sometimes include how tradeoffs between environmental protection and human uses.



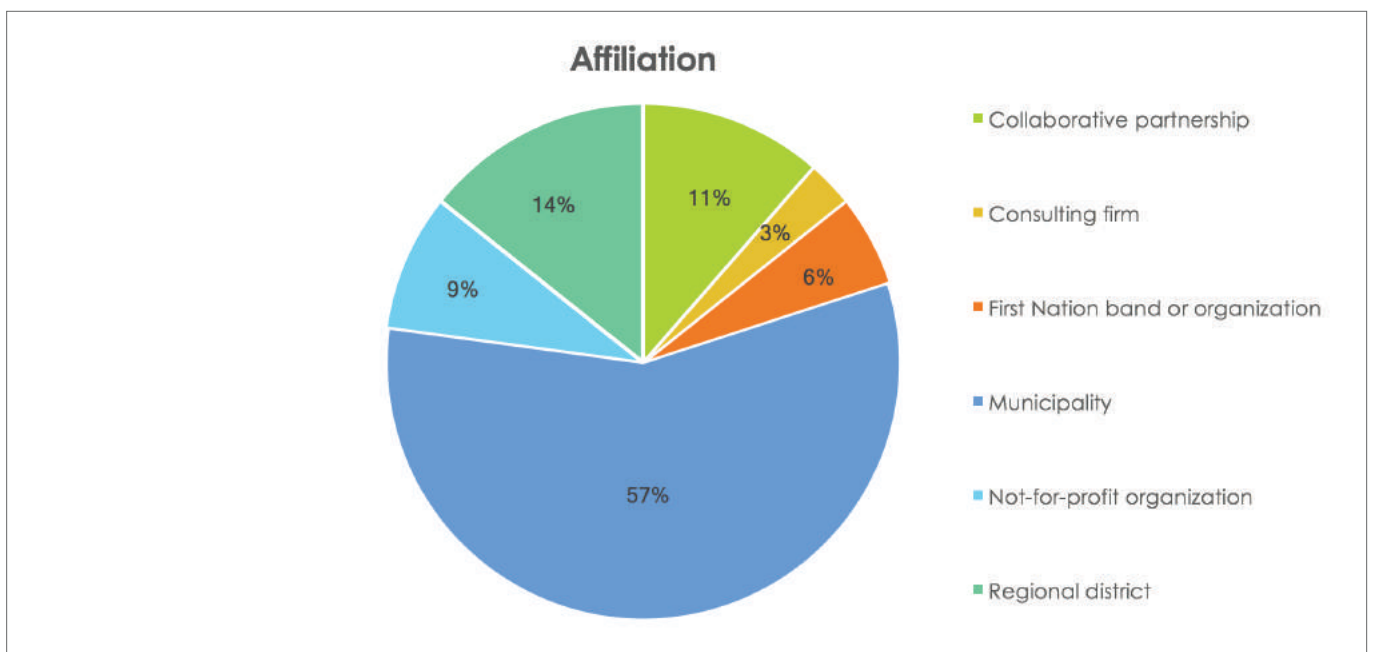
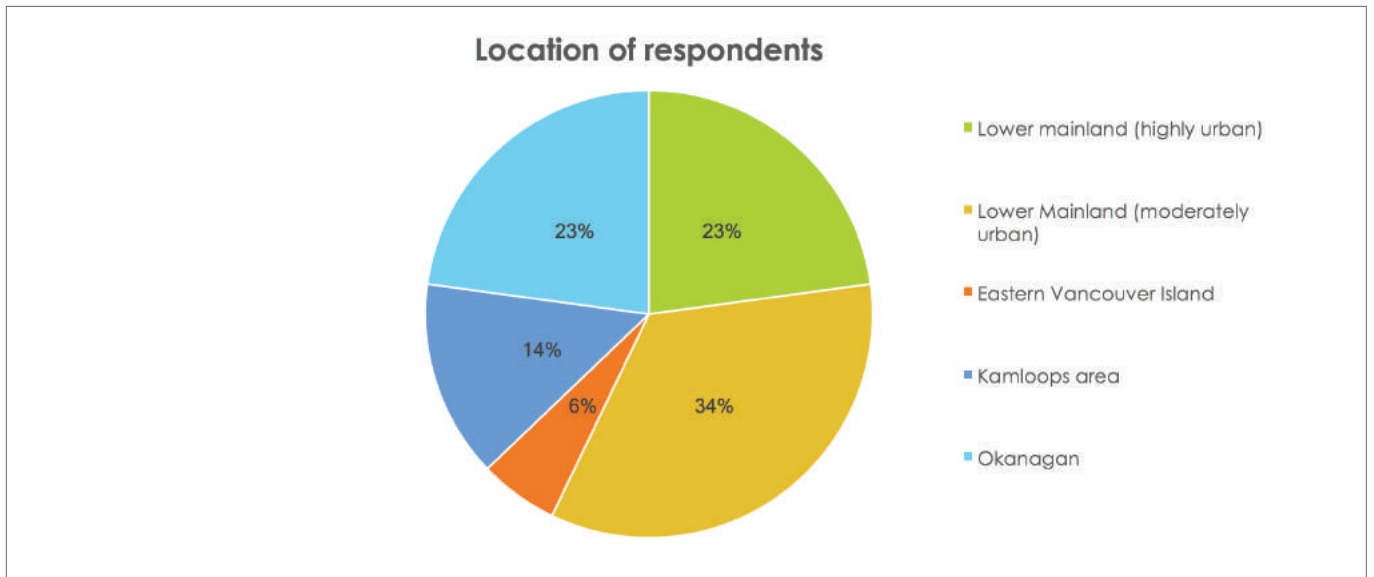
*Streetside rain garden. Photo Credit/ Green Communities Canada*

## 5. CONCLUSION

Urban watersheds in British Columbia provide essential services to the millions of residents that live in them, as well as to the ecosystems that depend on them. However, these watersheds are under stress. As populations grow and the impacts of climate change become more apparent, these stresses will intensify. Local governments have responsibilities and authority to protect watershed health within their boundaries for the wellbeing of their constituents. However, a number of watershed managers working for local governments have expressed concern about the health of their watersheds. They have identified challenges that hamper their ability to mitigate and reverse the pressures that give rise to watershed degradation.

The new *Water Sustainability Act* provides an opportunity to address some of these environmental and management challenges. The Act enables the provincial government to take action in a number of areas to strengthen watershed management at both the provincial and local level. This research has suggested that, if the opportunity is effectively seized, such action could engender important steps to harmonizing the water management framework in British Columbia, minimizing the impacts of land-use activities on watershed health, improving coordination in decision-making, securing adequate funds for watershed management, ensuring water is protected for nature, and establishing a robust monitoring and reporting program—actions that could go a long way to address challenges that hinder local governments in sustainably managing urban watersheds.

# APPENDIX A – Demographics of Survey Respondents



## APPENDIX B – On Watershed Sustainability

If watershed sustainability entails water systems that are able to meet the needs of current generations without compromising those of future generations, then it follows that a sustainable system is one where the current generation:

- (i) consumes renewable resources at a rate less than the rate at which they are renewed;
- (ii) consumes non-renewable resources at a rate less than the rate at which substitutes can be found; and
- (iii) emits pollution at a rate less than the capacity of the environment to absorb the pollutants.<sup>81</sup>

Needs vary between watersheds. They may include human health, economic, social, cultural and ecological needs. Water systems must maintain their ecological and hydrological integrity in order to provide water quantities and qualities that allows for these needs to be met. Ensuring sustainable watersheds requires preventing degradation so that they are able to renew themselves and sustain the various practices that contribute to human (and non-human) well-being. However, it may not be enough to prevent degradation as watershed functions may already be degraded in ways that compromise their integrity. In addition to preserving the ecological and hydrological integrity of water systems, watershed sustainability may also require enhancing the capacity of watersheds to provide quantities and qualities that meet human and ecological needs. Although pristine, pre-development states are all but impossible in urbanized watersheds, there are many actions that can be taken to bring urban watersheds to as natural a water balance as possible, and encourage high quality water for human and ecological health.<sup>82</sup>

This view of sustainability implies that prudent planning and management is necessary in order to ensure that current needs do not compromise the ability of water systems to provide for future needs. Watershed planners and managers must understand and account for how watershed processes function over space and time, and how human needs and activities impact these functions. Of course, what the future holds and how future social, economic and environmental circumstances will impact the needs of generations to come is uncertain. We do know with some certainty that climate change and population growth is expected to put more strain on watersheds, but exactly how the impacts will be borne out are unclear.<sup>83</sup> Therefore, planning for sustainable watersheds will involve taking into account uncertainty. A guiding principle here is to interfere as little as possible with watershed functioning, in order to maintain options for future generations. This may involve tradeoffs, such as costs associated with preserving or enhancing watersheds, or reduction of the immediate benefits of current generations.<sup>84</sup>

  
<sup>81</sup> Daly, Herman E. *Steady-state economics*. Island Press. (1991).

<sup>82</sup> Loucks, Daniel P. "Sustainable water resources management." *Water international* 25.1 (2000).

<sup>83</sup> See for example McDonald, Robert I., et al. "Urban growth, climate change, and freshwater availability." *Proceedings of the National Academy of Sciences* 108.15 (2011) and McDonald, Robert I., et al. "Urban growth, climate change, and freshwater availability." *Proceedings of the National Academy of Sciences* 108.15 (2011).

<sup>84</sup> Loucks, D.P. (2000).

Sustainable watershed planning and management require not just commitments to maintaining watersheds in healthy conditions, but also the resources to achieve plans. This includes both financial resources and human resource capacity—including investment in capacity building. This will be further enabled by increased integration and coordination between a multiplicity of individuals and organizations whose activities affect or are affected by watershed sustainability, as well as an involved and supportive public who are aware of the necessity of planning for watershed sustainability and its associated tradeoffs.

It should be noted that the above discussion does not explicitly incorporate or acknowledge Indigenous worldviews. Although aspects of this discussion imply a connectedness between humans and their environment and humans to each other, the idea that “everything is profoundly connected” is a cornerstone of many Indigenous philosophies of sustainability.<sup>85</sup> It is beyond the scope of this paper to attempt to reconcile Western perspectives on sustainability with Indigenous perspectives. However, such work could lend richness and depth to future work related to operationalizing and implementing sustainability planning in B.C. and elsewhere.



<sup>85</sup> Hall, David Edward. Sustainability from the perspectives of indigenous leaders in the bioregion defined by the Pacific Salmon runs of North America. Portland State University (2008).

# APPENDIX C – Environmental Toolkits and Guides

## Climate Change

1. [Adapting to Climate Change: A Risk-based Guide for Local Governments](#), 2010 (Natural Resources Canada and the Institute for Catastrophic Loss Reduction)
2. [BC Climate Action Toolkit](#) (UBCM, Green Communities Canada, Fraser Basin Council)
3. [Changing Climate, Changing Communities: Guide and Workbook for Municipal Climate Adaptation](#), 2014 (ICLEI Local Governments for Sustainability)
4. [Creating Complete, Compact and Energy-Efficient Communities in BC: How Fiscal tools can be an Opportunity for Local Governments](#), 2015 (Sustainable Prosperity)
5. [Official Community Plans Supporting Climate Resilience](#), 2015 (Columbia Basin Trust)
6. [Preparing for Climate Change: An Implementation Guide for Local Governments in BC](#), 2012 (West Coast Environmental Law)
7. [Retooling for Climate Change](#) (Fraser Basin Council)

## Green Community Planning

8. [Connecting the Dots: Regional Green Infrastructure Network Resource Guide](#), 2013 (Metro Vancouver)
9. [Develop with Care 2014: Environmental Guidelines for Urban and Rural Land Development in British Columbia](#), 2014 (BC Ministry of Environment)
10. [Green Bylaws Toolkit for Conserving Sensitive Ecosystems and Green Infrastructure](#), 2016 (Deborah Curran and Company)
11. [Economic Rationale for Integrated Stormwater Management 2006](#) (UBC, funded by BC MOE)
12. [A Guide to Green Choices: Ideas & Practical Advice of Land Use Decisions in British Columbia Communities](#), 2008 (Ministry of Community, Sport and Cultural Development)
13. [The Green Infrastructure Guide](#), 2007 (West Coast Environmental Law)
14. [Greening Shorelines to Enhance Resilience](#), 2014 (Stewardship Centre for British Columbia)
15. [Smart Planning for Communities](#) (Fraser Basin Council)
16. [Topsoil Bylaws Toolkit](#), 2012 (Okanagan Basin Water Board)

## Watershed Management

17. "Beyond the Guidebook" documents (produced by the Partnership for Water Sustainability in BC)
18. [Climate Change Adaptation and Water Governance: Summary for Decision-Makers](#), 2011 (Adaption to Climate Change Team, Simon Fraser University)aa
19. [From Rain to Resource: Managing Stormwater in a Changing Climate](#), 2010 (Okanagan Basin Water Board and the BC Water and Waste Association)
20. [Groundwater Bylaws Toolkit](#), 2009 (Okanagan Basin Water Board)
21. Peeling Back the Pavement, 2011 (POLIS Project on Ecological Governance)
22. [Rethinking our Water Ways](#), 2011 (Fraser Basin Council)
23. [Thinking Beyond Pipes and Pumps: Top 10 Ways Communities Can Save Water and Money](#), 2006 (POLIS Project on Ecological Governance)
24. [Soak It Up! Toolkit](#), 2016 (Green Communities Canada)
25. [Standards and Best Practices for Instream Works: Urban Stormwater Management](#), 2008 (BC MOE and DFO)
26. [Stormwater Planning: A Guidebook for British Columbia, 2002](#) (Government of BC)
27. [Tools for Climate Change Vulnerability Assessments for Watersheds](#), 2013 (Canadian Council of Minister of the Environment)
28. [Water Conservation Planning Guide for British Columbia](#), 2009 (POLIS Project on Ecological Governance)



# APPENDIX D – Types of Water Plans in B.C.<sup>85</sup>

## PLANS TO ADDRESS WATER QUANTITY CONCERNS

### Drought Management Plans

Drought management plans are typically developed at the community or regional scale. They focus on managing demand, reducing consumption and improving efficiency of water use, with an emphasis on reducing water demand and addressing extreme circumstances associated with drought. Drought management plans develop specific responses to these drought stages and triggers (e.g., limiting lawn watering if a reservoir drops to a specified level).<sup>86</sup>

### Water Allocation Plans

Water Allocation Plans are considered regional policy, and the Ministry of Forests, Lands and Natural Resource Operations uses these plans while exercising its authority (e.g. issuing water licenses) under the *Water Act*. The plans are operational tools developed and used by the Ministry to help determine the quantity of water required in a watershed to protect ecosystem health, and the quantity of water available to be allocated for human use.

### Water Conservation Plans

Water conservation plans focus on managing water demand, reducing consumption, and improving efficiency of water use. These plans extend beyond household water savings to include industrial, commercial, institutional and agricultural water users. Local governments in BC are now required to have water conservation plans to be eligible for provincial capital grant funding for drinking water and wastewater infrastructure.

### Water Use Plans

The Comptroller of Water Rights or other appropriate authorities under the Water Act may require that a WUP be prepared for any existing licence. Expected priorities for the completion of plans are power developments, municipal water systems, and larger-scale industrial operations. For the most part, WUPs have been associated with waterpower licences that are held by BC Hydro. WUPs may also be required for other water control facilities where there is an undesirable effect on fish, aquatic habitat, or other important values. While WUPs for existing licences may be required as needs are identified, plans may also be required as a condition of proponents seeking new licences for larger-scale operations (industrial, agricultural, municipal, or other facilities), or for works located on particularly valuable or sensitive streams.



<sup>85</sup> Content in this appendix was adapted from the Fraser Basin Council's 2011 document Rethinking our Water Ways.

<sup>86</sup> Metro Vancouver has a "Water Shortage Response Plan" (see <http://www.metrovancouver.org/services/water/WaterPublications/WaterShortageResponsePlanFeb2016.pdf>) which may trigger actions set out in local bylaws, such as the Surrey Water Shortage Response by-law (see: [http://www.surrey.ca/bylawsandcouncillibrary/BYL\\_reg\\_15454.pdf](http://www.surrey.ca/bylawsandcouncillibrary/BYL_reg_15454.pdf)).

## PLANS TO ADDRESS WATER QUALITY CONCERNS

### Drinking Water Protection Plans

Drinking Water Protection Plans (DWPPs) are designed to protect water quality and quantity from a wide range of pressures. The plans are typically developed for a specific source of drinking water supply, such as a watercourse, watershed, reservoir or aquifer. Part 5 of the *Drinking Water Protection Act* outlines the requirements to designate an area for a Drinking Water Protection Plan, the plan authority, and the planning and implementation process. The decision whether to initiate a DWPP is one for the Minister to make. As of 2011, no DWPPs had been completed or designated in BC. They are considered to be a last resort because of the stringent requirements associated with them, and should only be considered where it can be established that regulatory tools are required to achieve the planning objectives.

### Watershed Response & Assessment Plans

Under Part 3 of the *Drinking Water Protection Act*, a drinking water protection officer may order a water supplier to complete a water source and system assessment. The purpose of the assessment is to:

- assess the drinking water source in relation to land uses within the watershed and activities that may affect the source;
- inventory the water supply system, including treatment options and operational procedures;
- assess the monitoring requirements for the drinking water source and water supply system; and
- identify current and potential future threats to drinking water.

### Well Protection Plans

Well protection plans are based on a toolkit developed jointly by Province of BC, Environment Canada and BC Groundwater Association. The plans may be required by:

- Health authorities when they review an operating permit for a large drinking water system that includes wells;
- The provincial government as a condition of granting infrastructure funding for new municipal/regional district wells; and,
- As a condition of a provincial environmental assessment for proposed large withdrawals.

## PLANS TO FACILITATE INTEGRATED WATERSHED MANAGEMENT

### Water Management Plans (WMP)

Part 4 of the old *Water Act* specified that the Province may issue an Order for a Water Management Plan to be created to address concerns in a watershed. The Township of Langley was the first and only local government to develop a WMP due to significant concerns regarding contamination of the town's aquifer. However, the plan has not been brought into force and many activities outlined in the plan have not been implemented.

### Watershed Plans

Watershed Plans assess the state of a watershed and presents detailed management information in terms of analyses, actions, participants and resources required for developing and implementing the plan. BC has no formal requirements or stipulations for undertaking watershed planning processes beyond the provisions under the *Water Act* to develop a WMP, with approval from the provincial government.

### Integrated Stormwater Management Plans (ISMPs)

Metro Vancouver's member municipalities ISMPs have collectively agreed to develop and implement ISMPs in accordance with the Integrated Liquid Waste and Resource Management Plan. They apply to watersheds that are 20% developed or more.