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How Crown laws and policy normalize cumulative harm to salmon watersheds in British Columbia: A Case Study

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In many salmon watersheds in BC, the freshwater and estuarine regions that are vital for spawning and rearing have been severely and harmfully altered through the “death by a thousand cuts” of modern urban and industrial activities and climate change.

We gratefully acknowledge funding that contributed to this work, noting that the analysis and findings in this report represent the views of West Coast Environmental Law Association.





Executive Summary

CONTEXT

Since time out of mind, the Pacific salmon have been of central cultural, social, and economic importance to coastal and interior peoples and communities. Ecologically, salmon are keystone species. Salmon have a complex lifecycle, relying on freshwater, estuarine and marine environments at different times in their lives, and thus may encounter many different stressors. In British Columbia, salmon-bearing systems have been stewarded for abundance by First Nations for millennia. In the colonial period, the economic importance of salmon has been recognized and exploited, but without reciprocal protection in law and policy to maintain wild salmon populations. Today, wild salmon populations in BC are in a perilous state. In many salmon watersheds in BC, the freshwater and estuarine regions that are vital for spawning and rearing have been severely and harmfully altered through the “death by a thousand cuts” of modern urban and industrial activities, and now climate change. Addressing ongoing and historical cumulative effects in these ecosystems is a key component of salmon stewardship, and understanding the shortcomings of existing Crown law and policy is needed to inform action going forward.

SCOPE OF EVALUATION

Behind every cumulative effect in a watershed – for example, diminished water quality, damaged stream channels, inadequate flows, loss of riparian habitat, and barriers to fish passage – are human decisions and actions. The decisions that allowed the cumulative effects are not easily visible, resulting from a complex combination of laws and policies that are primarily designed to facilitate resource extraction and development, not to protect salmon and their watersheds. To help unpack this complexity, this report focuses on one sub-set of decisions and impacts: single and cumulative effects from stream crossing and stream-spanning structures as regulated and managed by federal and provincial Crown authorities in public highway construction, forestry, and flood management activities. These impacts are discrete and localized, but extremely common across

BC salmon-bearing watersheds; they are known to be harmful for salmon, and yet still allowed to occur. This report looks at existing laws and policies for managing these activities, and evaluates the effectiveness and suitability of those laws and policies to manage single and cumulative impacts.

FINDINGS

The evaluation used a methodology in which the efficacy of law and policy tools was evaluated against five criteria, including: limiting harm from a single instance of an activity, controlling the accumulation of harm over time from multiple instances of an activity, controlling the accumulation of harm over space; enabling active management; and enabling enforcement. Key results were:

- harm to salmon habitats caused by stream crossings and stream-spanning structures is legally permissible and normalized in Crown laws and policy as an implicit but not clearly defined trade-off between harm to salmon and other socio-economic values embedded in the Crown legal system;
- the regulatory tools evaluated were primarily designed to facilitate **new** activities related to resource extraction and human occupation of the land, without reference to historical baselines, or tracking of past harms, thus furthering the accumulation of harm to habitats over time;
- the regulatory tools did not provide legal support for responsibility for salmon system restoration where harms had accumulated;
- the Crown legal framework has multiple laws and jurisdictions that apply to a single type of impact caused by different activities, detrimentally operating in isolation from each other, in contrast to the interconnected nature of salmon systems where they apply.

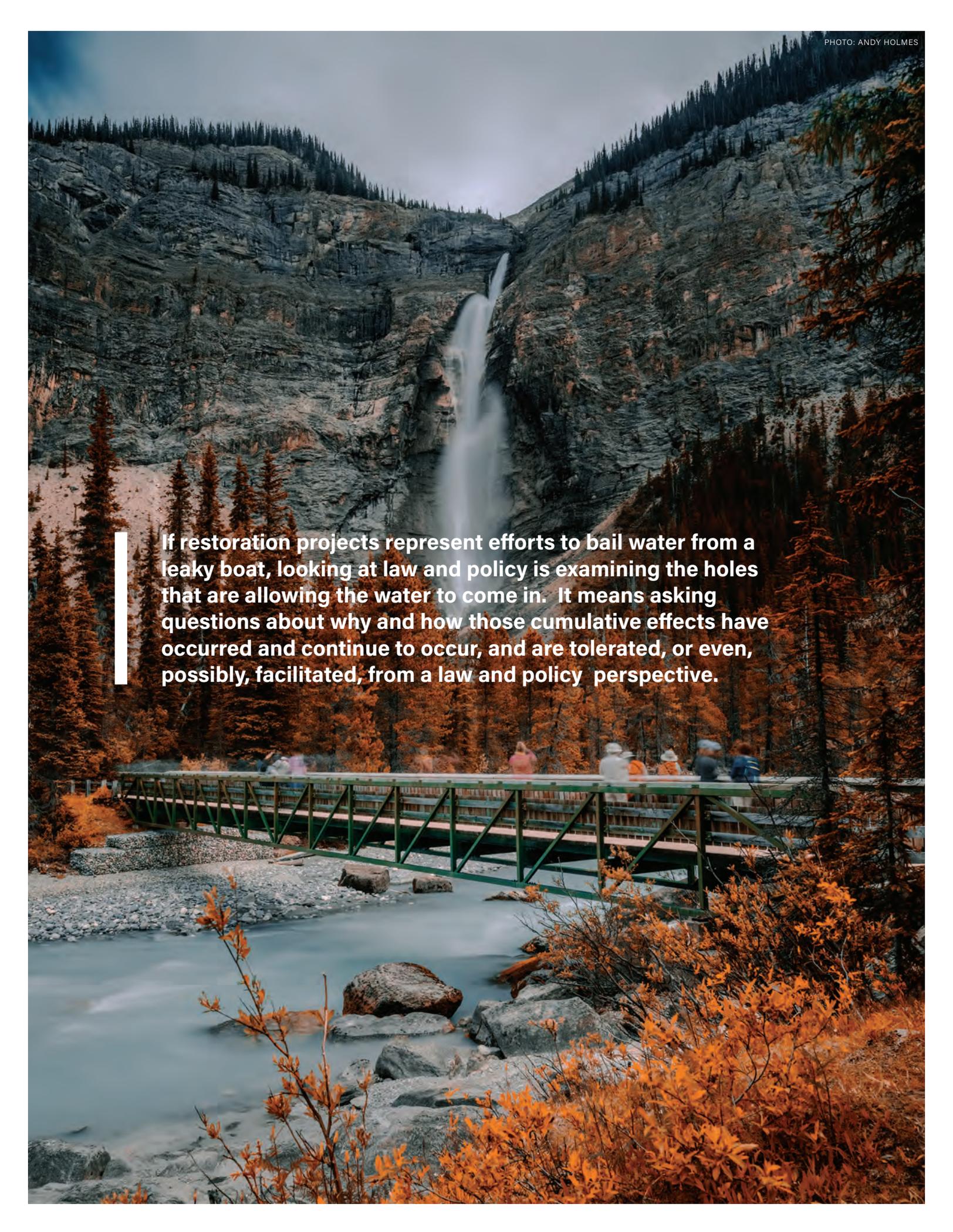
RECOMMENDATIONS

If wild salmon conservation and restoration is a priority, then action is urgently needed to address cumulative effects in salmon watersheds and the regulation of human activities. **Our review demonstrates that BC and federal governments need to re-tool Crown regulations and regulatory processes that currently enable harm to salmon.** Drawing from this case study of the regulation of stream crossings and barriers, we make the following recommendations:

- 1** Introduce considerations of cumulative effects from Crown permitting and regulatory practices into regulatory review and development processes, beginning with attention to the regulation of activities that are known to cause specific impacts/stressors. There is already a legislated requirement to consider cumulative effects in the development of regulations to protect fish and fish habitat in the federal *Fisheries Act*.
- 2** Create, in collaboration with Indigenous nations, a framework for Indigenous-led or co-managed authorities to set standards/objectives/limits and monitor ecosystem health from a salmon perspective, likely operating at a watershed scale, in order to counter systemic, legalized, and normalized harm in salmon watersheds associated with Crown laws and policies.
- 3** Encourage and facilitate respectful and complementary collaboration between Indigenous and settler scientists, knowledge holders, law and policy specialists, and professionals to identify salmon cumulative effects that need to be managed, and ways to manage them.
- 4** Invest in Indigenous-led and co-managed initiatives across BC to manage complexity and the uniqueness of regional/local systems by implementing place-based, watershed-scale management and regulation.

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If restoration projects represent efforts to bail water from a leaky boat, looking at law and policy is examining the holes that are allowing the water to come in. It means asking questions about why and how those cumulative effects have occurred and continue to occur, and are tolerated, or even, possibly, facilitated, from a law and policy perspective.



Introduction

For many salmon watersheds in BC, declining ecosystem health is a reality. We know from scientists, from Indigenous authorities, and from the salmon themselves that human activities in salmon watersheds are not being adequately managed: sustained incremental loss and degradation of salmon habitats is dramatic and ongoing.¹ Climate change is further contributing to negative impacts, and increasing the urgency for action.² Decision-making in the marine environment and fisheries mis-management also bear blame for decimating salmon populations,³ but loss of the estuarine and freshwater habitats needed for spawning and rearing is critical to address in any recovery strategy.⁴ In apparent response to this, federal and provincial governments have recently been making large allocations to grant programs for habitat restoration projects.⁵

Yet these grant programs (whether they are successful in achieving net ecosystem benefits, or not), do not directly address the human activities that are the root causes of habitat loss and degradation and harm to ecosystem health.⁶ Many of these activities – resource extraction, industrial and agricultural activities, and urban development – continue, as do their impacts, to accumulate over time and across watersheds. A body of science and policy has developed in consideration of these types of multiple impacts, which are typically referred to as “cumulative effects.” Not only do the impacts add up, but they can also interact with each other and natural processes and lead to further, indirect effects.⁷ Put another way, the ecosystems in salmon watersheds in BC, our geographic focus in this report, are subject to multiple human stressors related to

industrial, agricultural and urban development, and the results are complex, and primarily negative and harmful from the perspective of ecosystem health.⁸

This report looks at the management of – or more accurately, the failure to manage – cumulative effects in salmon watersheds, through the lens of federal and BC law and policy. If restoration projects represent efforts to bail water from a leaky boat, looking at law and policy is examining the holes that are allowing the water to come in. It means asking questions about why and how those cumulative effects have occurred and continue to occur, and are *tolerated*, or even, possibly, *facilitated*, from a law and policy⁹ perspective.

Other authors and researchers have analyzed and explored cumulative effects from the perspective of overarching governance structures and decision-making processes. Some examples of this analysis and discussion of alternative governance arrangements include: co-governance with Crown and Indigenous authorities;¹⁰ environmental assessment for large projects, including regional assessments;¹¹ community participation and engagement in regional assessment processes;¹² structured decision-making;¹³ and the need to address regulatory siloes.¹⁴ Applied to the context of salmon watersheds, this body of work offers insights into who participates, and who *should* participate in establishing and revising the overarching federal and provincial laws governing activities that affect ecosystem health; how Indigenous laws are upheld; how to ensure that ecosystem health is adequately prioritized at a strategic level; and how to integrate and coordinate strategic planning and decision-making across a range of different human activities.

There is also a growing body of scientific research that identifies cumulative effects and how they are damaging salmon watersheds, with developing capacity to predict future scenarios.¹⁵ Further, the equal, and vital importance of Indigenous knowledges and science in conservation planning and management is increasingly being acknowledged, and emerging practices around “ethical space”¹⁶ hold promise for informing and guiding transformational direction and action for watershed protection and recovery.¹⁷

Assuming we can get the strategic level right, in all of the senses described above, it is still necessary to translate strategic objectives and limits into regulation on the ground. For large projects, this can be a tailored set of mandatory operating conditions, as part of the environmental assessment process and approval.¹⁸ However, for the myriad of activities that do not reach that scale, we rely on the routine, repeated application of specific regulatory tools and accompanying policies. Their application has, combined, led to vast changes on the landscape of BC, such as the approximately 719,000 km of roads in British Columbia¹⁹ and the devastating level of land disturbance in northeastern BC that was addressed in the recent Blueberry First River Nations decision at the BC Supreme Court.²⁰

This report looks at several routine and widespread human activities causing impacts in salmon watersheds, and the federal and BC regulations and policies that apply to them. Using a consistent methodology, we consider how those regulatory and policy tools manage, or don't manage harmful impacts – singly and cumulatively. We examined only a subset of laws, regulations and policies; in particular, those related to activities that cause one type of impact, stream crossings or stream-spanning structures on salmon-bearing streams. We looked at three different types of human activities that cause this impact: public highway construction, forestry and flood management.

This subset of regulatory tools and policies was chosen for several reasons:

- It was impractical to look at the regulations and policies related to all known impacts within the scope of a single report;
- The impact itself is reasonably discrete and associated with specific, localized, well-identified human activities, unlike some impacts, which might carry with them uncertainty about causality and relative contributions from multiple, different types of activities;

- It is an impact that can, in principle, be readily managed from a practical perspective;
- The impact is extremely widespread in most major salmon watersheds in BC; and
- We know it matters. Connectivity is critically important for salmon, as they travel through salmon watersheds for the spawning and rearing parts of their lifecycles.

This report provides a brief description of cumulative effects management in BC, and contextualizes the impacts of stream crossings and dikes in BC. It then explains the methodology we created for our analysis, documents its application, and concludes with our findings and some brief recommendations. An Appendix provides an overview of the law and policies that were analyzed.



This report looks at the management of - or more accurately, the failure to manage - cumulative effects in salmon watersheds, through the lens of federal and BC law and policy.



A short background on cumulative effects management in BC

In BC, federal and provincial laws have not been designed to manage cumulative effects and create a protective net for salmon watersheds, so it's not surprising that cumulative effects are a problem. Historically these laws and associated policies were primarily developed to facilitate resource extraction and using the land and water for colonial settlement and industrialization. Over time, as negative impacts associated with these activities have become apparent in salmon watersheds, lawmakers adjusted laws and policies to require less harmful practices in some cases. Still, as noted by the BC Auditor-General in 2015, "We found that no existing legislation or other government directives explicitly requires the Ministry of Forests, Lands and Natural Resource Operations, or any other government ministry or agency, to manage cumulative effects when authorizing the use of natural resources."²¹ There is still much work to be done.

ATTEMPTS TO IMPROVE COORDINATION ACROSS THE LANDSCAPE

Under Crown law, 94% of the land in BC is provincial Crown land, but although the BC landscape has been profoundly altered by colonial settlement, authorization of resource extraction, and forcible displacement of Indigenous nations beginning even before BC became a Province, strategic land use planning is relatively new.²²

The Province of BC first undertook strategic land use planning processes in the 1990s – and to a lesser degree in the following decade – through engagement that was intended to balance environmental protection, resource development and community values, and build consensus.²³ It was primarily a response to land-use conflicts among tenure holders from different industries, and other interests, including environmental groups. Only in the latter decade did the Province begin to undertake government-to-government engagement with Indigenous Nations in land use planning processes, meaning that the land use plans that were developed in the 1990s lack this fundamental foundation.²⁴ The plans that were developed were in some cases made legally binding for forestry and range activities, but not necessarily for other types of resource and industrial activities, like mining²⁵ – nor did they address climate change.²⁶ As well, some parts of the province, like the Lower Fraser and the Sunshine Coast, were never part of the provincial land use planning process.²⁷ While the Province has made a start to revisiting the land use planning process, as of 2018, it is difficult to predict how this will relate to issues around cumulative effects in salmon watersheds.²⁸

More recently the Province has developed a Cumulative Effects Framework (CEF), but this is a decision-making tool that provides information for regulators and managers without having any legally binding consequences itself.²⁹ The interim policy for the application of CEF assessments to natural resource decision-making explains how CEF assessments indicate the status of CEF values and how that information should be applied by decision-makers within the context of existing regulation. The CEF assessments themselves do not *inform* regulatory objectives, and set thresholds but rather provide additional information for decision-makers.³⁰

Going forward, there are also opportunities to use specific legislative tools to manage aspects of cumulative effects in watersheds and prioritize ecosystem health. On the federal side, the *Wild Salmon Policy 2018-2022 Implementation Plan* developed by Fisheries and Oceans Canada (DFO) states that “[m]oving forward with a focus on ecosystems will require consideration of the cumulative effects on salmon.”³¹ Under the *Fisheries Act*, the Minister is now required to consider cumulative effects to fish and fish habitat when making regulations.³²

Provincially, the *Water Sustainability Act*³³ enables the development of Water Sustainability Plans for watersheds that may be co-developed with Indigenous nations.³⁴ The *Environment and Land Use Act* offers broad powers to the provincial Cabinet to make orders “respecting the environment or land use” that supersede other provincial legislation.³⁵ There are also provisions in the *Land Act* that are not currently in force but could be brought into force and used to set objectives that are applicable to all Crown-regulated users.³⁶ New environmental assessment legislation at both the federal and provincial levels also includes provisions for regional and strategic assessments that could help inform understanding and management of cumulative effects.³⁷

However, at present we are some distance from realizing effective cumulative effects management in BC. A landmark decision of the BC Supreme Court in June 2021 confirmed, in great detail, that the Province was failing dismally to manage cumulative effects of industrial development from a range of activities that it had authorized (and was continuing to authorize) in the territory of Blueberry River First Nations in northeastern BC, and that this failure amounted to an infringement of the rights of Blueberry River First Nations as set out in Treaty 8.³⁸ For the most part, the regulatory regimes and practices described in this court decision apply throughout the province, including the Cumulative Effects Framework. It remains to be seen if the case will lead to litigation in other parts of the Province, or if it will result in changes to the way BC manages cumulative effects of its regulatory authorizations – or both – but it is a clear and comprehensive indictment of current laws and practices.

“We found that **no existing legislation or other government directives explicitly requires the Ministry of Forests, Lands and Natural Resource Operations, or any other government ministry or agency, to manage cumulative effects when authorizing the use of natural resources.”**

BC Auditor General (2015)





Focus area: Stream crossings and stream-spanning structures from forest roads, BC highways, and dikes

Barriers and interference with passage on streams are a source of significant, cumulative impacts for salmon and their habitat in BC.³⁹ Barriers can also result from natural causes, but in BC roadbuilding and flood management activities are among the primary human causes of interference with salmon passage on streams. These barriers reconfigure and shrink the landscapes of salmon watersheds, by blocking or restricting access to ancient spawning grounds and other habitat. Barriers also interfere with young salmon moving up and down streams and into off-channel habitat in search of optimal conditions and food, as they grow and prepare to migrate to sea.⁴⁰ For salmon, natural resourcefulness and resilience is linked to their ability to distribute their communities across the rivers, streams and tributaries and the connectivity and complexity of those habitats.⁴¹ Opportunities to access a range of habitat in a given watershed may be associated with genetic diversity.⁴² And diversity among salmon populations may be associated with population-level resilience, and less vulnerability to future change, including climate change.⁴³

While this report looks at existing regulatory tools, the reality of past failures to manage impacts from the same activities cannot be ignored and remain the responsibility of the Crown governments that have allowed them. It isn't enough, from a cumulative effects perspective, to manage new impacts only. As noted by a provincial document, "[f]ish passage failure at road crossings constitutes a major, if not the major, loss of freshwater habitat by both migratory and resident fish populations in British Columbia."⁴⁴

ROADS

There are approximately 719,000 km of roads in British Columbia.⁴⁵ The BC Ministry of Transportation and Infrastructure (MOTI) is responsible for about 47,000 km of these roads, amounting to 6% of the total road network⁴⁶. The rest of the network is largely comprised of municipal and resource roads,⁴⁷ with resource roads making up over 620,000 km⁴⁸ (or 86%). But these numbers are only estimates, and according to a 2015 report released by the Forest Practices Board, "no one, including the Board, has ever had, nor now has, a comprehensive inventory of roads in BC. As a result, precise, and possibly accurate, estimates of the extent of roads are not possible."⁴⁹ To study and manage the cumulative impacts associated with roads, which include not only stream crossings, but also sediment delivery to streams through erosion and landslides,⁵⁰ accurate information about the location, extent and condition of roads is necessary. The uncertainty regarding BC's extensive road network is cause for concern.

The Forest Practices Board carried out a detailed assessment of fish passage on resource roads in 2009, describing problems with current stream crossings.⁵¹ The number of stream crossings reported in 2009 was approximately 370,000 and is likely greater now.⁵²

The Fish Passage Technical Working Group is an inter-ministerial group (with representatives from the BC Ministries of Environment and Climate Change Strategy; Forests, Lands, Natural Resource Operations & Rural Development (FLNRORD), BC Timber Sales and the BC MOTI) that works on identifying and overseeing the remediation of sites that are barriers to fish passage, which are noted to be primarily closed bottom structures. BC maintains the Provincial Stream Crossing Inventory System (PSCIS) which documents known stream crossings and their status (barrier, potential barrier, passible, unknown).⁵³

A report published in June 2014 found that there are an estimated 170,000 closed bottom culverts alone currently impeding fish passage.⁵⁴

Fish Passage Strategic Approach:

Protocol for Prioritizing Sites for Fish Passage Remediation [see note 54]

- This protocol is not linked to law or policy directives that would *require* action be taken to remediate stream crossings.
- The protocol was created by the Fish Passage Technical Working Group, with members from the BC Ministry of Environment and Climate Change Strategy, the BC Ministry of FLNRORD, BC Timber Sales and the BC MOTI.
- The working group uses data from the Provincial Stream Crossing Information System (PSCIS), and "informs government of investment opportunities in fish passage remediation. Government considers this information in making funding decisions."
- The document sets out a four-phase approach. The first step, fish passage assessment, is used to determine which watersheds have problematic crossings, and should therefore be a priority site for remediation. The second step, habitat confirmation, ensures that the prioritization from the first phase is accurate, and that the problem crossings identified actually impede fish crossing.

The third step, design, is where the site plan for remediation is developed. The Fish Passage Activity Engineering Standards are utilized at this stage, if, following habitat confirmation, the site is still considered high-priority. The fourth and final step involves remediating the area to reconnect the fish habitat.

According to the Province, from 2008 to 2020, 182 stream crossings were remediated, re-connecting 815.6 km of fish habitat.⁵⁵ This highlights the extent of the problem and the relative slowness of an administrative response in terms of managing cumulative effects.

DIKES

Dikes are problematic for fish passage and habitat. There are over 200 dikes in British Columbia, amounting to 1,100 km of diking.⁵⁶ In the Lower Mainland alone, there are approximately 600 km of dikes, including both coastal dikes (125 km) and riverine dikes (475 km) along the Lower Fraser River. It has been estimated that 95% of the banks of the Fraser River downstream of the Agassiz bridge have been diked.⁵⁷ Diking infrastructure also includes flood boxes and pumping stations. While dikes are designed to protect areas on the landward side from the hazards of flooding and thus have benefits for communities, they also create barriers to fish passage for salmon and other fish, by blocking or impeding access to streams and tributaries. A study in the Lower Fraser showed that approximately 64% of salmonid stream habitat is blocked by flood control structures or has disappeared. Overall, access to 85% of the former floodplain habitat has been lost.⁵⁸

Where dikes cross the mouths of streams or tributaries that empty into the river that is being diked, there is typically a flood box with a flood gate. When the water outside the dike is higher, such as during spring freshet, the pressure from the water operates to close the flood gate. For the rest of the year, the water in the stream on the landward side is higher and the water pressure opens the flood gate so that the stream can flow into the larger river. At this time fish can usually pass through the flood gate. However, the time when the flood gates are closed may coincide with times that salmon are trying to swim out, and it is also possible that the flood gates do not function adequately to allow salmon passage.⁵⁹

This problem is not new. A DFO study from 1999 observed that:

Although flood boxes are designed to safely pass fish, and many do, there is mounting evidence that some don't. The widely held assumption that flood boxes safely pass fish has never been thoroughly tested in the lower mainland. In addition, many of the low gradient streams that are governed by flood boxes contain valuable coho habitat that is in many cases underutilized. This problem may be partially due to fish passage problems that involve flood boxes.⁶⁰

The flood boxes can be a barrier to fish passage, but the pumping stations often integrated with them can also cause high mortality rates for the fish that pass through them.⁶¹



For salmon, natural resourcefulness and resilience is linked to their ability to distribute their communities across the rivers, streams and tributaries and the connectivity and complexity of those habitats. Opportunities to access a range of habitat in a given watershed may be associated with genetic diversity. And diversity among salmon populations may be associated with population-level resilience, and less vulnerability to future change, including climate change.

Methodology

We used the methodology below to evaluate the selected regulatory tools. We note that our focus is on the tools themselves and not on the more strategic level processes and decision-making that might inform them. Where there is reference in the methodology to management objectives or processes, or monitoring, etc., our analysis is limited to evaluating whether the regulatory tools are informed by conservation objectives (for example), and not an evaluation of the objectives themselves.

1 EFFICIENCY

Does the regulatory tool limit harm from a single occurrence of the identified activity?

- *Can authorization be refused?*
- *If the activity is allowed, is it regulated in such a way that harm is prevented?*

2 SPATIAL COMPONENT

Is authorization for the activity limited in any way by considerations of cumulative effects, past and anticipated, at a watershed or sub-watershed scale?⁶²

- *Is authorization linked to spatial or other relevant objectives?*
- *Is authorization part of an integrated management process?*

3 TIME COMPONENT

Are shifting baselines accounted for?⁶³

- *Is there any explicit requirement for rehabilitation?*
- *Is authorization linked to consideration of past harms/historical baselines?*

4 ACTIVE MANAGEMENT

Is there any mechanism to re-calibrate the regulatory tool in response to monitoring and/or new information and/or priorities resulting in revised management objectives?⁶⁴

5 IS THERE EFFECTIVE ENFORCEMENT?

Is there oversight from regulators? Where professional reliance is part of the regulatory regime, is there appropriate professional guidance related to the application of the regulatory tool?

Evaluation of selected law and policy tools

Ministry of Transportation and Infrastructure Roads

Under the *Transportation Act*, the provincial government owns provincial public highways and rural side roads,⁶⁵ approximately 47,000 km in length. The Ministry of Transportation and Infrastructure (MOTI)'s oversight and control of the provincial road network extends to the construction, repair, maintenance, improvement, operation and deactivation of provincial public highways.⁶⁶ The primary concern is road user safety, and this drives funding allocation – as opposed to upgrading or repair of road infrastructure presenting environmental concerns. The *Transportation Act* gives the Minister ultimate discretion about proceeding with any works related to highways.⁶⁷

MOTI usually contracts with outside companies to carry out works related to provincial public highways, through a competitive tender process.⁶⁸

MOTI legislation and related regulations do not specifically address stream crossings. An environmental assessment only applies for new highways and upgrades of ≥ 20 continuous km of paved highway with ≥ 2 lanes⁶⁹ – meaning the vast majority of new projects do not undergo environmental assessment. Regulation of stream crossings is provided by external agencies under the provincial *Water Sustainability Act*⁷⁰ and the federal *Fisheries Act*. However, MOTI staff do play an active role in ensuring that construction contracts include requirements and references regarding environmental concerns, including in relation to stream crossings.

EVALUATION

1 EFFICIENCY

Does the regulatory tool limit harm from a single occurrence of the identified activity?

Can authorization be refused?

Yes. Stream crossings by BC public highways are regulated under the *Water Sustainability Act* (WSA) and the *Fisheries Act*. Under the WSA, a proposed stream crossing must fall within one of the categories set out in the Water Sustainability Regulation and meet the specified standards⁷¹, otherwise it will need a change approval⁷² and can, in principle, be refused.

Under the *Fisheries Act*, if a stream crossing would harmfully alter or destroy fish habitat it would need an authorization – although DFO relies on proponents to follow its written advice about stream crossings and to self-identify if this cannot be followed.

The likelihood that a WSA change approval or a DFO authorization will be refused is in practice likely to be limited. Under the WSA, the regulator can

grant a change approval and require compensatory mitigation measures if other mitigation measures will not address “significant adverse” effects, and these compensatory measures may be taken on different parts of the same stream or another stream altogether.⁷³ Regarding DFO authorizations, DFO has an offsetting policy which effectively facilitates authorizations “when proponents are unable to avoid the death of fish and/or the harmful alteration, disruption or destruction of fish.”⁷⁴

If the activity is allowed, is it regulated in such a way that harm is prevented?

Yes, in the sense that this is a plain objective of the regulation. The requirements in the WSA regulation and the DFO guidance are based on best management practices that the Province and DFO have jointly prepared.⁷⁵

2 SPATIAL COMPONENT

Is authorization for the activity limited in any way by considerations of cumulative effects, past and anticipated, at a watershed or sub-watershed scale?

Is authorization linked to spatial or other relevant objectives?

No.

If authorization part of an integrated management process?

No.

3 TIME COMPONENT

Are shifting baselines accounted for?

Is there any explicit requirement for rehabilitation?

No. If a stream crossing was constructed without authorization and in such a way that it obstructed the free passage of fish, the federal Minister of Fisheries and Oceans could, on a discretionary basis, subsequently order it removed or remediated, but there is no explicit provincial requirement for remediation.⁷⁶ Under provincial regulation, if a stream crossing did not meet the regulatory requirements when it was constructed, this could be considered an offence under the WSA, as long as the Province took action to prosecute the person responsible within three years of the activities in question, or within three years of learning of the activities.⁷⁷ As part of sentencing the offender could be required to rehabilitate past crossings, but there is no independent WSA requirement creating responsibility for a landowner or tenure holder to rehabilitate stream crossings.

Once a road construction project is complete, roadway maintenance is carried out by Highway Maintenance Contractors. However, they are largely tasked with the upkeep of roadside infrastructure, controlling the flow of traffic, addressing winter road conditions and drainage requirements. Their maintenance activities do not extend to replacing or restoring stream crossings that are barriers to fish passage.

MOTI established an Environmental Enhancement Fund in 2013, which invests approximately \$2 million annually. The Culvert Retrofit Program is a subdivision of the fund, through which the government invests approximately \$250,000 annually to improve, restore and rehabilitate fish passage at existing MOTI fish-bearing stream crossings. However, this amount is subject to change from year to year. Further, the program does not have any set targets for remediation of stream crossings on provincial highways that are barriers to fish passage.

Is authorization linked to consideration of past harms / historical baselines?

No.

4

ACTIVE MANAGEMENT

Is there any mechanism to re-calibrate the regulatory tool in response to monitoring and/or new information and/or priorities resulting in revised management objectives?

No. It would be possible to change the regulatory requirements in the WSA if the “best practices” it embodies were found to be inadequate, but there is no formal review process triggered by the WSA or its regulations. “Multi-year” post-construction monitoring by project proponents is one of the best practices, and there is also mention of compliance monitoring by the Province, but it isn’t clear how the information from either type of monitoring would be used beyond simply ensuring that conditions of approval for a specific project were met. The *Fisheries Act* includes a general provision that the provisions of the Act should be reviewed by a Parliamentary committee every five years, but this doesn’t directly trigger an informed review of any particular requirement in the Act or its regulations.

5

IS THERE EFFECTIVE ENFORCEMENT?

Is there oversight from regulators?

Information for proponents is clearly communicated, early in project development, and it appears that MOTI staff are engaged in looking closely at new projects as they develop tender documents and share information with the regulating agencies. It is not clear if either the Province or DFO exercises independent oversight regarding road construction projects.

Where professional reliance is part of the regulatory

The project proponents will either rely on their own interpretation of the best practice guidance provided by the Province and DFO or may engage an

regime, is there appropriate professional guidance of the regulatory tool?

environmental professional. The guidance appears reasonably straightforward and specific.



Forest resource roads

In British Columbia, there is a vast network of forest resource roads. The Forest Practices Board has estimated that at least three-quarters of all resource roads are forest resource roads (approximately 480,000 km).⁷⁸ The Minister of Forests may construct and maintain roads in order to provide access to timber⁷⁹, and may grant licences, permits and approvals to commercial and industrial users to build forest roads. Only approximately 60,000 km of forest resource roads are forest service roads that are administered by the Province, leaving an immense expanse of roads that are constructed and managed by forest tenure holders and relying largely on the forest professionals they engage for guidance.⁸⁰

Compared to the law governing provincial public highways and rural roads, the law governing resource roads is more robust, with specific environmental protection provisions, which may exist because of the dominant role of private interests, i.e. forest tenure holders (as opposed to government) in relation to forest resource roads. Applicable legislation includes the *Forest Act*,⁸¹ and the *Forest and Range Practices Act* (FRPA),⁸² along with its *Forest Planning and Practices Regulation* (FPPR)⁸³ and *Government Actions Regulation* (GAR).⁸⁴ Forest roads are not subject to the BC *Environmental Assessment Act*. The *Forest Act* establishes forest tenures and overarching requirements, while FRPA requires tenure holders to develop forest stewardship plans through a regime of professional reliance. FPPR and GAR set out requirements for these plans. In addition, the Ministry has developed extensive policy and guidance about the construction of fish-stream crossings.⁸⁵

Road permitting for forest licence areas is contingent on approval of forest stewardship plans. FPPR also sets out requirements that stream crossings “must not have a material adverse effect on fish passage in a fish

stream.” Unlike public highways, forest resource roads are generally not intended to be used indefinitely. If a road is no longer required, since 1995 there are procedures that must be undertaken by the tenure holder to discontinue or deactivate it, including dismantling and remediating stream crossings.⁸⁶ Unfortunately this requirement, which was first instituted with the Forest Practices Code, does not apply retroactively, so there is no requirement for stream crossings to be remediated for roads discontinued prior to 1995.

Under GAR, “fisheries sensitive watersheds” may be designated “where cumulative hydrological effects that would have a material adverse impact on fish”, and tenure holders are required to adopt strategies to meet legal objectives set by the Province. Such designations are currently in place for 61 watersheds in BC.⁸⁷ At the same time, it should be noted that GAR objectives are ultimately limited in their effectiveness by the statutory limitation that they must not “unduly affect the supply of timber from British Columbia’s forests.”⁸⁸

EVALUATION

1 EFFICIENCY

Does the regulatory tool limit harm from a single occurrence of the identified activity?

Can authorization be refused?

In practical terms, no. Once a forest licensee has an approved Forest Stewardship Plan, there is limited discretion on the part of the Minister in regards to approving a road permit that will allow construction of new roads in the licence area. Under the *Forest Act*, a road permit can then only be refused if it “would compromise government objectives specified by regulation”⁸⁹ or if the licensee has not met obligations for other road permits in the same licence area.⁹⁰ Government policy guidance requires District-level staff to consider these points as part of due diligence when reviewing road permit applications, although it is not clear how detailed consideration could be, given the long list of points to review.⁹¹

If the activity is allowed, is it regulated in such a way that harm is prevented?

For the most part, yes. Stream crossings are specifically regulated in the FPPR with respect to their potential adverse effect on fish passage, on stream channels, and in the timing of construction.⁹² Stream crossings are required to be built in such a way as to mitigate any disturbance to the stream channel and bank.⁹³ As well, “[a]n authorized person who carries out a primary forest activity must ensure that the primary forest activity [which includes road building] does not have a material adverse effect on fish passage in a fish stream.” The provision also states that this requirement only applies to crossings built after June 15, 1995.⁹⁴

There has been extensive work done by the Ministry, in cooperation with DFO, to develop specifications for stream crossings (see Appendix 1). Based on review by the Forest Practices Board, it appears that the construction of stream crossings from the perspective of ensuring fish passage has improved significantly in recent years.

At the same time, other direct and indirect impacts associated with stream crossings are more problematic, such as sediment from roads associated with stream crossings, including:

- “road surface not crowned or sloped towards stream crossings;
- road surface erosion depositing sediment directly into fish-streams or tributaries to fish-streams;
- soil accumulation on bridge decks releasing sediment into fish-streams;
- stream openings used as snow dumps, resulting in sediment mixed with snow to be deposited directly into fish habitat.”⁹⁵

2 SPATIAL COMPONENT

Is authorization for the activity limited in any way by considerations of cumulative effects, past and anticipated, at a watershed or sub-watershed scale?

Is authorization linked to spatial or other relevant objectives?

In some cases, yes. “Fisheries Sensitive Watershed” designation under GAR requires watershed-scale management objectives, in part to prevent “cumulative hydrological effects that would have a material adverse effect on fish.”⁹⁶ “Stream crossing density” could be translated into a management objective at a watershed scale, but this would only apply in designated watersheds, and designation remains an exceptional practice with no apparent plans by the Province to scale it up. As noted above, it is also subject to the qualification that any objectives must not “unduly affect the supply of timber.”

As observed by the Forest Practices Board, an activity that has a low, tolerated level of impact for single occurrences can nonetheless add up on the landscape of a forest tenure area if the activity occurs many times in different locations,⁹⁷ which is often the case with stream crossings.

If authorization part of an integrated management process?

No. The Forest Practices Board has also identified that cumulative effects across different forest tenure holders with overlapping tenure areas (which can occur with volume-based tenures) is a problem, with no mechanism for coordinated planning amongst them.⁹⁸ The regulatory tools also do not apply to stream crossings that occur as a result of non-forestry activities.

3 TIME COMPONENT

Are shifting baselines accounted for?

Is there any explicit requirement for rehabilitation?

Technically, yes, for roads constructed in 1995 or later. Maintenance of road permit roads is the responsibility of the forest licensee, and includes “bridges, culverts, fords and other structures associated with the road.”⁹⁹ Responsibility for maintaining a road continues until it is deactivated and a declaration to that effect has been accepted by the district manager.¹⁰⁰ When deactivating a road, bridges, log culvert superstructures and stream pipe culverts must be removed.¹⁰¹ None of this applies to stream crossings that were constructed before May 1995, when the BC Forest Practices Code was adopted (note: it was later transitioned into FRPA and its regulations).

Is authorization linked to consideration of past harms / historical baselines?

Generally, no. Road permits are issued to enable timber harvesting as set out in the tenure holder’s Forest Stewardship Plan and site plan. It is possible that an existing road permit could be transferred to a new tenure holder, but this would be up to the tenure holders to arrange, and would presumably be done for convenience and to save the costs of roadbuilding.

It is possible that objectives for a Fisheries Sensitive Watershed could implicitly take into account past harms, such that there would be a lower threshold for harms that could be allowed from new activities.

4

ACTIVE MANAGEMENT

Is there any mechanism to re-calibrate the regulatory tool in response to monitoring and/or new information and/or priorities resulting in revised management objectives?

It appears that the re-calibration of regulatory tools was meant to be supported through the Forest & Range Evaluation Program that has operated since 1995. Its primary objective was to “determine if forest and range policies and practices in BC are achieving government’s objectives for FRPA resource values”, and “to recommend options for changes to forest and range policies, practices and legislation, where required.” A review of the Forest & Range Evaluation Program by the Forest Practices Board found that the Program was collecting valuable ecological data about the land base in BC, but that it lacked landscape-level data¹⁰² – which would be important from the perspective of cumulative effects.

In terms of improving outcomes for government objectives, it was originally envisioned that while the Forest & Range Evaluation Program would provide information and options, FLNRORD would lead a process with forest professionals and stakeholders to determine whether and what policy and regulatory changes were needed. Instead, without FLNRORD leadership, professionals have been expected to make voluntary practice improvements based on the Forest & Range Evaluation Program findings. Not surprisingly this has not been effective.¹⁰³ In a regulatory scheme such as FRPA, professionals who work for tenure holders seem more likely to be focused on meeting existing requirements while making it possible for tenure holders to engage in forestry operations, rather than trying to improve environmental management. This does not mean that professionals would not be receptive, or would not have good ideas, simply that they are unlikely to be strong catalysts for change.

5

IS THERE EFFECTIVE ENFORCEMENT?

Is there oversight from regulators?

No. The process of developing a Forest Stewardship Plan is highly reliant on forest professionals hired by the proponent, although there are relatively detailed requirements in law, regulation and policy. Oversight occurs with the review and approval of Forest Stewardship Plans, but at the operational level there is relatively little oversight. The forestry professional who signed off on the site or road plan, and/or other documents related to the application, has a professional responsibility to oversee the work being done, and to ensure that it complies with the Forest Stewardship Plan. Tenure staff may carry out interim monitoring, between the start and end of the cutting permit; however, there is no set requirement or policy in place.¹⁰⁴

From a range of sources, monitoring appears to be less than what is needed to support management of cumulative effects (see comments above about the Forest & Range Evaluation Program). In addition, within government there is a lack of mechanisms to share information across agencies.

Where professional reliance is part of the regulatory regime, is there appropriate professional guidance of the regulatory tool?

Yes, there is extensive guidance available for professionals with respect to stream crossings (see Appendix 1).



Dikes

Dikes in BC are owned and administered by diking authorities, which are now mainly operated by local governments.¹⁰⁵ The Province sees local governments as the “most appropriate legal entities” to own, operate and manage dikes for a number of reasons, including: their ownership of municipal lands, control over land use regulation, provision of similar services (for example, drainage and stormwater management), experience and capacity to manage large infrastructure, their taxing authority and their access to funding from federal and provincial governments.¹⁰⁶

Flood management in BC is carried out primarily by local governments, within a law and policy framework established by the Province, and funded primarily by the federal government. The Province also leads emergency planning and response, but local governments manage flood and drainage infrastructure, including dikes, and make decisions about land use. By contrast, until 2003 the Province (with funding from

the federal government) developed floodplain maps and oversaw how they were used by local governments to help assess and manage flood hazards. After 2003, through an amendment to the *Local Government Act*, the Province downloaded responsibility for floodplain mapping and regulation to local governments. Not surprisingly, the period up until the present has not resulted in significant changes to existing diking infrastructure, as local governments are often stretched to even manage its upkeep¹⁰⁷ – let alone able to upgrade the infrastructure.

However, in order to be eligible to receive Disaster Financial Assistance¹⁰⁸ in times of flooding, local governments are still required to have followed provincial guidance for managing flood risks. This includes 2018 amendments to the Flood Hazard Land Use Management Guidelines that direct local governments in coastal areas to plan for a metre of sea level rise by 2100.¹⁰⁹ Both the increasing reality of a changing climate and recent flooding events in the Fraser Valley have created an opportunity to re-consider the *status quo*.

New dikes are now relatively rare, and activity related to dikes is now primarily maintenance and upgrades. The technical and financial capacity of local governments to carry out these activities varies. Some local governments, such as the City of Richmond and the City of Surrey, have larger, denser populations and are able to secure consistent core funding for planning and operations through service fees.¹¹⁰ Other local governments have more limited resources. At both ends of the spectrum, given the enormous capital investments that are involved, local governments rely on infrastructure funding from provincial and federal governments for major upgrades and maintenance of diking infrastructure. This means that the infrastructure funding programs fundamentally shape the work that is done. To date these programs have not specifically supported “fish-friendly” upgrades to diking infrastructure, which means that any work that has been done has been separately – and often creatively – funded, and in spite of the existing regulatory framework.¹¹¹

In terms of environmental regulation, provisions of the *Fisheries Act* related to obstructing fish passage, death of fish, and protecting fish habitat may potentially apply to dikes and diking upgrades, although the federal regulator has taken little or no enforcement action in the past.

EVALUATION

1 EFFICIENCY

Does the regulatory tool limit harm from a single occurrence of the identified activity?

Can authorization be refused?

No, there is no specific legal basis to refuse authorization. Construction of a dike requires written approval from the Inspector of Dikes, and it is possible that a request to construct a dike can be refused, based on a proposed design; however, there are no mandatory criteria or guidelines that require provisions for fish passage or protection of fish habitat. There are also no provincial requirements related to the operation of dikes regarding barriers to fish passage or other harm to fish and fish habitat. It is possible, in principle, that Fisheries and Oceans Canada (DFO) could refuse authorization of harmful impacts to fish or fish habitat for a new dike, but there are no specific criteria in law or policy indicating when this would occur.

If the activity is allowed, is it regulated in such a way that harm is prevented?

No. There is no regulation under the *Dike Maintenance Act* of barriers to fish passage or other harm to fish or fish habitat resulting from dikes.

Ongoing activity may be contrary to provisions prohibiting death to fish and harm to fish habitat under the *Fisheries Act*, but there is no specific regulatory mechanism that requires permitting or regulatory scrutiny of the activity itself.

2 SPATIAL COMPONENT

Is authorization for the activity limited in any way by considerations of cumulative effects, past and anticipated, at a watershed or sub-watershed scale?

Is authorization linked to spatial or other relevant objectives?

No.

If authorization part of an integrated management process?

No.

3 TIME COMPONENT

Are shifting baselines accounted for?

Is there any explicit requirement for rehabilitation?

No. However, the provincial Inspector of Dikes may require that a diking authority/owner “repair, replace, renew, alter, add to, improve or remove a dike, or a part of a dike, or anything used in connection with a dike.”¹¹² There is no qualification to these broad powers, except by inference from the fact that they appear in the *Dike Maintenance Act*, which suggests that its general purpose must be to maintain dikes, which are things “assembled or installed to prevent the flooding of land.” In principle, it appears that the Inspector of Dikes could require fish friendly modifications to a dike, for example, that would improve fish passage or reduce fish mortality, but its office has no mandate or capacity to do this.

In relation to the *Fisheries Act*, the policy that DFO has adopted regarding its application to existing facilities¹¹³ states that owners and operators are responsible for ensuring that ongoing operation, modification or maintenance conforms to the *Fisheries Act* provisions. The footprint of the structure is not subject to habitat protection provisions if it was in place prior to the legislation (i.e., pre-1977). However according to DFO’s interpretation, it would appear that if the ongoing operation of flood gates and pumping stations cause death to fish or habitat alteration, disruption or destruction, it should be subject to enforcement. Discussions with regional DFO staff suggest that DFO does not

proactively pursue any enforcement action on this in regards to Lower Fraser dikes.

Uptake of “fish friendly” measures to address the impacts of flood boxes and flood pumps on the part of some local governments and Indigenous authorities has been entirely voluntary. Based on a small survey of these initiatives, funding and technology both provided challenges.¹¹⁴

Is authorization linked to consideration of past harms / historical baselines?

No.

4

ACTIVE MANAGEMENT

Is there any mechanism to re-calibrate the regulatory tool in response to monitoring and/or new information and/or priorities resulting in revised management objectives?

No.

5

IS THERE EFFECTIVE ENFORCEMENT?

Is there oversight from regulators?

The Inspector of Dikes and its employees appear to be well-engaged in diking and flood management in the Lower Fraser, although with generally limited capacity. The inspection function and reporting requirements for diking authorities could align well with regulatory requirements related to ensuring that dikes are not causing barriers to fish and harm to fish and fish habitat, although it would require cooperation between provincial and federal authorities.

A 1999 report that DFO commissioned to assess harm to fish from pumping stations and flood boxes in the Lower Fraser suggests that there was past interest and oversight from the federal regulator,¹¹⁵ although there is no indication of current oversight.

Where professional reliance is part of the regulatory regime, is there appropriate professional guidance of the regulatory tool?

Diking authorities, who in the Lower Fraser are primarily local governments, typically rely on consultants and contractors for the design and construction of diking upgrades. There is extensive guidance provided by the Province of BC related to diking design and construction. The *Dike Design and Construction Guide – Best Management Practices for British Columbia* (2003) notes that flood boxes, pump stations and other diking infrastructure can interfere with fish migration, and suggests that construction of fish friendly structures such as screw pumps and flood boxes with horizontally opening floodgates can minimize fish mortality.¹¹⁶ As noted, these management practices are not regulated and required, but if they were, there is a community of professionals that could be potentially relied upon to implement them.



The acceptance of systemic environmental harm in these regulatory schemes is 'normal,' and there is no accountability for, and little monitoring of, the harm that accumulates. This is something that must be considered when looking at how to reform laws and regulations to implement cumulative effects management and new limits on human activities.

Summary of Results

Application of the methodology to the three regulatory schemes showed that there was some diversity in the efficiency of the different schemes in regulating single occurrences of the activity to avoid harm, and in the opportunities to manage cumulative effects associated with multiple occurrences across watersheds and over time, and for regulators to modify management in response to changing conditions. We note that our analysis is not meant to be definitive from a technical perspective, and we also acknowledge that there may be further information about the application of existing regulations that would be relevant. Our goal was instead to tease apart particular aspects of these regulatory schemes in order to understand how and whether they could help deliver effective cumulative effects management on the ground, by identifying gaps, current barriers and opportunities.

Below is a colour-coded chart that presents a snapshot of our findings, with the caveat that even our limited analysis identified nuances as described in the discussion in the section above. We also note that this represents the *status quo* of the regulatory schemes evaluated, and some of the “reds” and “yellows” could become “greens” with changes to laws and regulations – assuming political will and leadership. Overall, it should not be surprising that there is not a lot of green in this summary, given what we know about cumulative effects in salmon watersheds in BC.

		Meets criterion	Partly meets criterion	Does not meet criterion
EVALUATION CRITERIA		MOTI (BC public highways)	Forest resource roads	Lower Fraser diking
Efficiency re: single occurrence	Discretion to not allow activity	Meets criterion	Partly meets criterion	Does not meet criterion
	Harm prevented	Meets criterion	Partly meets criterion	Does not meet criterion
Managing effects across a watershed	Linked to spatial objectives	Does not meet criterion	Partly meets criterion	Does not meet criterion
	Integrated management process	Does not meet criterion	Does not meet criterion	Does not meet criterion
Managing effects across time	Rehabilitation required	Does not meet criterion	Partly meets criterion	Partly meets criterion
	Past harms considered	Does not meet criterion	Does not meet criterion	Does not meet criterion
Active management	Monitoring results and recalibrating	Partly meets criterion	Partly meets criterion	Does not meet criterion
Enforcement	Oversight by regulators	Meets criterion	Does not meet criterion	Partly meets criterion
	Professional guidance exists	Meets criterion	Meets criterion	Partly meets criterion



Conclusions

Our analysis explored two main issues: first, how a subset of existing regulatory tools currently manage cumulative effects in BC salmon watersheds, if at all; and second, how, without regulatory reform, they might be used to manage cumulative effects if they were linked to watershed-scale or sub-watershed scale planning, objectives, active management, monitoring and enforcement.

Our criteria included:

- effectiveness in managing harm from single impacts;
- whether impacts across a landscape are managed;
- whether impacts across time are managed;
- whether active management is accommodated; and
- whether there is enforcement – including monitoring of effectiveness.

We looked at three different examples of regulatory schemes and the way they manage the activity of building structures across fish-bearing streams (stream crossings and dikes) – its primary impact being barriers to fish passage. The regulatory examples were:

- 1) the provincial government as an owner-operator relying on specialized environmental regulations from other agencies (MOTI and provincial highways);
- 2) regulation of land tenure holders through a results-based, professional reliance regime (BC forestry); and
- 3) large, legacy infrastructure that sits in some jurisdictional limbo (Lower Fraser diking system).

Not surprisingly, given that impacts from stream crossings and diking infrastructure in BC are widespread and well-documented, the evaluation showed that there are many areas of deficiency in the regulatory schemes we reviewed. The regulations continue to allow more harmful effects to accumulate across watersheds, and also provide little impetus for remediation of past harms.

The regulations continue to allow more harmful effects to accumulate across watersheds, and also provide little impetus for remediation of past harms.

This starts with the way that regulations manage new, single occurrences. For forest resource roads, there is little opportunity for regulators to refuse the construction of new roads, and while stream crossing standards have greatly improved over time to reduce direct barriers to fish passage, indirect and significantly harmful effects are still possible and are legally tolerated for each stream crossing. In the case of Lower Fraser dikes, the provincial law on dikes does not mention fish or fish habitat, although, as noted in the Dike Design Guidelines, “most floodplain areas are fisheries sensitive zones.”¹¹⁷ The guidelines suggest that there are ways that harmful impacts on fish and fish habitat can be mitigated, but this is not required in regulation. In principle there is federal protection under the *Fisheries Act*, but this is lessened by the option to obtain an authorization allowing harmful impacts. While in practice most of the dikes in the Lower Fraser are already in place, there are ongoing needs for upgrades that could be regulated to improve outcomes for fish and fish habitat, if the regulations were stronger.

Why are the existing regulations so weak?

The laws and regulations were primarily designed to enable profits from resource extraction and security for private property holders. Even now, when there appears to be very broad-based concern for wild salmon in BC,¹¹⁸ making changes to laws that have a wide and general application, and benefits for many actors, is difficult, because the changes are subject to perpetual negotiation and push back by those actors. This suggests that political leadership is needed. However, our analysis also showed that even where there is intention by regulators to put in place standards that will prevent environmental harm in salmon watersheds, it is challenging to insert those standards into regulatory frameworks not designed for that purpose or to apply them effectively through external agencies not directly engaged in regulating specific activities.

At the heart of all the schemes we examined was a tolerance for the accumulation of harmful effects across time and space. In line with the underlying purposes of most Crown law and regulation, as noted above, preventing environmental harm is not a system-level concern in these regulatory schemes, but more of an exceptional feature or a secondary objective. The acceptance of systemic environmental harm in these regulatory schemes is ‘normal’, and there is no accountability for, and little monitoring of, the harm that accumulates. This is something that must be considered when looking at how to reform laws and regulations to implement cumulative effects management and new limits on human activities.

The rigour and thoroughness needed to re-purpose a regulatory scheme designed to facilitate resource extraction should be taken seriously. In the Blueberry River First Nations case, the Court took note of a Forest Practices Board report that stated that there are methods available to manage cumulative effects from a technical, science perspective, but on the regulatory side, there is “no one to tell.”¹¹⁹ At a practical level, Crown regulators need to be realistic and accountable about the ways that that Crown regulations allow harmful impacts to salmon watersheds to continue. This includes first identifying where in the regulatory process decisions are being made, and by whom. Our report looked at a set of impacts where identifying the decision and the decision-maker is relatively straightforward, but in some cases, such as, for example, water quality impacts, this may be more complex. Next, the way in which the decision-making allows specific, harmful, cumulative impacts needs to be audited to performance criteria such as those outlined in this report. We note that this process of evaluating and revising regulations does not address the need to have standards and thresholds to protect salmon watersheds, but provides the necessary tools to implement them.



Recommendations

1 Crown regulatory development and review processes need to be specifically tailored to address cumulative effects management. In the case of the *Fisheries Act*, the 2019 changes require that the Minister consider cumulative effects before recommending regulations to Cabinet.¹²⁰ This should be reflected in a policy for developing and monitoring the impact of regulations that reflects criteria similar to those set out in this report. A similar policy should be developed for regulatory processes within the provincial government.

2 Our sampling of three different Crown regulatory schemes confirms there is a strong case to be made for an external authority to set standards / objectives / limits and monitor ecosystem health from a salmon perspective, likely at a watershed scale.

Not only is the legal landscape of federal and provincial regulation not designed to manage or monitor ecosystem health, it is also complex, and getting different regulators to pull all the levers to reform multiple parts of it simultaneously will require strong commitments from federal and provincial governments. Any external authority or standard-setting body must be also established within the requirements established by federal and provincial commitments under the *UN Declaration on the Rights of Indigenous Peoples Act* (UNDRIP),¹²¹ and the *Declaration on the Rights of Indigenous Peoples Act* (DRIPA),¹²² respectively. It will be critical, however, to ensure that Crown laws and regulations have legal accountability for meeting the new standards. The evaluation criteria developed for this report offer a general idea of how to ensure these links are systematically in place across regulatory schemes. Watershed planning is already underway in BC (with examples from other jurisdictions as well), and watershed-scale regulation can be enabled through the *Water Sustainability Act*,¹²³ and through orders under other legislation such as the *Environment and Land Use Act*.¹²⁴ New environmental assessment legislation at both the federal and provincial levels also includes provisions for regional and strategic assessments that could help inform understanding and management of cumulative effects.¹²⁵ Newly proposed forest landscape planning also offers opportunities.¹²⁶ The Province of BC is currently considering the development of an overarching ‘biodiversity law’ that could provide relevant standards and accountability, and would be subject to the requirements of DRIPA.¹²⁷

3 In some watersheds, it seems likely that Indigenous-led regulation and processes will emerge as the most effective frameworks for taking the lead on managing cumulative effects to secure salmon watershed health. Given the demonstrated shortcomings of Crown laws and policies, this is an opportunity to improve salmon watershed health and should be supported by Crown governments, including by providing adequate and sustained funding.¹²⁸ At the same time, this will still require responsive, reciprocal Crown regulations, both federal and provincial, that can help operationalize objectives to protect and restore ecosystem health.

4 Given the weakness of the status quo Crown regulatory framework, it is important to think and work outside that framework as well to develop new management approaches, based on Indigenous and western science. This means investing resources in continued collaboration and respectful work among scientists, Indigenous knowledge holders, law and policy specialists and professionals to identify stressors that need to be managed and ways to manage them. “Two-eyed seeing” can offer a foundation as a legitimate, decolonial approach for working on “wicked” fisheries problems or other aquatic environmental challenges where singular solutions are near impossibilities.¹²⁹

Appendix 1: Overview of Law and Policy Related to BC Provincial Highways, Forest Resource Roads, and Dikes

Ministry of Transportation and Infrastructure Roads

LAW

Under the *Transportation Act*, the provincial government owns provincial public highways and rural side roads.¹³⁰ The Ministry of Transportation and Infrastructure (MOTI)'s oversight and control of the provincial road network extends to the construction, repair, maintenance, improvement, operation and deactivation of provincial public highways.¹³¹ The primary concern is road user safety, and this drives funding allocation – as opposed to upgrading or repair of road infrastructure presenting environmental concerns. The *Transportation Act* gives the Minister ultimate discretion about proceeding with any works related to highways.¹³²

MOTI legislation and related regulations do not specifically address stream crossings. An environmental assessment only applies for new highways and upgrades of ≥ 20 continuous km of paved highway with ≥ 2 lanes¹³³ – meaning the vast majority of new projects do not undergo environmental assessment. Regulation of stream crossings is provided by external agencies under the provincial *Water Sustainability Act* and the federal *Fisheries Act*. However, MOTI staff do play an active role in ensuring that construction contracts include requirements and references regarding environmental concerns, including in relation to stream crossings.

MOTI usually contracts with outside companies to carry out works related to provincial public highways, through a competitive tender process.¹³⁴ Before the tender, MOTI will apply for and secure the necessary permits. In rare cases the contractor (project proponent) is responsible for obtaining permits.¹³⁵

MOTI consults FrontCounter BC¹³⁶ to determine the permits that will be required. “Changes in and about a stream,” as defined under the *Water Sustainability Act* generally require a use approval,¹³⁷ but the Water Sustainability Regulation provides that stream crossings with culverts and single span bridges do not require approvals if they meet the requirements of that Regulation.¹³⁸ In the case of culverts on fish-bearing streams, no approval is needed if “the culvert allows fish in the stream to pass up or down stream under all flow conditions.”¹³⁹ If no approval is required, a notification must be sent to FrontCounter BC 45 days prior to the commencement of any work.¹⁴⁰ A habitat officer may make written conditions about relevant timing windows and avoiding harm to fish, vegetation and channel stability during and after construction.¹⁴¹

The *Fisheries Act* also applies to stream crossings by prohibiting the harmful alteration, disruption or destruction of fish habitat, prohibiting the obstruction of fish passage, and regulating the deposit of deleterious substances into fish streams.¹⁴² DFO has a list of suggested measures to protect fish, fish habitat and fish passage¹⁴³, and does not review projects except in response to a proponent's request.¹⁴⁴ If, following a review, DFO determines that a stream crossing will contravene the *Fisheries Act*, an authorization must be obtained before the project can proceed.¹⁴⁵ Authorizations include terms and conditions that must be

followed in order to mitigate, offset and monitor any impact to fish or fish habitat resulting from the project. Failure to meet these conditions may result in a fine. Note that the authorization can also serve as a federal *Species at Risk Act*¹⁴⁶ permit if a species at risk or its critical habitat will be affected by the project.¹⁴⁷ No notification to DFO is required if the proponent does not seek an authorization.

POLICY

Once a project is given the green light, a team of MOTI representatives – including biologists, engineers and land acquisition specialists, among others – will perform an assessment of the land proposed for the project, and set out the construction and maintenance standards to be met. These will include environmental provisions and protections. This stage of the process may involve consultations with other provincial or federal ministries when their jurisdiction is implicated. When dealing with large projects, the team itself may include representatives from outside ministries (though this is rare).¹⁴⁸ The ministries that are generally consulted at this phase are BC's Ministry of Environment and Climate Change Strategy and DFO.

MOTI has developed policies and guidelines related to the construction and maintenance of provincial highways that apply to contractors and in each contract, MOTI identifies which guidelines must be followed. These include:

2018 Design Build Standard Specifications for Highway Construction¹⁴⁹

This document requires that the project proponent engage:

- 1) a qualified professional to develop a Construction Environmental Management Plan that is provided to the Ministry in advance of construction; and
- 2) an environmental monitor to ensure that environmental requirements are met during construction. The project proponent remains responsible for following all federal and provincial laws.¹⁵⁰

In addition, “[t]hese Specifications give the Ministry or its Agent the right, but not the obligation, to exercise control over environmental aspects of the Work, and further that The Ministry reserves the right of approval over the general methods employed by the Contractor in the performance of the Work, but only insofar as they may affect compliance with Environmental Approvals and the Contract, and the protection of aquatic and terrestrial resources, the health and safety of public, and protection of socio-community resources and features.”¹⁵¹

Ministry of Transportation and Infrastructure, Information Sheet: Culverts and Fish Passage¹⁵²

This document lays out good practices for culvert design and construction, and states it has been prepared for use by Ministry staff, contractors, and other stakeholders. It confirms that salmon and other fish need access to freshwater habitat for rearing and spawning, and that culvert design and installation are important both for highway construction and maintenance activities, but also for fish and fish habitat.

Forest resource roads

LAW

The Forest Act

The *Forest Act*¹⁵³ gives the Lieutenant-Governor-in-Council (the provincial Cabinet) the power to designate Provincial Crown land as a Provincial forest,¹⁵⁴ and sets out the different types of tenures that can be awarded to authorize the harvesting of timber in a Provincial forest in BC,¹⁵⁵ as well as the rights associated with those tenures. Provincial forests account for about 60 million ha within the area of BC.¹⁵⁶ Two types of tenures, Timber Supply Areas and Tree Farm Licences, have traditionally accounted for most of the tenured area, and have been held by a relatively small number of large forest products companies. As described elsewhere, much of BC's forest tenure system is an "anachronism", reflecting objectives that were established in the 1940s and designed to facilitate conversion of old-growth forest into forests of managed rotation, carried out by large forest product companies.¹⁵⁷

Forest Service Roads are administered by the Ministry of Forests, and more specifically the District Manager.¹⁵⁸ If a road user is of the opinion that a Forest Service Road is not being adequately maintained, they can enter into a Forest Service Road Maintenance Agreement and undertake responsibility for the road.¹⁵⁹

Road permit roads (authorized by a road permit) are built and maintained by tenure holders in order to access a harvest area, along with cutting permit roads (authorized by a cutting permit), which are wholly contained within a cutblock, as opposed to "mainline" roads.

The Forest and Range Practices Act

The *Forest and Range Practices Act* (FRPA) sets out how road permits related to exercising tenure rights are obtained, and legal requirements that must be met before an authorization is given. Before applying for a road permit, a forest licensee must develop a Forest Stewardship Plan¹⁶⁰. An FSP "is a map-based, landscape-level plan of potential forest development activities that are intended to take place in the plan area."¹⁶¹

Section 46 of the FRPA also states that a "person must not carry out a forest practice, a range practice or another activity that results in damage to the environment unless (a) the person is acting in compliance with a plan, permit or authorization under the Act [...] or (b) the person does not know and cannot reasonably be expected to know that, because of weather conditions or site factors, the carrying out of the forest practice, range practice or other activity may result, directly or indirectly, in damage specified by regulation". It is an offence to contravene section 46, and those found liable can be subject to a fine or imprisonment.¹⁶²

The Forest Planning and Practices Regulation (FPPR) and Government Actions Regulation (GAR)

Before applying for a cutting permit or a road permit, a forest licensee must have an approved Forest Stewardship Plan,¹⁶³ and this is typically done by forest professionals (e.g. foresters and engineers) who take responsibility for ensuring that the plan complies with all legal requirements. After a period of public notice,¹⁶⁴ the Forest Stewardship Plan is submitted to the District Manager, who has discretion in approving the Plan. Consultation with First Nations must be carried out before approval.¹⁶⁵

Forest Stewardship Plans must also include requirements set out under the Government Actions Regulation (GAR) of FRPA. GAR gives the minister responsible for the *Wildlife Act*¹⁶⁶ the authority to make orders that are legally binding for forest tenure holders, including the designation of "fisheries sensitive watersheds." The orders must not "unduly affect the supply of timber", nor can they affect existing cutting and road permits.

In particular:

- Fisheries Sensitive Watershed spatial designations are applied to watersheds that have “significant downstream fisheries values and significant watershed sensitivity.”¹⁶⁷ These designations impose additional requirements on any tenure holders, including “conserving the natural hydrological conditions, natural stream bed dynamics and stream channel integrity, and the quality, quantity and timing of water flow, and preventing cumulative hydrological effects that would have a material adverse effect on fish.”¹⁶⁸ The “Fisheries Sensitive Watershed: Default-objectives Designation Procedure” sets out in detail how Fisheries Sensitive Watersheds are designated.¹⁶⁹
- A Fisheries Sensitive Watershed designation is a planning requirement, and therefore, when made, the tenure holder is given two years to fully comply with the order and amend their Forest Stewardship Plan.¹⁷⁰ There are currently 61 Fisheries Sensitive Watersheds in British Columbia.¹⁷¹

Once a forest licensee has an approved Forest Stewardship Plan, they will work with a professional engineer and/or forester who will certify a site plan, or a road plan, which is required before any work can begin. A site plan must “(a) identify the approximate locations of cutblocks and roads, (b) be consistent with the forest stewardship plan, this Act and the regulations, and (c) identify how the intended results or strategies described in the forest stewardship plan apply to the site.”¹⁷² However, “[t]he existence or content of a site plan is not a consideration during the issuance of a cutting permit or road tenure”¹⁷³; in other words, the site plan is not reviewed for compliance before a permit is given. At this stage, the government has less discretion and if the application meets all necessary requirements, it will be accepted.¹⁷⁴

Specifically, regarding roads used to access Crown timber for harvest, the *Forest Act*, section 115 (2) provides that, where an applicant is a forest tenure holder, “[and] Subject to section 81, the minister or timber sales manager **must grant** [emphasis added] to an applicant under subsection (1) a road permit to construct a road on Crown land, if satisfied that the location of the proposed road is identified in a prescribed manner.”¹⁷⁵ However, section 81 allows a district manager to refuse to issue a cutting permit or require specific conditions if the applicant has not met obligations related to a road permit or a road use permit for the tenure and section 81.1 provides that the issuance of a road permit must be refused if it “would compromise government objectives specified by regulation.”¹⁷⁶

FPPR also contains provisions specific to stream crossing construction, maintenance and deactivation:

- Section 55 requires that stream crossings be built in such a way as to mitigate any disturbance to the stream channel and bank.¹⁷⁷
- Section 56 addresses fish passage and states that “[a]n authorized person who carries out a primary forest activity must ensure that the primary forest activity does not have a material adverse effect on fish passage in a fish stream.” The provision also states that this requirement only applies to crossings built after June 15, 1995.¹⁷⁸
- Section 57 addresses the timing of primary forest activities, which include road construction, maintenance and deactivation, stating that these activities must be carried out at “a time and in a manner that is unlikely to harm fish or destroy, damage or harmfully alter fish habitat”.¹⁷⁹
- Sections 56 and 57 make it an offence to contravene certain provisions in the FPPR, including those related to the protection of fish passage and fish habitat. Any individual found liable will face “a fine not exceeding \$500,000 or imprisonment for not more than 2 years or both.”¹⁸⁰
- Under the FPPR, maintenance of road permit roads is the responsibility of the forest licensee, and includes “bridges, culverts, fords and other structures associated with the road.”¹⁸¹ When deactivating a road, bridges, log culvert superstructures and stream pipe culverts must be removed.¹⁸² Responsibility for maintaining the road continues until it is deactivated and a declaration to that effect has been accepted by the district manager.¹⁸³

POLICY

Guidance for Compliance and Enforcement staff regarding interpreting “material adverse effect on fish passage in a fish stream” (which appears in section 56 of the FPPR) is provided in an information bulletin. It notes that a structure in a stream does not need to be a barrier in order to have an adverse effect, and details how to determine if the adverse effect is “material” to the fish populations using the stream. The Information bulletin refers users to a “fish passage scoring model” to aid in assessment.¹⁸⁴

The Ministry of FLNRORD has its own engineering branch that generates engineering guidelines and standards, including the 2018 MFLNRO Engineering Manual, revised in 2019.¹⁸⁵ There are also a number of guidelines and guidebooks in circulation regarding the construction and management of fish stream crossings. In 2007 several ministries came together to form the Fish Passage Technical Working Group, with the aim of remediating problem crossings.¹⁸⁶

Policies and guidelines most relevant to stream crossings and fish passage:	
Fish-stream Crossing Guidebook	“The purpose of this revised guidebook is to help forest and other resource managers and practitioners plan, prescribe, and implement sound fish-stream crossing practices to maintain fish passage and protect fish and fish habitat as required by the <i>Forest and Range Practices Act</i> and the federal <i>Fisheries Act</i> .” ¹⁸⁷
Fish Passage Activity Engineering Standards	This “document is intended to outline the criteria for fish passage restoration projects. Activities are focused on the layout, design, construction and post-construction inspections for the restoration of fish passage at priority fish stream crossings on Forest Service roads (FSRs), Road Permit roads (pre-1995), and non-status roads.” ¹⁸⁸
Resource Road Engineering Manual	<p>The manual maps onto certain provisions of the FPPR, setting out best practices that will comply with the legal requirements. The manual also makes reference to the Fish-stream Crossing Guidebook.</p> <p>The following statement is included; “As with any such policy, procedures and best practices, in exceptional situations where the implementation of a policy, procedure or practice will not result in achieving the expected result, the local decision maker could vary the practice for that specific application. In such cases, the rationale for variation should be clearly documented and placed on the project file.”¹⁸⁹ This indicates that the Ministry of FLNRORD expects a high level of compliance with the manual.</p>

Dikes

LAW

The *Dike Maintenance Act* sets out the powers of the Inspector of Dikes, which include entering on land to inspect dikes, and requiring diking authorities to maintain, repair, and alter dikes, and carry out flood hazard planning.¹⁹⁰ The Act sets out a number of alterations to dikes that require the prior approval of the Inspector of Dikes. The Act also “requires diking authorities to complete annual dike inspection reports to ensure adequate dike performance.”¹⁹¹ The *Dike Maintenance Act* is a short piece of legislation, and there is no mention of fish, fish habitat or passage, or any reference to environmental impacts or considerations. There are no regulations to the Act.

The Inspector of Dikes can require that a diking authority “repair, replace, renew, alter, add to, improve or remove a dike, or a part of a dike, or anything used in connection with a dike.”¹⁹² There is no qualification related to the purpose for which any of these activities would be required.

Under the provincial *Environmental Assessment Act*, an environmental assessment is required for a new dike project that protects an area of $\geq 10 \text{ km}^2$ from flooding, and for modifications to dikes that meet the same criterion and involve raising the height of the dike for its entire length.¹⁹³

Changes to an existing dike or an adjacent area must not take place without the prior written approval of a Deputy Inspector of Dikes or an Inspector of Dikes, including:

- a) the construction of a new dike;
- b) alterations to the cross section or crest elevation of a dike;
- c) any type of construction on or over a dike including: culverts, pipes, flood-boxes, utility lines, pump stations, excavations;
- d) construction of any works on or over a dike right-of-way; and
- e) alteration of the foreshore or stream channel that could increase flood levels or impact dike integrity.¹⁹⁴

The following outlines the process for the approval and construction of a dike, which is similar to the process for a diking upgrade:¹⁹⁵

- 1) A design plan for the dike is prepared, and must be certified by a qualified professional engineer who has expertise in civil engineering and flood protection.
- 2) The applicant then submits the certified designs to the deputy inspector of dikes (and the local diking authority if it is not the proponent) where it undergoes a preliminary review and is assessed against other projects to prioritize among existing demands.
- 3) A more in-depth technical review is undertaken. The government may interact with the proponent or directly with their certifying engineer. Additional document may be requested and the authority may visit the anticipated construction site.
- 4) As appropriate, the government grants approval with conditions.
- 5) Construction begins under the supervision of the engineer. Government staff may also inspect the site from time to time during construction.
- 6) At the end of construction, the engineer submits a signed construction report to the government and the local diking authority, providing a record of the project.

A new dike will only be allowed if a diking authority has agreed to take ownership of it.¹⁹⁶

Fisheries Act¹⁹⁷

The federal *Fisheries Act* contains a number of provisions that have potential application to diking infrastructure and its effects on fish and fish habitat.

Fish passage:	
Section 34.3(1)	provides that the Minister can request that the owner or person that controls something that obstructs fish passage or is detrimental to fish “conduct studies, analyses, samplings and evaluations” and provide them to the Minister.
Section 34.3(2)	provides that to ensure fish passage or the protection of fish or fish habitat, the Minister can order that an obstruction be removed, a fishway be constructed, a catch and release option, the flow needed for fish passage, and downstream flows for fish and fish habitat be maintained.
Section 34.3(3)	provides that the Minister can also order or require repairs and modifications to the thing in question.
Section 34.4(1)	provides that no person shall carry on any work, undertaking or activity, other than fishing, that results in the death of fish (except if authorized).
Section 35 (1)	provides that no person shall carry on any work, undertaking or activity that results in the harmful alteration, disruption or destruction of fish habitat (except if authorized).

POLICY

The following guidelines have been developed for dike construction:

Guidelines for dike construction:	
Dike Design and Construction Guide – Best Management Practices for British Columbia (2003)	<ul style="list-style-type: none">• The guide notes that all works or vegetation removal in or adjacent to waters containing salmon or salmon habitat will require approval from DFO.• Construction of fish friendly structures such as screw pumps and flood boxes with horizontally opening floodgates can minimize fish mortality.• Careful planning and implementing of habitat mitigation, compensation and environmental enhancement measures, within or locally outside the proposed flood protection area, may achieve both flood protection and environmental protection objectives.• In bank protection works, approved vegetation can be incorporated within the rock riprap layer to provide some degree of natural

	vegetation. Acceptable guidelines for vegetation are detailed in the “Guidelines for Vegetation Management” ¹⁹⁸ .
Climate Change Adaption Guidelines for Sea Dikes and Coastal Flood Hazard Land Use Sea Dike Guidelines (2011) ¹⁹⁹	Specifically notes that environmental and land use issues are important but not considered.
Environmental Guidelines for Vegetation Management on Flood Protection Works to Protect Public Safety and the Environment (1999) ²⁰⁰	<ul style="list-style-type: none"> • Applies to Lower Fraser Valley. • Recognizes that in certain situations additional vegetation on or near flood protection works will not compromise their integrity and public safety; however, does not provide criteria to protect sensitive fish habitat. • Provides guidance for setback dikes, overwidth dikes, vegetation clumps. • Notes that extensive diking of Lower Fraser and loss of natural river banks demonstrates the need to provide at least some fish habitat value on dike structures in order to sustain healthy fisheries.
Guidelines for Management of Flood Protection Works in British Columbia (1999) ²⁰¹	Notes that works on flood protection infrastructure will be planned and constructed with “due regard” for environmental needs.
Shoreline Structures Environmental Design: A Guide for Structures along Estuaries and Large Rivers (2002) ²⁰²	Provides detailed guidance for vegetation along dikes that will not compromise dike integrity. Does not address fish passage issues with dikes.

DFO documents:	
Practitioner’s Guide to Fish Passage for DFO Habitat Management Staff (2007) ²⁰³	<ul style="list-style-type: none"> • Sets out a risk-based approach to applying fish passage regulation based on scale of negative effect (geographic, time, intensity) • HADD (harmful alteration, disruption or destruction of fish habitat) provisions apply to works that are going to be undertaken, not existing works.

Application of the Habitat Protection Provisions of the *Fisheries Act* to Existing Facilities and Structures (2007)²⁰⁴

The habitat protection provisions of the *Fisheries Act* apply to the ongoing operation, modification, maintenance or other works and undertakings associated with an existing facility/structure in or near fish-bearing waters, even if the facility or structure was constructed prior to the enactment of those provisions.

- Compliance with the habitat protection provisions of the *Fisheries Act* is mandatory.
- Compliance will be encouraged through communication with owners/operators of existing facilities/structures to clarify the requirements of habitat protection provisions.
- Enforcement actions will be undertaken in a manner that is fair, predictable, and consistent. Rules, sanctions and processes securely founded in law will be used.

Priority for enforcement action will be guided by:

- the degree of harm to fish and fish habitat caused by the existing facility/structure, or the risk of that harm; and
- situational factors to be considered to achieve compliance.

Owners/operators are responsible for ensuring that their existing facilities and structures operate in compliance with the *Fisheries Act*, regardless of when these facilities and structures were constructed or whether they have provincial permits, licences or other government approval. The fact that a facility or structure existed prior to the enactment of the habitat protection provisions of the *Fisheries Act* should not, on its own, prevent DFO from fulfilling its legislated responsibilities to regulate impacts to fish and fish habitat, in relation to the ongoing operation, modification or maintenance of an existing facility/structure.

The footprint of the existing facility/structure, however, is not subject to the habitat protection provisions of the *Fisheries Act* if its construction precedes the enactment of those provisions.

References

- ¹ See for example, Michael Price *et al* “Canada’s Wild Salmon Policy: an assessment of conservation progress in British Columbia,” (2017) *Canadian Journal of Fisheries and Aquatic Science* 74:1507, online: <https://cdnsiencepub.com/doi/pdf/10.1139/cjfas-2017-0127> ; Union of BC Indian Chiefs, First Nations Leaders Declare Collapse of Pacific Sockeye, Press Release, August 18, 2020, online: https://www.ubcic.bc.ca/first_nations_leaders_declare_collapse_of_pacific_sockeye ; Riley J.R. Finn *et al*, “Quantifying lost and inaccessible habitat for Pacific salmon in Canada’s Lower Fraser River,” *Ecosphere* 12:7 2021 <https://doi.org/10.1002/ecs2.3646>
- ² Scott G. Hinch *et al*, *A Review of Potential Climate Change Effects on Survival of Fraser River Sockeye Salmon and an Analysis of Interannual Trends in En Route Loss and Pre-spawn Mortality* (2011) The Cohen Commission of Inquiry into the Decline of Sockeye Salmon in the Fraser River, Technical Report 9, online: <https://www.watershed-watch.org/wp-content/uploads/2011/06/Exh-553-NonRT.pdf>
- ³ Office of the Auditor General of Canada. 1999. Pacific salmon: sustainability of the fisheries. Chapter 20, online: https://publications.gc.ca/collections/collection_2016/bvg-oag/FA1-1999-3-20-eng.pdf ; William W.L. Cheung *et al*, “Marine high temperature extremes amplify the impacts of climate change on fish and fisheries,” 2021 *Science Advances* 7:40, online: <https://www.science.org/doi/10.1126/sciadv.abho895>
- ⁴ Erik R. Schoen, “Insights into drivers of population declines offer a ray of hope for migratory fishes in the temperate rainforest,” *Commentary, Global Change Biology*, October 2021, online: DOI: 10.1111/gcb.15948 ; K.L. Wilson, *et al* (2021). Marine and freshwater regime changes impact a community of migratory Pacific salmonids in decline. *Global Change Biology* 2021,28:72–85. <https://doi.org/10.1111/gcb.15895>;
- ⁵ For example: BC Salmon Restoration and Innovation Fund (\$142.85 million over 5 years, up to March 31, 2024) <https://www.dfo-mpo.gc.ca/fisheries-peches/initiatives/fish-fund-bc-fonds-peche-cb/index-eng.html> ; Coastal Restoration Fund (\$75 million 2018 – 2022, projects across Canada) online: <https://www.dfo-mpo.gc.ca/oceans/crf-frc/description-eng.html> ; Canada Nature Fund for Aquatic Species at Risk (CNFASAR) (\$78 million 2018 -2025, projects across Canada), online: <https://www.dfo-mpo.gc.ca/species-especies/sara-lep/cnfasar-fnceap/overview/index-eng.html>
- ⁶ Grant programs also typically only exist for short periods of time, and fund projects with even shorter time frames.
- ⁷ Emma E. Hodgson *et al* “Moving Beyond Siloes in Cumulative Effects Assessment” (2019) *Frontiers in Ecology and Evolution*, online: <https://www.frontiersin.org/articles/10.3389/fevo.2019.00211/full>
- ⁸ There is no single, agreed-upon definition of cumulative effects. How we define cumulative effects reflects our understanding of how effects accumulate and interact in a landscape, such as a watershed, and directs how we decide to investigate and manage cumulative effects, suggesting that definitions can usefully evolve over time, and in relation to landscapes. The corollary to this is that we should be self-conscious about the definitions we are using to develop specific cumulative effects management tools and practices. Peter N. Duinker *et al* “Scientific dimensions of cumulative effects assessment: toward improvements in guidance for practice,” (2012) *Environmental Reviews* 21:40-52; See also Emma E. Hodgson *et al* “Moving Beyond Siloes in Cumulative Effects Assessment” (2019) *Frontiers in Ecology and Evolution*, online: <https://www.frontiersin.org/articles/10.3389/fevo.2019.00211/full>
- ⁹ In this report federal and provincial “law” refers to statutes, regulations and orders. Laws and regulations are used somewhat interchangeably in the narrative, but it should be noted that while statutes can only be modified by legislatures, regulations may be developed (according to the enabling legislation) by Cabinet, Ministers and their delegated authorities, as specified in the legislation. Both laws and regulations have legal effect, although the language used may be open to interpretation, such as when a Minister is directed to “consider” something in making a decision. An example is the *Forest and Range Practices Act* and Government Action Regulations. “Policies” include not legally binding, but written guidance from federal or provincial government authorities. Sometimes policies are developed by authorities in response to laws and regulations, to support their implementation, and sometimes they are developed to fill in perceived gaps in legislation, although this may limit their ability to influence regulatory decision-making. An example of the latter is the provincial Cumulative Effects Framework. Both examples are discussed in more detail later this report.
- ¹⁰ Jessica Clogg *et al*, *Padding Together: Co-Governance Models for Regional Cumulative Effects Management* (2017) West Coast Environmental Law, online: <https://www.wcel.org/sites/default/files/publications/2017-06-wcel-paddingtogether-report.pdf> and Linda Nowlan *et al*, *Literature Review & Analysis of Shared Indigenous and Crown Governance in Marine Protected Areas* (2019) Coastal First Nations Great Bear Initiative and West Coast Environmental Law, online: <https://www.wcel.org/sites/default/files/publications/2019-11-cfn-wcel-cogov-study-analysis.pdf>
- ¹¹ Peter Duinker and Lorne A. Greig, “The Impotence of Cumulative Effects Assessment in Canada: Ailments and Ideas for Redeployment” (2006) *Environmental Management* 37(2):153-61, online: https://www.researchgate.net/publication/7408890_The_Impotence_of_Cumulative_Effects_Assessment_in_Canada_Ailme

nts_and_Ideas_for_Redeployment and Monique Dube, *Assessing Cumulative Effects of Canadian Waters* (2015), Canada Water Network, online: <https://cwn-rce.ca/wp-content/uploads/2015/04/CWN-EN-Dube-2014-5Pager-Web.pdf>

¹² Lindsay Staples (lead author) and Hannah Askew, *Regional Strategic Environmental Assessment for Northern British Columbia: the Case and the Opportunity* (2016), West Coast Environmental Law and Northwest Institute for Regional Research, online: https://www.wcel.org/sites/default/files/publications/WCEL_NBCenviroAssess_report_FINAL_o.pdf

¹³ Jessica Walsh et al “Prioritizing conservation actions for Pacific salmon in Canada” (2020) *Journal of Applied Ecology*, online: <https://doi.org/10.1111/1365-2664.13646>

¹⁴ Carol Bellringer, *Managing the Cumulative Effects of Natural Resource Development in BC* (2015) British Columbia Auditor General, online:

<https://www.bcauditor.com/sites/default/files/publications/reports/OAGBC%20Cumulative%20Effects%20FINAL.pdf>

¹⁵ See Cathryn Murray et al, *A Review of Cumulative Effects Research and Assessment in Fisheries and Oceans Canada* (2020) Canadian Technical Report of Fisheries and Aquatic Sciences 3357, online at: <https://waves-vagues.dfo-mpo.gc.ca/Library/40851576.pdf>

¹⁶ See the thoughtful discussion and guidance about ethical space as “a venue for collaboration and advice, sharing and cross-validation” that “respects the integrity of all knowledge systems” in *We Rise Together: Achieving Pathway to Canada Target 1 through the creation of Indigenous Protected and Conserved Areas in the spirit and practice of reconciliation*, The Indigenous Circle of Experts’ Report and Recommendations, March 2018, online at:

https://static1.squarespace.com/static/57e007452e69cf9a7afoa033/t/5ab94aca6d2a7338ecb1d05e/1522092766605/PA234-ICE_Report_2018_Mar_22_web.pdf

¹⁷ Rachel Buxton et al “Key information needs to move from knowledge to action for biodiversity conservation in Canada,” (2021) *Biological Conservation* online at: <https://www.sciencedirect.com/science/article/pii/S0006320721000355?via%3Dihub>

¹⁸ Issued pursuant to *Environmental Assessment Act*, SBC 2018, c 51, s 29(4)(c)(i).

¹⁹ “Roads and Roadless Areas in British Columbia”, (accessed 11 August 2020), online: *Environmental Reporting BC* <<http://www.env.gov.bc.ca/soe/indicators/land/roads.html>>. In 2015 the Forest Practices Board indicated that “at least 800,000 km of roads have been constructed in British Columbia”. The discrepancy may relate in part to roads that have been decommissioned. See Forest Practices Board, *Access Management and Resource Roads: 2015 Update* (2015) online: <https://www.bcfpb.ca/wp-content/uploads/2015/04/SR49-Access-Management-2015-Update.pdf>

²⁰ *Yahey v British Columbia*, 2021 BCSC 1287 (CanLII), <https://canlii.ca/t/jgpbr> From the decision, at paras 905-906:

“I conclude, as the 2016 Atlas demonstrates, that based upon the data available as of January 2016:

- a. 73% of the Blueberry Claim Area is within 250 metres of an industrial disturbance; and,
- b. 84% of the Blueberry Claim Area is within 500 metres of an industrial disturbance.

I also conclude, as the Regional Strategic Environmental Assessment’s 2018 disturbance datasets demonstrate, that, by September 2018, the level of disturbance in the Blueberry Claim Area was as follows:

- a. 85% of the Blueberry Claim Area is disturbed when a 250-metre buffer is applied; and,
- b. 91% of the Blueberry Claim Area is disturbed when a 500-metre buffer is applied.”

²¹ Auditor General of BC, *Managing the Cumulative Effects of Natural Resource Development in B.C.* (2015) at 26, online: <https://www.bcauditor.com/sites/default/files/publications/reports/OAGBC%20Cumulative%20Effects%20FINAL.pdf>

²² Earlier forms of planning were generally in response to conflicts among resource users, were at a smaller scale, and included “coordinated access management plans, integrated watershed management plans, coordinated resource management plans and local resource use plans,” carried out by provincial staff. See Forest Practices Board, *Provincial Land Use Planning: Which Way from Here?* FPB/SR/34 (2008) at 5, online: <https://www.bcfpb.ca/wp-content/uploads/2008/11/SR34-Provincial-Land-Use-Planning.pdf>

²³ See Jessica Clogg et al, *Paddling Together: Co-Governance Models for Regional Cumulative Effects Management* (2017) West Coast Environmental Law, online: <https://www.wcel.org/sites/default/files/publications/2017-06-wcel-paddlingtogether-report.pdf>; see also Oliver Brandes et al *Towards Watershed Security: The role of water in modernized land use planning in British Columbia*, July 2020, Polis Water Sustainability Project, online:

<https://poliswaterproject.org/files/2020/07/DirectionPaperTWS.pdf>

²⁴ Forest Practices Board, *Provincial Land Use Planning: Which way from here?* (2008) FPB/SR/34, online: <https://www.bcfpb.ca/wp-content/uploads/2008/11/SR34-Provincial-Land-Use-Planning.pdf>

²⁵ Jessica Clogg and Deborah Carlson, *Land Use Planning for Nature, Climate and Communities: Taking Stock and Moving Forward* (2013) West Coast Environmental Law, at 5, online:

https://www.wcel.org/sites/default/files/publications/WCEL_LandUse_report_web_o.pdf

²⁶ *Ibid*, at 11-12.

²⁷ Province of British Columbia, “South Coast Regional Land Use Plans,”

<https://www2.gov.bc.ca/gov/content/industry/crown-land-water/land-use-planning/regions/south-coast-region-plans> Instead the Chilliwack and Sunshine Coast Natural Resource Districts have Landscape Unit Plans that were developed administratively.

²⁸ In 2018, the B.C. government committed \$16 million over three years to work collaboratively with Indigenous governments, communities, and stakeholders to modernize land use planning. See Government of British Columbia, “Land Use Planning for

Provincial Public Land” (accessed 4 February 2022), online: <https://www2.gov.bc.ca/gov/content/industry/crown-land-water/land-use-planning>

²⁹ Government of British Columbia, “Cumulative Effects Framework Overview” (accessed 4 February 2022), online: <https://www2.gov.bc.ca/gov/content/environment/natural-resource-stewardship/cumulative-effects-framework/overview>

³⁰ Province of British Columbia, *Cumulative Effects Framework: Interim Policy for the Natural Resource Sector* (2016), online: https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/cumulative-effects/cef-interimpolicy-oct_14_-2_2016_signed.pdf S. 13.1.1 states that CEF assessments, where available, “should be considered” in decisions about natural resource authorizations, but CEF assessments do not affect existing legal requirements or create any new ones.

³¹ Fisheries and Oceans Canada, *Wild Salmon Policy 2018-2022 Implementation Plan*, at 13, online: <https://www.pac.dfo-mpo.gc.ca/fm-gp/salmon-saumon/wsp-pss/ip-pmo/index-eng.html>

³² *Fisheries Act*, RSC 1985, c F-14, s.34.1 (1)(d).

³³ *Water Sustainability Act*, SBC 2014, c 15, Division 4.

³⁴ The Nicola Watershed Pilot is exploring how Water Sustainability Plans could be used to support government-to-government arrangements for watershed management between the Province and Indigenous nations, in this case the Nlaka’pamux and Syilx peoples of the Nicola Valley. See Nicola Watershed Pilot Memorandum of Understanding (23 March 2018), online: https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/consulting-with-first-nations/agreements/nicola_watershed_pilot_mou_-_signed_2018.pdf

³⁵ *Environment and Land Use Act*, RSBC 1996, c 117, s 7. An order under this statute was made, for example, to support implementation of the Great Bear Rainforest Agreements to prohibit commercial logging and hydroelectric development in certain areas. See Jessica Clogg *et al*, *Paddling Together: Co-Governance Models for Regional Cumulative Effects Management* (2017) West Coast Environmental Law, at 74, online: <https://www.wcel.org/sites/default/files/publications/2017-06-wcel-paddlingtogether-report.pdf>;

³⁶ *Land Act*, RSBC 1996 c 245, ss 93.1, 93.3 (text of provisions reviewable here:

<https://www.bclaws.gov.bc.ca/civix/document/id/bills/billsprevious/4th37th:gov46-1>).

³⁷ *Impact Assessment Act*, SC 2019, c 28, s 1, at ss 92, 95; *Environmental Assessment Act*, SBC 2018, c 51, ss 35, 73.

³⁸ *Yahey v British Columbia*, 2021 BCSC 1287 (CanLII), <https://canlii.ca/t/jgpbr> The Court declared that the Province could not continue to make authorizations that infringed the treaty, but paused this for six months so that the Province and Blueberry River First Nations could attempt to negotiate about enforceable mechanisms to manage cumulative impacts on treaty rights. Notably the Province did not appeal the case.

³⁹ Riley J.R. Finn *et al*, “Quantifying lost and inaccessible habitat for Pacific salmon in Canada’s Lower Fraser River,” *Ecosphere* 12:7 2021 <https://doi.org/10.1002/ecs2.3646>

⁴⁰ Alan R. Thomson *et al* Study of Flood Proofing Barriers in Lower Mainland fish Bearing Streams (1999) Department of Fisheries and Oceans, online: <https://waves-vagues.dfo-mpo.gc.ca/Library/356770.pdf>

⁴¹ Peter A. Bisson *et al* “Freshwater Ecosystems and Resilience of Pacific Salmon: Habitat Management Based on Natural Variability” (2009) 14:1 *Ecology and Society* online:

https://www.jstor.org/stable/26268060?seq=1#metadata_info_tab_contents; Erik R. Schoen *et al* “Future of Pacific Salmon in the Face of Environmental Change: Lessons from One of the World’s Remaining Productive Salmon Regions,” *Fisheries* (2017) 42:10, 538-553 online:

https://www.researchgate.net/publication/320604700_Future_of_Pacific_Salmon_in_the_Face_of_Environmental_Change_Lessons_from_One_of_the_World's_Remaining_Productive_Salmon_Regions

⁴² Chante D. Davis *et al* “Identification of multiple genetically distinct populations of Chinook salmon (*Oncorhynchus tshawytscha*) in a small coastal watershed” (2017) *Environmental Biology of Fishes* Vol 100, 923-933 online:

<https://link.springer.com/article/10.1007/s10641-017-0616-z>

⁴³ Michael H. H. Price *et al* “Portfolio simplification arising from a century of change in salmon population diversity and artificial production” (2021) *Journal of Applied Ecology* 58(7), online:

https://www.researchgate.net/publication/349497518_Portfolio_simplification_arising_from_a_century_of_change_in_salmon_population_diversity_and_artificial_production See also Fisheries and Oceans Canada, Canada’s policy for conservation of wild Pacific salmon (2005), at 10, online: <https://waves-vagues.dfo-mpo.gc.ca/Library/315577.pdf>. “[P]ersistence of salmon within the CU [conservation unit], and its associated production, demand responsible management of its population structure and habitats, as well as the ability of fish to move among habitat areas (connectivity).”

⁴⁴ Fish Passage Technical Working Group (British Columbia Ministry of Environment, British Columbia Ministry of Forests, Lands and Natural Resource Operations, British Columbia Timber Sales, British Columbia Ministry of Transportation and Infrastructure), *Fish Passage Strategic Approach: Protocol for Prioritizing Sites for Fish Passage Remediation* (June 2014), at 7 online: <https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/fish-fish-habitat/fish-passage/strategic20approach20july202014.pdf>, citing TG Northcote and GF Hartman, 2004, *Fishes and Forestry: Worldwide Watershed Interactions and Management*.

⁴⁵ “Roads and Roadless Areas in British Columbia”, (accessed 11 August 2020), online: *Environmental Reporting BC* <<http://www.env.gov.bc.ca/soe/indicators/land/roads.html>>. In 2015 the Forest Practices Board indicated that “at least 800,000 km of roads have been constructed in British Columbia”. The discrepancy may relate in part to roads that have been

decommissioned. See Forest Practices Board, *Access Management and Resource Roads: 2015 Update* (2015) online: <https://www.bcfpb.ca/wp-content/uploads/2015/04/SR49-Access-Management-2015-Update.pdf>

⁴⁶ Johnathan Tillie, Environmental Programs Policy & Standards, Environmental Management Branch, Ministry of Transportation and Infrastructure. [communication to West Coast Environmental Law]

⁴⁷ “Resource roads are constructed to develop, protect and access B.C.’s natural resources. They are used primarily by industrial vehicles engaged in forestry, mining, oil and gas or agriculture operations.” Government of British Columbia, “Resource Roads” (accessed 11 August 2020), online: <<https://www2.gov.bc.ca/gov/content/industry/natural-resource-use/resource-roads>>.

⁴⁸ *Ibid.*

⁴⁹ British Columbia, Forest Practices Board, *Access Management and Resource Roads: 2015 Update – Special Report* (April 2015) at 8, online: <https://www.bcfpb.ca/wp-content/uploads/2015/04/SR49-Access-Management-2015-Update.pdf>.

⁵⁰ Forest Practices Board, Special Investigation: Conserving Fish Habitat under the Forest and Range Practices Act, Part 2: An Evaluation of Forest and Range Practices on the Ground (2020), online: <https://www.bcfpb.ca/wp-content/uploads/2020/05/SIR52-Fish-Habitat-Conservation-Part2.pdf>

⁵¹ British Columbia, Forest Practices Board, *Fish Passage at Stream Crossings – Special Investigation* (January 2009), online: <https://www.bcfpb.ca/wp-content/uploads/2016/04/SIR25-Fish-Passage-at-Stream-Crossings.pdf>.

⁵² *Ibid* at 1.

⁵³ “Fish Passage Technical Direction” Government of BC, online: <https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/fish/aquatic-habitat-management/fish-passage/fish-passage-technical> PSCIS data can be viewed on iMapBC: https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/land-based-investment/using_imapbc_to_explore_fish_passage_pscis_data.pdf

⁵⁴ British Columbia, British Columbia Ministry of Environment, British Columbia Ministry of Forests, Lands and Natural Resource Operations, British Columbia Timber Sales, British Columbia Ministry of Transportation and Infrastructure, *Fish Passage Strategic Approach: Protocol for Prioritizing Sites for Fish Passage Remediation* (June 2014), at 7, online: <https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/fish-fish-habitat/fish-passage/strategic20approach20july202014.pdf?bcgovtm=buffer>

⁵⁵ Sacha M. O’Regan, *BC Fish Passage Program Annual Report 2020–2021*, prepared for BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development Land Based Investment Strategy (LBIS) And Inter-Agency Fish Passage Technical Working Group, online: https://www2.gov.bc.ca/assets/gov/sports-recreation-arts-and-culture/outdoor-recreation/fishing-and-hunting/freshwater-fishing/fish-passage/bcts_fish_passage_annual_report_2020-2021.pdf See also Government of British Columbia, “Fish Passage” (accessed 4 February 2022), online: <<https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/fish/aquatic-habitat-management/fish-passage>>. See also Sarah Boon and Ian Miller, “Remediation of Fish Passage at Stream Crossings on BC’s Forest Roads” *BC Forest Professional*, May – June 2015 at 22. Online: https://abcfp.ca/WEB/abcfp/Files/magazine/BCFORPRO-2015-3_Full_Issue.pdf

⁵⁶ Government of British Columbia, “Dike Management”, (accessed 4 February 2022), online: <<https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/drought-flooding-dikes-dams/integrated-flood-hazard-management/dike-management>>.

⁵⁷ BC Ministry of Environment, Lands and Parks, Fisheries and Oceans Canada, *Environmental Guidelines for Vegetation Management on Flood Protection Works to Protect Public Safety and the Environment*, Appendix B, Fish Habitat and Dike Maintenance Activities, (1999) online: http://www.env.gov.bc.ca/wsd/public_safety/flood/pdfs_word/env_gd_veg_man.pdf

⁵⁸ Riley J.R. Finn *et al*, “Quantifying lost and inaccessible habitat for Pacific salmon in Canada’s Lower Fraser River,” *Ecosphere* 12:7 2021 <https://doi.org/10.1002/ecs2.3646>

⁵⁹ See, for example, Rebecca Seifert and Jonathan Moore, “Floodgate Operations and Fish Communities in Tidal Creeks of the Lower Fraser River (British Columbia, Canada)” (2018) *Estuaries and Coasts* 41:1206, online: <https://link.springer.com/article/10.1007/s12237-017-0313-3> See also David Scott *et al* “Flood control structures in tidal creeks associated with reduction in nursery potential for native fishes and creation of hot-spots for invasive species” (2015) *Canadian Journal of Fisheries and Aquatic Sciences*, online: <https://tspace.library.utoronto.ca/bitstream/1807/72834/1/cjfas-2015-0311.pdf> and Marvin Rosenau and Mark Angelo, *Conflicts Between Agriculture and Salmon in the Eastern Fraser Valley* (2005) Pacific Fisheries Resource Conservation Council, online: <https://www.for.gov.bc.ca/HFD/library/Documents/bib94906.pdf>

⁶⁰ Alan R. Thomson *et al Study of Flood Proofing Barriers in Lower Mainland fish Bearing Streams* (1999) Department of Fisheries and Oceans, at 1 (PDF p 10), online: <https://waves-vagues.dfo-mpo.gc.ca/Library/356770.pdf>

⁶¹ *Ibid.* See also Bierschenk, Beate & Pander, Joachim & Müller, Melanie & Geist, Juergen. “Fish injury and mortality at pumping stations: A comparison of conventional and fish-friendly pumps” *Marine and Freshwater Research*. (2018). DOI: 10.1071/MF18116

⁶² The spatial component is particularly relevant for barriers to passage for salmon in watersheds. “Barriers can dramatically impact the fraction of the watershed accessible to migratory salmonids, potentially removing the ideal habitat. The lost habitat may have been particularly suitable for certain species and particular life stages:” M.B. Sheer and E.A. Steel, “Lost Watersheds: Barriers, Aquatic Habitat Connectivity, and Salmon Persistence in the Willamette and Lower Columbia River Basins” *Transactions of the American Fisheries Society* 135:6, 1654-69, at 1655, online:

https://www.fs.fed.us/pnw/lwm/aem/docs/steel/2006_sheer_and_steel_lost_watersheds.pdf Here we are interested in whether the regulatory tools are linked to objectives or management processes at the watershed or sub-watershed that set limits on harm to salmon habitat.

⁶³ Masashi Soshia and Kevin J. Gaston, “Shifting baseline syndrome: causes, consequences, and implications” *Frontiers in Ecology and the Environment* 16:4, 222-30, online: <https://doi.org/10.1002/fee.1794>

⁶⁴ Here we have chosen to look at ‘active management’ as an indication of a level of responsiveness of regulatory mechanisms to monitoring feedback and/or new information and/or regulator priorities when any of those would affect management objectives in relation to cumulative effects. A further inquiry would be to explore the possibilities for *adaptive management*. The opportunities for adaptive management in relation to oft-repeated, routine decision-making are identified in Charles K. Minns, “Canadian Fish Habitat Management: Symptoms and Remedies”, *American Fisheries Society Symposium* 2015, 78:213-48 at 229. “AM [adaptive management] requires recurring, continuous cycles of assessment, planning, implementation, monitoring, evaluation and adjustment, and provides a formal framework for learning by doing...The numbers of referrals and the repetition levels of many activities in fish habitat management could provide the scope for active AM with large-scale experimentation to foster a shift to net gain.” In the regulations we examined, there was little opportunity for what we have termed active management, within the existing regulatory framework, so we didn’t address adaptive management, but this could be a design consideration for the development of future regulations. In this case, we suggest the question would be something like: Is it possible to apply the regulatory tool in an experimental framework and gauge relative effectiveness through ongoing monitoring, assessment and adjustment?

⁶⁵ *Transportation Act*, SBC 2004, c 44, s 57 [*Transportation Act*].

⁶⁶ *Transportation Act*, ss 1-2.

⁶⁷ *Transportation Act*, s 84.

⁶⁸ *Transportation Act*, ss 3-4.

⁶⁹ *Environmental Assessment Act*, SBC 2018, c 51, Reviewable Projects Regulation, BC Reg 243/2019, online: https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/243_2019

⁷⁰ SBC 2014, c 15.

⁷¹ BC Reg 36/2016, Part 3.

⁷² WSA ss 11, 124(1)(b).

⁷³ WSA ss 16, 17. See also BC Ministry of Environment, Policy for Mitigating Impacts on Environmental Values (2014), online: https://www2.gov.bc.ca/assets/gov/environment/natural-resource-policy-legislation/environmental-mitigation-policy/em_policy_may13_2014.pdf and Procedures for Mitigating Impacts on Environmental Values (Environmental Mitigation Procedures) (2014), online: https://www2.gov.bc.ca/assets/gov/environment/natural-resource-policy-legislation/environmental-mitigation-policy/em_procedures_may27_2014.pdf

⁷⁴ Fisheries and Oceans Canada, “Policy for Applying Measures to Offset Adverse Effects on Fish and Fish Habitat Under the *Fisheries Act*” (December 2019), online: <https://waves-vagues.dfo-mpo.gc.ca/library-bibliotheque/40939698.pdf>

⁷⁵ See for example BC Ministry of Water, Land and Air Protection, “Standards and Best Practices for Instream Works”, online: https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/bc-timber-sales/ems-sfm-certification/business-area/kamloops/standards_bmp_for_instream_works_2004.pdf and Government of British Columbia, Fisheries and Oceans Canada, “Standards and Best Practices for Instream Works – Culverts,” online: <https://waves-vagues.dfo-mpo.gc.ca/Library/40793977.pdf> This document also notes that clear-span bridges are preferred to culverts.

⁷⁶ *Fisheries Act*, RSC 1985, c F-14, s 34.3(1), (2).

⁷⁷ *Water Sustainability Act*, SBC 2014, c 15, ss 106(1)(b), 109(1)(b), 112.

⁷⁸ Although the same report notes that a further 60,000 km of roads of unknown origin may be roads that were constructed by the forest industry before reporting was required. Forest Practices Board, “Access Management and Resource Roads: 2015 Update” (2015), at 8, online: <https://www.bcfpb.ca/wp-content/uploads/2015/04/SR49-Access-Management-2015-Update.pdf>

⁷⁹ *Forest Act*, RSBC 1997, c 157, s 121.

⁸⁰ Government of British Columbia, “Resource Roads” (accessed 4 February 2022), online: <https://www2.gov.bc.ca/gov/content/industry/natural-resource-use/resource-roads>

⁸¹ *Forest Act*, RSBC 1996, c 157.

⁸² *Forest and Range Practices Act*, SBC 2002, c 69.

⁸³ Forest Planning and Practices Regulation, BC Reg 14/2004 (“FPPR”).

⁸⁴ Government Actions Regulation, BC Reg 582/2004.

⁸⁵ BC Ministry of Forests, Lands and Natural Resource Operation, Ministry of Environment and Fisheries and Oceans Canada, *Fish-stream Crossing Guidebook* (September 2012), online: <https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/fish-fish-habitat/fish-passage/fish-stream2ocrossing2oweb.pdf>

⁸⁶ “1.2 Types of Roads & Applicable Permits or Authorizations” (accessed 4 February 2022), online: *BC Government* <<https://www2.gov.bc.ca/gov/content/industry/natural-resource-use/resource-roads/engineering-publications-permits/engineering-manual/road-administration-introduction/road-administration-road-types-permits>>.]

⁸⁷ Despite the number, it should be noted that these designations are still relatively exceptional in relation to the area of Provincial Forest Land.

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- ⁸⁸ FPPR, s 8.1(3).
- ⁸⁹ *Forest Act*, RSBC 1996, c 157, at s 81.1.
- ⁹⁰ *Forest Act*, RSBC 1996, c 157, at s 81.
- ⁹¹ Government of British Columbia, Ministry of Forests, Lands, Natural Resource Operations and Rural Development, Cutting Permit and Road Tenure Administration Manual, September 2020, Section 3, Road Tenure Administration, at 96, online: https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/timber-tenures/cutting-permit-road-tenure-admin/cp_rp_manual_september_2020.pdf
- ⁹² Forest Planning and Practices Regulation, BC Reg 14/2004, at ss. 55-57.
- ⁹³ *Ibid*, s 55.
- ⁹⁴ *Ibid*, s 56.
- ⁹⁵ Forest Practices Board, *Special Investigation: Conserving Fish Habitat under the Forest and Range Practices Act PART 2: An Evaluation of Forest and Range Practices on the Ground*, May 2020, at 11. Online: <https://www.bcfpb.ca/wp-content/uploads/2020/05/SIR52-Fish-Habitat-Conservation-Part2.pdf>
- ⁹⁶ Government Actions Regulation, BC Reg 582/2004, at s 14.
- ⁹⁷ *Ibid*, at 12, and note viii. The FPB report refers to the provincial Forest & Range Evaluation Program criterion for sediment deposition into a stream at a crossing (i.e., < 1.0m³/year), but notes that in a tenure area with 76 crossings this could add up to 76m³/year.
- ⁹⁸ Forest Practices Board, *Special Report: Conserving Fish Habitats under the Forest and Range Practices Act PART 1: A Review of the BC Government Approach*, July 2018 at 12, online: <https://www.bcfpb.ca/wp-content/uploads/2018/07/SR56-Fish-Habitat-Conservation.pdf>
- ⁹⁹ FPPR, s 79.
- ¹⁰⁰ FRPA, s 107.
- ¹⁰¹ FPPR, s 82.
- ¹⁰² Forest Practices Board, *Special Report on The Forest and Range Evaluation Program* (November 2017), at 11-12, online: <https://www.bcfpb.ca/wp-content/uploads/2017/11/SR54-Forest-Range-Evaluation-Program.pdf>.
- ¹⁰³ *Ibid*, at 14-15.
- ¹⁰⁴ Kevin Kilpatrick, Senior Timber Tenures Forester. [communication with West Coast Environmental Law]
- ¹⁰⁵ Government of British Columbia, “Dike Management”, (accessed 4 February 2022), online: <https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/drought-flooding-dikes-dams/integrated-flood-hazard-management/dike-management>
- ¹⁰⁶ Ministry of Environment and Ministry of Forests, Lands and Natural Resource Operations, “Policy: Diking Authorities for New Dikes,” December 27 February 2017, online: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/water-rights/diking_authorities_for_new_dikes_policy.pdf
- ¹⁰⁷ A study commissioned by the Province found that more than 70% of the existing dikes in the Lower Fraser region did not meet current standards, and, further, that investing in bringing them up to standard could be prohibitively expensive. Ministry of Forests, Lands and Natural Resource Operations, Lower Mainland Dike Assessment – Final Report (2015), prepared by Northwest Hydraulic Consultants, online: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/integrated-flood-hazard-mgmt/nhc_final_lower_mainland_dike_assessment.pdf
- ¹⁰⁸ *Emergency Program Act*, RSBC 1996, c 111, Compensation and Disaster Financial Assistance Regulation, BC Reg 124/95, online: https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/124_95
- ¹⁰⁹ Province of British Columbia, *Flood Hazard Land Use Management Guidelines* (amended 2018), at s. 3.5.3, online: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/integrated-flood-hazard-mgmt/flood_hazard_area_land_use_guidelines_2017.pdf
- ¹¹⁰ City of Richmond, “Flood Protection”, online: <https://www.richmond.ca/services/rdws/dikes.htm> and City of Surrey, “Flood Control and Protection”, online: <https://www.surrey.ca/services-payments/water-drainage-sewer/flood-control-and-prevention>
- ¹¹¹ Fraser Basin Council, *Environmental Protection in Flood Hazard Management, A Guide for Practitioners* (2010), online: https://www.fraserbasin.bc.ca/_Library/Water/report_flood_and_environmental_protection_2010.pdf
- ¹¹² *Dike Maintenance Act*, RSBC 1996, c 95, s 2(2)(b).
- ¹¹³ Fisheries and Oceans Canada, *Application of the Habitat Protection Provisions of the Fisheries Act to Existing Facilities and Structures* (2007), at 2, online: https://publications.gc.ca/collection_2008/dfo-mpo/Fs23-529-2007E.pdf
- ¹¹⁴ Fraser Basin Council, *Environmental Protection in Flood Hazard Management, A Guide for Practitioners* (2010), online: https://www.fraserbasin.bc.ca/_Library/Water/report_flood_and_environmental_protection_2010.pdf
- ¹¹⁵ Alan R. Thomson *et al Study of Flood Proofing Barriers in Lower Mainland fish Bearing Streams* (1999) Department of Fisheries and Oceans, online: <https://waves-vagues.dfo-mpo.gc.ca/Library/356770.pdf>
- ¹¹⁶ Government of British Columbia Ministry of Water, Land and Air Protection, *Dike Design and Construction Guide – Best Management Practices for British Columbia* (2003), at 2-40, online: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/integrated-flood-hazard-mgmt/dike_des_cons_guide_july-2011.pdf

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- ¹¹⁷ Province of British Columbia Ministry of Water, Land and Air Protection, *Dike Design and Construction Guide – Best Management Practices for British Columbia* (July 2003), at 2-40, online: https://www2.gov.bc.ca/assets/gov/environment/air-land-water/water/integrated-flood-hazard-mgmt/dike_des_cons_guide_july-2011.pdf
- ¹¹⁸ For example, an Insights West poll from July 2021 commissioned by Wild First found that 86% of British Columbians are concerned about declining wild salmon stocks. Online: <https://www.wildfirst.ca/news/vast-majority-of-british-columbians-86-are-concerned-about-declining-wild-salmon-stocks/>
- ¹¹⁹ *Yahey v British Columbia* 2021 BCSC 1287 (CanLII), <https://canlii.ca/t/jgpbr> at paras 1592-1594. Citing Forest Practices Board, *Cumulative Effects: From Assessment Towards Management*, FPB/SR/39 (March 2011), online: <https://www.bcfpb.ca/wp-content/uploads/2016/04/SR39-Cumulative-Effects.pdf>
- ¹²⁰ *Fisheries Act*, RSC 1985, c F-14, s 34.1(1)(d)
- ¹²¹ *United Nations Declaration on the Rights of Indigenous Peoples Act* SC 2021, c 14, online: <https://laws-lois.justice.gc.ca/eng/acts/U-2.2/FullText.html>
- ¹²² *Declaration on the Rights of Indigenous Peoples Act*, SBC 2019, c 44.
- ¹²³ The Nicola Watershed Pilot is exploring how Water Sustainability Plans could be used to support government-to-government arrangements for watershed management between the Province and Indigenous nations, in this case the Nlaka’pamux and Syilx peoples of the Nicola Valley. See https://www2.gov.bc.ca/assets/gov/environment/natural-resource-stewardship/consulting-with-first-nations/agreements/nicola_watershed_pilot_mou_-_signed_2018.pdf
- ¹²⁴ RSBC 1996, c 117, s 7. An order under this statute was made, for example, to support implementation of the Great Bear Rainforest Agreements to prohibit commercial logging and hydroelectric development in certain areas. See Jessica Clogg *et al*, *Paddling Together: Co-Governance Models for Regional Cumulative Effects Management* (2017) *West Coast Environmental Law* at 74, online: <https://www.wcel.org/sites/default/files/publications/2017-06-wcel-paddlingtogether-report.pdf>;
- ¹²⁵ *Impact Assessment Act*, SC 2019, c 28, s 92; *Environmental Assessment Act*, SBC 2018, c 51, ss 35, 73.
- ¹²⁶ Province of BC, “Forest Landscape Plans”, online: <https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/forest-landscape-plans>
- ¹²⁷ Based on its commitment to implement the recommendations of the Old Growth Review, See Al Gorley and Garry Merkel, *A New Future for Old Forests: A Strategic Review of how BC Manages for Old Forests within its Ancient Ecosystems* (2020) <https://engage.gov.bc.ca/app/uploads/sites/563/2020/09/STRATEGIC-REVIEW-20200430.pdf>
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- ¹²⁹ Andrea J. Reid *et al* “Two-Eyed Seeing”: An Indigenous framework to transform fisheries research and management” (2020) *Fish and Fisheries*, online: <https://doi.org/10.1111/faf.12516>
- ¹³⁰ *Transportation Act*, SBC 2004, c 44, s 57.
- ¹³¹ *Transportation Act*, SBC 2004, c 44, ss 1-2.
- ¹³² *Transportation Act*, SBC 2004, c 44, s 84.
- ¹³³ *Environmental Assessment Act*, SBC 2018, c 51, Reviewable Projects Regulation, BC Reg 243/2019, at Part 7, Table 13, online: https://www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/243_2019
- ¹³⁴ *Transportation Act*, SBC 2004, c 44, ss 3-4.
- ¹³⁵ Brent Persello, Provincial Manager, Environmental Service Delivery, Ministry of Transportation and Infrastructure. [communication with West Coast Environmental Law]
- ¹³⁶ Government of British Columbia, FrontCounterBC (accessed 4 February 2022), online: <http://www.frontcounterbc.ca>
- ¹³⁷ *Water Sustainability Act*, SBC 2014, c 15, at s. 11.
- ¹³⁸ *Water Sustainability Regulation*, BC Reg 36/2016, at s 39(1).
- ¹³⁹ *Water Sustainability Regulation*, BC Reg 36/2016, s 39(1)(ii).
- ¹⁴⁰ *Water Sustainability Regulation*, BC Reg 36/2016, at s 38.
- ¹⁴¹ *Water Sustainability Regulation*, BC Reg 36/2016, at s 44; Government of British Columbia, “Apply for a Change Approval or Submit Notification of Instream Work”, (accessed 4 February 2022), online: <https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-licensing-rights/water-licences-approvals/apply-for-a-change-approval-or-submit-notification-of-instream-work>.
- ¹⁴² *Fisheries Act*, RSC 1985, c F-14, ss 34-35.
- ¹⁴³ Fisheries and Oceans Canada, “Measures to Protect Fish and Fish Habitat” (28 August 2018), online: <https://dfo-mpo.gc.ca/pnw-ppe/measures-mesures-eng.html>.
- ¹⁴⁴ Fisheries and Oceans Canada “Request a review of your project near water: Step 3. Check if your project needs a review” (modified 22 December 2021), online: <https://dfo-mpo.gc.ca/pnw-ppe/reviews-revues/request-review-demande-d-examen-003-eng.html>.
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- ¹⁴⁶ *Species at Risk Act*, SC 2002, c 29.

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- ¹⁵¹ *Ibid*, 2018 Design Build Standard Specifications for Highway Construction, s 165.01.01 (in Volume 1).
- ¹⁵² Ministry of Transportation and Infrastructure, “Culverts and Fish Passage” (updated May 2013), online: https://www2.gov.bc.ca/assets/gov/driving-and-transportation/transportation-infrastructure/engineering-standards-and-guidelines/environment/references/3824_culvertfishpassage_infosheet.pdf
- ¹⁵³ *Forest Act*, RSBC 1996, c 157.
- ¹⁵⁴ *Ibid*, s 5.
- ¹⁵⁵ *Ibid*, s 12.
- ¹⁵⁶ BC Ministry of Forests, *British Columbia’s Forests and Their Management* (September 2003), online: https://www.for.gov.bc.ca/hfd/pubs/Docs/Mr/Mr113/BC_Forest_Management.pdf
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- ¹⁵⁹ Government of British Columbia, “1.2 Types of Roads & Applicable Permits or Authorizations”, (accessed 4 February 2022), online: <<https://www2.gov.bc.ca/gov/content/industry/natural-resource-use/resource-roads/engineering-publications-permits/engineering-manual/road-administration-introduction/road-administration-road-types-permits>>.
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West Coast Environmental Law harnesses the power of law to solve complex environmental challenges. We are transforming environmental decision-making and strengthening legal protection for the environment through collaborative legal strategies that bridge Indigenous and Canadian law. By putting the law in the hands of communities and creating legal risk for those who would harm our land, air and water, we are building the collective power to achieve a more just and sustainable future for all.