



Legal Review of Flood Management and Fish Habitat in British Columbia

By Meaghan Partridge, Student
Deborah Curran, Professor and Lawyer

**Environmental Law Centre, University of Victoria
for Watershed Watch Salmon Society**

October 2017



Acknowledgements

We would like to thank the following people for speaking with us and clarifying decision-making processes for flood management in British Columbia, and in particular in the Lower Mainland/Fraser Valley:

- Mitchell Hahn, Inspector of Dikes, Ministry of Forestry, Lands and Natural Resources Operations
- Lloyd Bie, P. Eng, Manager, Engineering Planning, City of Richmond
- Anonymous, Fisheries and Oceans Canada
- Tara Friesen, Manager of Environmental Services, City of Chilliwack
- Matthew Brown, Engineering Department, City of Surrey
- Stephen Godwin, Environment Manager, City of Surrey
- Remko Rosenboom, Manager Water Authorizations, South Coast Natural Resource Region, Ministry of Forests, Lands and Natural Resource Operations

While we have not attributed individual statements to anyone, we have relied on their statements about how decisions are made and what factors go into those decisions.

The following discussion does not address flood management processes on Indian Reserve land.

TABLE OF CONTENTS

Executive Summary.....	i
1 Introduction to Flood Management in BC.....	1
2 Federal Involvement in Flood Management.....	2
2.1 Fisheries Act.....	2
2.2 Species at Risk Act.....	3
3 Provincial Integrated Flood Management Program.....	6
3.1 Dike Maintenance Act.....	7
3.2 Drainage, Ditch and Dike Act.....	9
3.3 Local Government Jurisdiction.....	10
3.3.1 Local Government Authority over Drainage.....	10
3.3.2 Local Government Authority over Floodplain Management.....	12
3.4 Municipal Examples.....	13
3.4.1 Surrey.....	13
3.4.2 Chilliwack.....	14
3.4.3 Richmond.....	15
3.5 Water Sustainability Act.....	16
3.6 Farm Practices Protection (Right to Farm) Act.....	18
4 Skagit County, Washington.....	19
5 Recommendations.....	21
6 Appendices.....	23
6.1 Connected Waters Campaign Map.....	23
6.2 Surrey Dyking District.....	24
6.3 Chilliwack.....	25
6.4 Richmond’s Ecological Network.....	26

EXECUTIVE SUMMARY

British Columbia's lower Fraser River valley was once one of the world's richest mosaics of Pacific salmon habitat. While still valuable, the river and its floodplain are heavily degraded through urbanization, agricultural practices, gravel mining, and continued industrialization. Many of the salmon populations are now very depleted. Extensive dike infrastructure plays a major role in flood control and irrigation, with these dikes being equipped with approximately 275 floodgates and pumps at the outlets of tributaries and sloughs. Because of these flood controls, waterways that once flowed naturally into the Fraser River are now severely restricted, creating dead zones with low oxygen levels, poor water quality, limited flow, and disconnected salmon habitat. Few floodgates are reliably open, and fewer still have fish-friendly pumps or appropriate design to allow for salmon passage. Watershed Watch has mapped 1,480 kilometers of current or potential fish habitat within more than 100 waterways affected by 155 structures, most of which need assessing for fish protection values.

Most flood control infrastructure in the Fraser Valley requires upgrading to address the likelihood of major flooding due to sea-level rise and other impacts of climate change. This requirement poses massive financial and logistical challenges for a large region governed by many different jurisdictions. As such, the Fraser Basin Council has stepped in to facilitate the regional planning of infrastructure upgrades. The ultimate purpose of this inter-jurisdictional initiative is to develop a Lower Mainland Flood Management Strategy with associated priorities and funding strategies. While much of the focus is on dikes, the infrastructure of most concern to Watershed Watch Salmon Society is floodgates and pump stations. Unfortunately, current flood control standards do not always consider fish passage or healthy fish habitat behind dikes as priority management concerns.

Staff and students with the Environmental Law Centre (ELC) at the University of Victoria reviewed flood management legislation on behalf of Watershed Watch Salmon Society, in order to understand legal requirements to manage fish and fish habitat affected by flood control infrastructure in the Fraser Valley. The ELC also reviewed regulatory procedures of local and senior governments, and provided recommendations for improving practices. This project was to help Watershed Watch effectively advocate for regional-scale, fish-friendly flood protection upgrades and ongoing fish-friendly operations.

The work done under this project confirms that flood management is largely a provincial and local government responsibility. The federal government also has a role to play through its mandate under the *Fisheries Act* and *Species at Risk Act*, and through its role in providing infrastructure funding for flood protection works.

Federal role in flood control infrastructure

Fisheries Act

Though the *Fisheries Act* was weakened in 2012, fisheries staff continue to have jurisdiction to investigate serious harm to fish species that are part of a fishery. Currently, the *Fisheries Act* states that no person may carry on work that results in "serious harm to fish" that are part of a "commercial, recreational, or Aboriginal fishery or to fish that support such a fishery". Therefore, these prohibitions in the *Fisheries Act* apply to salmon species and their habitats. The Act defines "serious harm to fish" as "the death of fish or any permanent alteration to, or destruction of, fish habitat".

Currently, authorizations under the *Fisheries Act* most clearly pertain to the construction of new infrastructure and have little impact on existing flood infrastructure. This is the case despite juvenile fish being killed by passing through pumps that have generally not been designed with fish-friendliness as one of the criteria. In practice, fisheries staff do not generally investigate harm to fish in areas affected by flood control infrastructure, even before 2012, and in any case the number of habitat-related enforcement activities has been steadily decreasing over the past decade. In summary, while the habitat provisions of the *Fisheries Act* can be interpreted to include fish habitat behind dikes, in practice the Fisheries and Oceans Canada dedicates few resources to this area.

Species at Risk Act

The Federal government could also have jurisdiction over fish habitat upstream of flood control structures through the *Species at Risk Act*. However, this is dependent on aquatic species using these habitats being listed on Schedule 1 of SARA, in which case there would be protection against killing or harming the species or damage or destruction of their “residences”. Also, a recovery strategy and action plan must be prepared for listed species, and critical habitat must be designated and protected under these plans and strategies. It is possible that critical habitat could occur behind flood control infrastructure. However, at this time there are no finalized action plans for species in British Columbia.

There are a few aquatic species in the lower Fraser River area that are listed under Schedule 1 of SARA and that are therefore accorded some protection. This includes the Nooksack Dace, White Sturgeon, and the Coastrange Sculpin. Ultimately, any works that may harm these protected species might require additional considerations or approvals. In the case of the Nooksack Dace, critical habitat has been designated, but this habitat is deemed to be already protected under the *Fisheries Act*.

In theory, the presence of listed species may cause the federal government to require that harmful flood infrastructure be upgraded. However, the federal government has never made an order for the replacement of established infrastructure that harms species at risk. Further, the federal government has already expressed reluctance to list salmon populations due to uncertainty in the marine environment and the impact on fisheries and dependent communities. Thus, the SARA has little potential in the foreseeable future to protect fish in the lower Fraser Valley from harmful flood control infrastructure.

Provincial role in managing flood control infrastructure

Dike Maintenance Act

The legal framework for flood management under the *Dike Maintenance Act* is primarily provincial. The *Dike Maintenance Act* is directed at the protection of human health and safety, and as such it cannot be relied on for fish protection. The Act contains no explicit provisions to protect the environment and fish health, and the focus of dike inspections is to ensure dike function for human safety and the protection of property. Significant amendments to the Act or to policy under the Act would be required for it to adequately provide for the protection of fish and fish habitat from harmful flood protection infrastructure.

Water Sustainability Act

The provincial government is responsible for the *Water Sustainability Act (WSA)*, which is administered by the Ministry of Forests, Lands and Natural Resource Operations (FLNRO). Section 11 authorizations under the *WSA* are the main regulatory mechanism to address environmental concerns and impacts from the construction, modification, maintenance, upgrade or replacement of dikes and flood infrastructure, when such works may have an impact on a stream or stream channel, or to the nature of a stream, including flows. Through *WSA* Section 11 authorizations “in and about streams”, FLNRO is capable of addressing the environmental impacts of new flood control infrastructure and to engage proponents in the discussion of how to prevent or mitigate harm that might arise from these works. FLNRO may also set terms and conditions to protect the stream during the authorized activity. However, a section 11 authorization is not required for the repair or maintenance of existing dikes or erosion protection works “to their original state” provided that the structures were operational in the previous year. In addition, there is no ability to address the ongoing operation of harmful historic flood infrastructure, the primary culprit of degraded fish habitat and harm to fish, through the *WSA* and section 11 approvals.

When considering a project’s impact on fish, FLNRO only communicates with the Department of Fisheries and Oceans Canada on more significant projects where authorizations are required by both governments. However, this communication with Fisheries and Oceans Canada is merely informative, and decision making regarding section 11 authorizations is separate from federal decisions. Staff in FLNRO will require environmentally friendly flood infrastructure such as a more fish-friendly pump if it will significantly improve migration opportunities for fish. Although fish-friendly pumps have not been required for proponents installing flood infrastructure, it is possible that these could be required in the future.

Local government role in managing flood control infrastructure

Local Government Act and the Community Charter

Although the province has oversight of flood infrastructure through the *Dike Maintenance Act*, the primary ownership and management of these works typically falls to local governments, i.e., municipalities and regional districts. The *Community Charter* applies to municipalities and is the source of municipal jurisdiction over drainage and flood management. Similar powers are also given to regional districts through the *Local Government Act*. Thus, local governments have the ownership, responsibility for, and control over much of the infrastructure associated with drainage, and have the primary authority for flood hazard management. This means that local governments can propose to install fish-friendly infrastructure through federal and provincial permitting processes, except for where infrastructure is on private land and is privately owned. Often, the issue that weighs against the installation of and upgrade to fish friendly infrastructure is its added cost.

Recommendations

Given the current legal and regulatory environment, the ELC provides the following recommendations for Watershed Watch Salmon Society or for any other organization working to improve fish habitat that is degraded by flood control infrastructure. Note that these recommendations are ones that can be undertaken within the short term (two years).

1. Advise municipalities on best practices and best available technology. Municipalities that are aware of current best practices for fish-friendly flood management can better weigh the costs and benefits of spending the extra money to obtain fish friendly infrastructure. They may also take advantage of funding opportunities to install fish-friendly pumps and infrastructure.
2. Support municipalities to create policies and bylaws relating to drainage that include requirements to consider fish habitat. The direction that municipalities set through drainage policies and bylaws establish the factors that go into decision making. Fish and fish habitat health can feature more prominently in flood management planning, regulation and policy.
3. Identify and target the most destructive infrastructure. Local governments that are aware of the most harmful flood infrastructure can prioritize these works for future upgrades to fish friendly infrastructure sooner than what the operational life cycle of the works would require.
4. Explore with municipalities the potential for obtaining control of abandoned/orphan infrastructure. There are many orphaned dikes in the lower Fraser River. Many of these were erected in times of emergency and are located on private land. These “orphaned dikes” are not subject to any maintenance or monitoring and therefore their impacts on fish and water quality is unknown. Local governments, while reluctant to accept the responsibility of these dikes, are best placed to mitigate their impacts and bring them into overall drainage management.
5. Work with FLNRO to improve Section 11 *Water Sustainability Act* authorizations. Water Managers and staff within the FLNRO could require that local governments and others installing flood management infrastructure be aware of fish-friendly alternatives. Further, it is within FLNRO staff jurisdiction to require the installation of fish friendly infrastructure as a condition of a section 11 authorization. Ministry staff could identify priority areas that still support fish and, in these locations, make fish friendly infrastructure a baseline requirement.
6. Advocate for fish-friendly infrastructure funding. Advocates such as Watershed Watch can work with the federal government (Fisheries and Oceans Canada and Infrastructure Canada) to raise awareness of the need for fish-friendly infrastructure, for new works that the federal government will be supporting through infrastructure funding. The federal government is one of the partners in the Lower Mainland Flood Management Strategy, and in 2016 announced major “green” infrastructure funding as well as other funds for disaster mitigation, climate innovation and asset management planning. Funding for improving habitat within the tidal reach of the Fraser River could also be made available through the new federal Oceans Protection Plan. In accord with the responsibilities of the federal government, fish-friendliness could be a pre-requisite for federal infrastructure funding. A special fund could also be set up to specifically address the incremental cost of fish-friendly infrastructure in high priority locations, until such time as fish-friendly infrastructure becomes the norm through legislation and/or policy.

1 INTRODUCTION TO FLOOD MANAGEMENT IN BC

The waterways in the lower Fraser Valley are subject to extensive flood management infrastructure. There are approximately 275 flood-boxes and gates on tributaries and sloughs in the lower Fraser Valley, as well as hundreds of kilometres of dikes. Much of the flood management infrastructure is historic, with some dikes having been in place for close to a century. Old and poorly designed infrastructure can have negative implications for fish populations and habitat. Waterways that historically flowed naturally into the Fraser River have been severely altered by these dikes, which has degraded some fish habitat and, in some places, turned it into dead zones with low oxygen levels, reduced or eliminated water flow, and disconnected fish habitat. Watershed Watch Salmon Society estimates that 1,480 kilometers of current or potential fish habitat in waterways in the lower Fraser Valley is affected by 155 flood infrastructure works. Further, many flood management works are directly harmful to fish and specifically salmon. Some of the outdated pumps stations and gates are colloquially termed “meat grinders”, which describes the impact they have on fish.

This report reviews the legislation that pertains to flood management in British Columbia, and specifically for the lower Fraser River and provides recommendations for improving flood management infrastructure for fish and fish habitat. Flood management is largely a provincial and municipal responsibility that is addressed through regulation and providing the service of flood management. The federal government has some impact on the physical structures involved in flood management through its concern for fish under the *Fisheries Act* and through emergency provisions. Otherwise, flood management is a provincial responsibility that is delegated to municipalities.¹

Fraser Basin Council has a coordinating role in flood management in the lower Fraser Valley. In 2014 the Fraser Basin Council initiated the Lower Mainland Flood Management Strategy. The Council describes this strategy as an “inter-jurisdictional initiative” and it includes involvement of the Government of Canada, the Province of British Columbia, 26 local governments, and other entities.² The Fraser Basin Council is currently engaged in Phase 2 of the strategy that is set to span from 2016 to 2018.³ The purpose of this phase is to develop a regional flood action plan that will include a cost sharing proposal, which is an often critical factor in dictating the quality of flood protection infrastructure installed and whether it is maintained.⁴ Given the opportunity presented by a possible cost sharing agreement, it is

¹ The federal government had a former Flood Damage Reduction Program that was initiated in 1975 to help minimize flood damage in the province. This was a joint venture with the provinces. In BC the Fraser Basin Council joined these efforts as well. This Program is now finished.

² Fraser Basin Council, *Introducing the Lower Mainland Flood Management Strategy*, (Backgrounder), online: <http://www.fraserbasin.bc.ca/Library/Media/backgrounder_lmfls.pdf>

³ Fraser Basin Council, Lower Mainland Flood Management Strategy, online: <http://www.fraserbasin.bc.ca/water_flood.html>

⁴ For example, the City of Surrey will not assume responsibility for the Colebrook Dyking District or the Mud Bay Dyking District “until such time as a long term and sustainable funding program has been established by the Province to address the costs of necessary upgrades to the dykes in these Districts”. See: City of Surrey, Corporate Report, No. R054, Council date: April 8, 2013, online: <http://www.surrey.ca/bylawsandcouncilibrary/CR_2013-R054.pdf>

essential that the flood action plan addresses the needs and health of salmon and fish in the lower Fraser River as it relates to flood control infrastructure.

2 FEDERAL INVOLVEMENT IN FLOOD MANAGEMENT

The federal government does not have direct responsibility for flood management but can affect provincial and municipal activities in their relation to federal lands or federal regulatory responsibilities. While federal lands are negligible in the lower Fraser River area, flood infrastructure has a direct impact on fish, over which the federal government has regulatory authority, and endangered species. While the Fraser River is a navigable water, it is unlikely that the federal navigation jurisdiction would provide fish protection on the tributaries that are the subject of this report.

2.1 FISHERIES ACT

The federal *Fisheries Act* provides for the management, regulation, and protection of fish and fish habitat. However, the Federal government amended the *Fisheries Act* in 2012, which weakened its protection of fish and fish habitat. Enforcement of fisheries-related offences has also decreased over the past ten years.⁵

No person may carry on work that results in “serious harm to fish” that are part of a “commercial, recreational, or Aboriginal fishery or to fish that support such a fishery”.⁶⁷ Therefore, these prohibitions in the *Fisheries Act* apply to salmon species and their habitats. The Act defines “serious harm to fish” as “the death of fish or any permanent alteration to, or destruction of, fish habitat”.⁸ Prior to 2012, this section prohibited any work or undertaking that would result “in the harmful alteration, disruption or destruction of fish habitat”.⁹ Therefore, this section offers considerably less protection to fish and fish habitat than it did in the past. However, even in the past, the stronger habitat provisions (in place from 1977 to 2012) were not applied to the construction or design of much of the dike infrastructure in the Fraser Valley, since most was built well before 1977.

A person can carry on work that results in serious harm to fish if the work is prescribed, authorized, or permitted under the Act, or is carried on in accordance with the regulations.¹⁰ The *Application for Authorization under Paragraph 35(2)(b) of the Fisheries Act Regulations*, a regulation under the *Fisheries Act*, sets out the information required to obtain authorization of a work that affects fish or fish habitat.¹¹

⁵ Martin ZP Olszynski. “From ‘Badly Wrong’ to Worse: An Empirical Analysis of Canada’s New Approach to Fish Habitat Protection Laws” (2015) 28:1 *Journal of Environmental Law and Practice* 1.

⁶ *Fisheries Act*, RSC 1985, c 14, s.35(1), online: <<http://laws-lois.justice.gc.ca/eng/acts/f-14/FullText.html>> [*Fisheries Act* 2012]

⁷ The definition of fishery “includes the area, locality, place or station in or on which a pound, seine, net, weir or other fishing appliance is used, set, placed or located, and the area, tract or stretch of water in or from which fish may be taken by the said pound, seine, net, weir or other fishing appliance, and also the pound, seine, net, weir, or other fishing appliance used in connection therewith”; See: *Fisheries Act* 2012, *supra* note 6 at s.2

⁸ *Fisheries Act* 2012, *supra* note 6 at s.2(1)

⁹ Historical version of *Fisheries Act*, RSC 1985, c F-14, s.35(1), online: <<http://canlii.ca/t/129h>>

¹⁰ *Fisheries Act* 2012, *supra* note 6 at s. 35(2)

¹¹ *Applications for Authorization under Paragraph 35(2)(b) of the Fisheries Act Regulations*, SOR/2013-191

The Department of Fisheries and Oceans considers the following when assessing an application for an authorization under paragraph 35(2)(b): the proposed work or activity itself; the timeline of the work; the location; the fish and fish habitat that will be impacted by the work and any effects on these; the measures and standards that will be implemented by the proponent to prevent or mitigate any harm to fish; any residual serious harm to fish; and whether there is an offsetting plan.¹² Any proponents constructing work or doing a project near water are responsible to avoid and mitigate any serious harm to fish and to avoid contravening the *Species at Risk Act* prohibitions.¹³ In the event that the harm cannot be mitigated, the proponent will be required to offset the harm through offsetting measures that will support and enhance the sustainability and productivity of fish that are part of a fishery.¹⁴

There are a number of fisheries in and around the lower Fraser River, and therefore any new flood management works that may cause serious harm to the fish in these fisheries will need authorization by Department of Fisheries and Oceans staff. Maintenance or upgrading of existing flood infrastructure may not require an authorization if the impact of the infrastructure on fish is not heightened.¹⁵

If existing works cause serious harm to fish, Department of Fisheries and Oceans staff may undertake an investigation that may lead to discussions with owners of the works. However, there is no mechanism to review and upgrade all flood infrastructure.

In addition, the Minister may make an order for a person to install fish protective measures or maintain the flow of water to either prevent harm to fish or to ensure the free passage of fish.¹⁶

In conclusion, the federal government has some involvement in flood management as it pertains to fish health through the federal *Fisheries Act*. Any new flood protection infrastructure, such as a dike or drainage pump, requires authorization if it would cause serious harm to fish in a fishery (i.e. salmon).¹⁷ However, although the federal government has primary responsibility for the health of commercial fish species, authorizations under the *Fisheries Act* most clearly affect the construction of new infrastructure and have little impact on existing flood infrastructure. This is the case despite juvenile fish being killed by passing through pumps that have generally not been designed with fish-friendliness as one of the criteria. Fisheries staff do have jurisdiction to investigate and enforce offences under the *Fisheries Act*, however the number of enforcement activities has been steadily decreasing over the past decade.

2.2 SPECIES AT RISK ACT

To ensure the protection of species at risk and species of concern, the federal government uses the *Species at Risk Act* (“SARA”).¹⁸ The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses species and can recommend the designation of species as extirpated, endangered,

¹² *Ibid* at Schedule 1

¹³ Fisheries and Oceans Canada, *Avoid, mitigate or offset harm to fish and fish habitat, including aquatic species at risk*, online: < <http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/offset-harm-dommage-comp-eng.html>>

¹⁴ *Ibid*

¹⁵ Fisheries and Oceans Canada, *Projects near water, Project activities and criteria where DFO review is not required*, online: < <http://www.dfo-mpo.gc.ca/pnw-ppe/index-eng.html>>

¹⁶ *Fisheries Act* 2012, *supra* note 6 at s.20(2) (e-f)

¹⁷ *Ibid* at s.35(2)(b)

¹⁸ *Species at Risk Act*, S.C. 2002, c.29 [SARA]

threatened or special concern. The federal government must consider the COSEWIC recommendations and may subsequently legally classify these species on the Schedule 1 List of Wildlife Species.¹⁹ Species on the List of Wildlife Species are listed as extirpated, endangered, threatened or special concern and these classifications afford different levels of protection to the species.

In certain circumstances, there will be general prohibitions that apply to actions having an impact on species that are listed under Schedule 1. These prohibit the killing or harming,²⁰ possession or collection,²¹ and the damage or destruction of species' residences for those species listed as extirpated, endangered or threatened.²² As noted above, these general prohibitions only apply in specific circumstances. They apply on all federal lands and to federal species wherever they occur. Federal species include aquatic species and migratory birds. Therefore, while these protections do not automatically apply on private and provincial lands for terrestrial species, they do apply on these lands for migratory birds and aquatic species. Any harm to these species or their residences on provincial lands could result in charges for violating *SARA*.

SARA requires the federal government to prepare a recovery strategy for species listed as extirpated, endangered or threatened.²³ In the event that it is determined that the recovery of the species is feasible, a recovery strategy will establish the requirements to stop or reverse a species' decline and must include a delineation of threats to the survival of the species, an identification of critical habitat, examples of activities that are likely to result in the destruction of critical habitat, and a statement of objectives to assist the recovery and survival of the species.²⁴ A proposed recovery strategy must be included in the public registry within one year following the listing of the species as endangered and within two years following the listing of the species as threatened on the Schedule 1 List of Wildlife Species.²⁵ Further, the government must prepare one or more action plans which will outline projects and activities that are required to meet the objectives outlined in the recovery strategy.²⁶ An action plan must identify the species' critical habitat, include a statement regarding proposed measures to protect the species' critical habitat, and include a statement of measures to implement the recovery strategy with a timeline for the implementation of these measures.²⁷ The federal government must prepare action plans in cooperation with provincial government, aboriginal organizations, and any other appropriate person or organization.²⁸ The government must monitor the implementation of the action plan and report on it after five years.²⁹ Currently, there are no finalized action plans for species in British

¹⁹ This list is contained within Schedule 1 of the *Species at Risk Act*

²⁰ *SARA*, *supra* note 18 at s.32(1)

²¹ *Ibid* at s.32(2)

²² *Ibid* at s.33

²³ *Ibid* at s.37(1)

²⁴ *Ibid* at s.41(1)

²⁵ *Ibid* at s.42(1)

²⁶ *Ibid* at s.47; see also: Action Plans, Species at Risk Public Registry, Government of Canada, online: <
http://www.registrelep-sararegistry.gc.ca/sar/recovery/action_e.cfm>

²⁷ *SARA*, *supra* note 18 at s.49(1)

²⁸ *Ibid* at s.48(1)

²⁹ *Ibid* at s.55

Columbia. However, there is a proposed action plan for the Cultus Pygmy Sculpin.³⁰ For species of special concern, a management plan must be prepared which should include measures for species conservation.³¹ Management plans do not identify critical habitat.

Critical habitat is defined as the “habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species’ critical habitat in the recovery strategy or in an action plan for the species”.³² Habitat for aquatic species is defined as “spawning grounds and nursery, rearing, food supply, migration and any other areas on which aquatic species depend directly or indirectly in order to carry out their life processes, or areas where aquatic species formerly occurred and have the potential to be reintroduced”.³³ The identification of the species’ critical habitat must be based on the best available information.³⁴ Following the identification of critical habitat within a recovery strategy or action plan, the competent Minister³⁵ has 180 days to ensure that all of the critical habitat is protected.³⁶ Critical habitat must be protected by other laws or agreements under SARA. Otherwise, SARA imposes a prohibition on the destruction of critical habitat if the critical habitat is located on federal land, the listed species is an aquatic species, or the listed species is a migratory bird.³⁷ There is critical habitat designated for the Nooksack dace in British Columbia. The Nooksack dace’s critical habitat is located in a number of streams in the lower Fraser River area.³⁸ Instream works including dams and weirs are identified as threats for the critical habitat of the Nooksack dace but the federal government, through its Critical Habitat Protection Statement, simply relies on section 35 of the *Fisheries Act* for protection of critical habitat of the species.³⁹

While there are a few species in the lower Fraser River area that are listed on Schedule 1 of SARA, the federal government has not designated any salmon species in British Columbia on Schedule 1 despite COSEWIC recommending their listing.⁴⁰ Both of the Interior Fraser population of coho Salmon (*Oncorhynchus kisutch*) and the Cultus Lake population of sockeye salmon (*Oncorhynchus nerka*) have been recommended by COSEWIC for listing, as threatened and endangered respectively.⁴¹ In deciding to

³⁰ Species at Risk Public Registry, Action Plan for the Cultus Pygmy Sculpin (*Cottus aleuticus*, Cultus Population) in Canada, online: < http://www.registrelep-sararegistry.gc.ca/document/default_e.cfm?documentID=2977 >

³¹ SARA, *supra* note 18 at s.65

³² *Ibid* at s.2(1)

³³ *Ibid*

³⁴ *Ibid*

³⁵ For aquatic species this is the Minister of Fisheries and Oceans Canada and for terrestrial species it is the Minister of Environment

³⁶ SARA, *supra* note 18 at s.57

³⁷ *Ibid* at s.57 and 58(1)

³⁸ Species at Risk Public Registry, Revised Recovery Strategy for the Nooksack Dace in Canada, online: < <http://www.sararegistry.gc.ca/default.asp?lang=En&n=7552DF70-1&offset=8&toc=show> >

³⁹ Species at Risk Public Registry, Nooksack Dace in Canada: Critical Habitat Protection Statement, online: < <http://www.registrelep-sararegistry.gc.ca/default.asp?lang=En&n=AAE8BAF0-1> >

⁴⁰ SARA, *supra* note 17 at Schedule 1; the Inner Bay of Fundy population of Atlantic Salmon has been designated as endangered on Schedule 1 and is the only salmon population on the Schedule 1 List of Wildlife Species

⁴¹ Species at Risk Public Registry, Species Profile (Coho Salmon) - Species at Risk Public Registry, (2016), online: *Sararegistrygcca* <http://www.sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=716>; Species at Risk Public Registry, Species Profile (Sockeye Salmon) - Species at Risk Public Registry, (2016), online: *Sararegistrygcca* <http://www.sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=730 >

not list coho salmon, the federal government suggests that not listing the species would enable flexibility for future management of the species and notes that this is desirable due to the uncertainty associated with the changing marine environment and future socio-economic impacts.⁴² The federal government acknowledged that the Cultus population of sockeye salmon are at risk of biological extinction due to their very low levels but also refused to list the species on Schedule 1 as endangered.⁴³ The reason cited for this refusal was primarily the severe consequences on the sockeye salmon fishing industry and on indigenous coastal communities that depend on salmon fishing.⁴⁴

There are a few species in the lower Fraser River area that are listed under Schedule 1 of *SARA* and that are therefore accorded some protection under *SARA*. Some of these listed species include the Nooksack dace,⁴⁵ white sturgeon,⁴⁶ and the coastrange sculpin.⁴⁷ Ultimately, any works that may harm these protected species might require additional considerations or approvals.

In conclusion, *SARA* does not have much potential in the near future to protect fish in the lower Fraser Valley from flood infrastructure that causes harm to fish and destroys habitat. Despite this, there may be potential for this law to protect fish in the future. If the federal government decides to list salmon populations from the lower Fraser River area on Schedule 1 of *SARA* then damaging flood infrastructure might be required to undergo upgrades in order to reduce harm on protected species. However, the federal government has never made an order for the replacement of established infrastructure that harms species at risk. Further, the federal government has already expressed reluctance to list salmon populations due to uncertainty in the marine environment and the impact on fisheries and dependant communities.

3 PROVINCIAL INTEGRATED FLOOD MANAGEMENT PROGRAM

The Province of British Columbia states that its Integrated Flood Hazard Management Program aims “to reduce the impacts flooding has on people, communities and infrastructure”.⁴⁸ Through the Program, the Province provides policies, guidelines and information to address the different areas of flood management for those involved. Flood management includes provincial oversight of flood infrastructure and activities in waterways, and local government operation and construction of flood infrastructure.

⁴² Species at Risk Public Registry, Order Giving Notice of Decisions not to add Certain Species to the List of Endangered Species, PC-2006-199 April 6, 2006, online:

< <http://www.sararegistry.gc.ca/default.asp?lang=En&n=1745ACDD-1> >

⁴³Species at Risk Public Registry, Order Giving Notice of Decisions not to add Certain Species to the List of Endangered Species, PC-2005-5 January 12, 2005, online:

< <http://www.sararegistry.gc.ca/default.asp?lang=En&n=F932A7A3-1>>

⁴⁴ *Ibid*

⁴⁵ *SARA*, *supra* note 17 at Schedule 1

⁴⁶ *Ibid*

⁴⁷ *Ibid*

⁴⁸ Ministry of Forests, Lands and Natural Resource Operations, Integrated Flood Hazard Management Program, online: <http://www.env.gov.bc.ca/wsd/public_safety/flood/fhm-2012/>

3.1 DIKE MAINTENANCE ACT

The Dike Maintenance Act applies to all dikes in British Columbia and is the main enactment relating to infrastructure for flood management. The Act defines a dike as “an embankment, wall, fill, piling, pump, gate, floodbox, pipe, sluice, culvert, canal, ditch, drain or any other thing that is constructed, assembled or installed to prevent the flooding of land”.⁴⁹ Therefore, this Act applies to many structures that concern the health and wellness of fish and fish habitat in the waterways of the lower Fraser River. This Act continues the office of the Inspector of Dikes.⁵⁰ The Office of the Inspector of Dikes is currently a part of the Ministry of Forests, Lands and Natural Resource Operations.⁵¹

The Inspector of Dikes is responsible for the general oversight of all dikes in British Columbia, excluding those that are private. Private dikes, defined as those located on private property and that protect only that property,⁵² do not generally fall under the responsibility of the Inspector of Dikes and are exempted from numerous provisions throughout the Act. Although private dikes generally do not require an approval under the *Dike Maintenance Act*,⁵³ they may still require approvals and authorizations under the *Water Sustainability Act* and the *Fisheries Act*. In addition to the supervision of all dikes in British Columbia, the Inspector of Dikes is responsible for the oversight of the operation of the diking authorities that have responsibility for the construction and maintenance of dikes in specified areas. Diking authorities are defined under the *Dike Maintenance Act* to include commissioners from the *Drainage, Ditch and Dike Act*, a person who owns or controls a non-private dike, a treaty first nation if provided for in their final agreement, a public authority as designated by the minister or a regional district, municipality or improvement district.

The Act itself contains no provisions that acknowledge the care of the environment or considerations to be taken for fish and habitat health other than section 6(2). This section enables the Lieutenant Governor in Council to make regulations to prescribe trust funds from the Habitat Conservation Trust that can have a purpose of protecting or restoring the environment from flooding.⁵⁴

The Inspector of Dikes has broad powers to enter on land, require diking authorities to maintain or improve dikes and require other actions and reviews related to construction and maintenance of dikes.⁵⁵ The inspector may “require a diking authority or a person on whose land a dike, other than a private dike, is located to repair, replace, renew, alter, add to, improve or remove a dike, or a part of a dike, or anything used in connection with the dike”.⁵⁶ This provision enables the inspector to require the

⁴⁹ *Dike Maintenance Act*, RSBC 1996, c 95, s.1 [*Dike Maintenance Act*]

⁵⁰ *Ibid* at s.2(1). All documents on the Ministry of Forest, Lands and Natural Resource Operations webpage indicate that the current inspector of dikes is still Neil Peters, however, a recent email from Neil Peters confirmed that Mitchell Hahn now occupies this role. See: Mitchell Hahn, BC Government Directory <<http://dir.gov.bc.ca/gtds.cgi?esearch=&updateRequest=&view=detailed&sortBy=name&for=people&attribute=display+name&matchMethod=is&searchString=Mitchell+Hahn&objectId=152240>>

⁵¹ <[2016 Dike Safety Program Contact List, http://www.env.gov.bc.ca/wsd/public_safety/flood/fhm-2012/safety_index.html](http://www.env.gov.bc.ca/wsd/public_safety/flood/fhm-2012/safety_index.html)>

⁵² *Dike Maintenance Act*, *supra* note 49 at s.1

⁵³ As long as they are on private property and only protect that property

⁵⁴ There are other purposes for the trust funds in the Habitat Conservation Fund enabled. See: *Dike Maintenance Act*, *supra* note 49 at s.6(2)(b)(ii)

⁵⁵ *Dike Maintenance Act*, *supra* note 49 at s.2(2)

⁵⁶ *Ibid* at s.2(2)(b)

upgrade or maintenance of dikes for any reason deemed necessary. Through this provision, the Inspector of Dikes has fairly extensive supervisory powers over dikes and can require upgrades if the Inspector is of the opinion that they are necessary. The main focus of the Office of the Inspector of Dikes is the protection of the public interest and the structural integrity of dikes. The Inspector of Dikes will not require diking authorities to take mitigative measures for environmental considerations.⁵⁷ Although, these may arise in the course of obtaining either *Fisheries Act* approvals or *Water Sustainability Act* approvals for flood management works.

The Inspector of Dikes requires Diking Authorities to complete annual dike inspection reports to ensure adequate dike performance.⁵⁸

The Act prohibits a variety of actions if not done under the authority of regulations or without the prior written approval of the inspector:

- 2(4) A person or a diking authority must not do any of the following unless it is done either with the prior written approval of the inspector or in accordance with the regulations made under section 8 (2):
- (a) lower, or cause or allow to be lowered, the elevation of a dike or decrease, or cause or allow to be decreased, the width or cross section of a dike;
 - (b) install, or cause or allow to be installed, any culvert, pipe, flood box or any structure through a dike;
 - (c) construct, or cause or allow to be constructed, any works on or over a dike or dike right of way;
 - (d) alter, or cause or allow to be altered, the foreshore or stream channel adjacent to a dike;
 - (e) construct a new dike.

As there are no regulations made under the Act, every action listed by section 2(4) needs the prior written approval of the inspector. These actions include any modification of or alteration to dikes, any alteration to the foreshore or streams adjacent to dikes, any construction of works over dikes and the construction of any new dikes. In granting approval for applications under section 2(4) the Inspector must consider the appropriateness and consider the surrounding water and streams around the dike, among other considerations.

The Act enables the Inspector of Dikes to make Orders under the Act and provides for offenses for failure to comply or harm to a dike. There are technically many possible orders as every decision to approve an application to construct a dike is technically an order. However, there are very few orders made by the Inspector of Dikes for issues such as gross negligence or interference requiring remedial work. As a result, there are essentially no appeals of Orders.

In summary, the *Dike Maintenance Act* is primarily directed at the protection of human health and safety and cannot be relied on for fish protection. The Act contains no explicit provisions to protect the environment and fish health and the thrust of dike inspections is to ensure that the technical

⁵⁷ Mitchell Hahn, personal communication

⁵⁸Ministry of Forests, Lands and Natural Resource Operations, Water Management Branch, Annual Inspections <www.env.gov.bc.ca/wsd/public_safety/flood/fhm-2012/annual_inspection.html>. The Inspector of Dikes can require a diking authority to “do any other thing relative to the construction and maintenance of dikes, including orders respecting flood hazard planning.” See: *Dike Maintenance Act*, *supra* note 49 at s.2(2)(h).

requirements are met to ensure the dike safety.⁵⁹ Significant amendments to the Act or to policy under the Act would be required for it to adequately provide for the protection of fish and fish habitat from harmful flood protection infrastructure.

3.2 DRAINAGE, DITCH AND DIKE ACT

The Drainage, Ditch and Dike Act provides a more comprehensive coverage of dikes and drainage. However, this enactment is rarely used and is currently being phased out.⁶⁰ The Ministry of Forest, Lands and Natural Resources states on the Dike Management and Safety webpage that:

“The Ministry is supporting the transition of the assets and responsibilities of five diking districts to local governments prior to the scheduled repeal of the Act”⁶¹

The Act defines the functions and powers of district commissioners. The commissioners have fairly broad powers with respect to the districts. The commissioners can levy taxes on all the lands in the diking districts.⁶² Further, the Act vests ownership and authority of flood infrastructure works in the commissioner and clarifies that the commissioners are required to comply with the *Water Sustainability Act* in all respects.⁶³ The commissioners have the power to execute, operate and maintain works.⁶⁴ The Act states that “works that injuriously affect natural or artificial waterways must not be executed until approved by the minister”.⁶⁵ Further, commissioners can create a maintenance fund for the purpose of the execution, operation and maintenance of works.⁶⁶

The *Drainage, Ditch and Dike Act* has a sunset clause that states that the Act will be repealed on December 31, 2020.⁶⁷ The province has amended the sunset date numerous times and the Act was originally set to be repealed on December 31, 2010.⁶⁸ These amendments to the sunset date have been at the request of local governments since they have needed additional time to incorporate the remaining diking districts into their oversight. Technically, the Act is still in use until the last remaining structures have been transferred to local governments. However, there are only a few structures and diking districts remaining that were enacted under this Act.

In short, the *Drainage Ditch and Dike Act* gives commissioners broad powers relating to the management of flood protection works and the taxation associated, however, the Act has sunset clause and all diking districts enacted under it are being transferred to local governments. As such, in

⁵⁹ BC Ministry of Environment, Lands and Parks, Environmental Guidelines for Vegetation Management of Flood Protection Works to Protect Public Safety and the Environment, March 1999, online: <http://www.env.gov.bc.ca/wsd/public_safety/flood/pdfs_word/env_gd_veg_man.pdf> at pg.1

⁶⁰ West Coast Environmental Law, Dike Maintenance Act/ Drainage Ditch and Dike Act, online: <http://www.bcwatersheds.org/wiki/index.php?title=Dike_Maintenance_Act/_Drainage,_Ditch_and_Dike_Act>

⁶¹ Ministry of Forest, Lands and Natural Resource Operations, Dike Management and Safety, online: <http://www.env.gov.bc.ca/wsd/public_safety/flood/fhm-2012/safety_index.html>>

⁶² *Drainage, Ditch and Dike Act*, RSBC 1996, c 102, at s.82

⁶³ *Ibid* at s.63

⁶⁴ *Ibid* at s.100

⁶⁵ *Ibid* at s.100(3)

⁶⁶ *Ibid* at s.102

⁶⁷ *Ibid* at s.173

⁶⁸ BC Reg 373/2008; BC Reg 325/2012; BC Reg 213/2015

conjunction with the impending repeal of the Act, there is no potential for this Act to protect fish and provide for improved flood infrastructure.

3.3 LOCAL GOVERNMENT JURISDICTION

Although the province has oversight of dikes in the province through the *Dike Maintenance Act*, the primary management of these works falls to local governments. In 2003, the *Flood Hazards Statutes Amendment Act* repealed a number of provisions relating to flood management and the provinces role in such.⁶⁹ Ultimately, the effect of this enactment was to shift responsibility for flood management, flood risk oversight, and floodplain regulation from the province to local governments.⁷⁰ Therefore, local governments currently have the primary authority for flood hazard management, and have responsibility for much of the infrastructure that affects fish.

Local government jurisdiction is established through both the *Local Government Act* and the *Community Charter*. The *Local Government Act*, logically, applies to local governments, which are defined within the Act as “the council of a municipality” and “the board of a regional district”.⁷¹ Through this Act, the governance, structure, powers and responsibility of regional districts and improvement districts is set out. Further, the Act establishes municipal and regional district authority for land use planning. The *Community Charter* specifically applies to municipalities and is the source of municipal jurisdiction over drainage and flood management.⁷² Through the *Community Charter*, a municipality is enabled to provide any service that council considers necessary.⁷³ Further, the municipality can directly provide this service or can delegate this to another public authority or organization.⁷⁴

Local government authority relating to flood control can be divided into two parts. These are authority for drainage and authority over floodplain management, addressed in turn below. Through their authority over drainage, local governments have practical ownership and operation over instream works relating to drainage and flood control. Local government authority over flood management is a regulatory authority and has little impact on the flood control works that impact fish.

3.3.1 Local Government Authority over Drainage

The first branch of local government authority relating to flood control is authority over drainage and sewerage. Through this authority, local governments own, control, and have responsibility for the

⁶⁹ Bill 56 – 2003, *Flood Hazard Statutes Amendment Act, 2003*, online: < <http://bclaws.ca/civix/document/id/bills/billsprevious/4th37th:gov56-3> >; See also: Bulletin, *Flood Hazard Statutes Amendment Act, 2003*, Policy and Statutory Changes Regarding Diking & Land Use Management for Flood Hazard Areas, online: < http://www.env.gov.bc.ca/wsd/public_safety/flood/pdfs_word/bulletin_fhstatutes_act.pdf >

⁷⁰ City of Richmond, 2008 – 2031 Flood Protection Strategy, online: < http://www.richmond.ca/cityhall/council/agendas/council/2008/062308_agenda.htm > at pg. 22; See also: Angela Etheridge, *Flood Risk and the Law*, FernieFix, online at: < <http://www.ferniefix.com/article/flood-risk-and-law> >

⁷¹ *Local Government Act*, RSBC 2015, c 1, [*Local Government Act*] at Schedule s. 1

⁷² *Community Charter*, SBC 2003, c 26, [*Community Charter*] at s.3

⁷³ *Ibid* at s.8(2)

⁷⁴ *Ibid*

installation and maintenance of flood control infrastructure, and other drainage works. Therefore, the choice as to whether to install fish friendly infrastructure rests entirely with the local governments.

The board of a regional district can create bylaws regulating the design and installation of drainage and sewerage works and denoting a watercourse as part of the regional districts drainage system even if it is on private land.⁷⁵ A board can propose to undertake works if they consider that the drainage of water into or through an area in the regional district should be diverted or improved. These works may be located on private land, in which case the owners of land that may be affected must be served notice.⁷⁶ In the event that a person has damaged or obstructed a dike, both regional districts and municipalities may impose remedial action requirements.⁷⁷ The remedial action requirements that municipalities can impose include requiring the person who caused damage to undertake restoration work on the damaged drainage and dike system.⁷⁸ Local governments can also exercise this same remedial authority.⁷⁹ The board of a regional district may also appropriate land that constitutes the channel or bed of a stream for the purposes of constructing works to maintain the proper flow of water in a stream, ditch, drain or sewer in the regional district, among other objectives.⁸⁰ Before this power is exercised, the board must enact a bylaw to define the channel or bed of the stream.⁸¹ A regional district's authority in relation to drainage, works and dikes is subject to the provisions of the *Water Sustainability Act*.⁸²

Municipalities have the specific authority to make bylaws relating to drainage and sewerage works.⁸³ Through this authority, municipalities are enabled to impose requirements on people who are undertaking the construction of works to "maintain the proper flow of water in a stream, ditch, drain, or sewer in the municipality".⁸⁴ Further, municipalities may impose requirements, through bylaws, on the owners of dikes or persons who are constructing dikes.⁸⁵ Municipalities are authorized to construct and improve works deemed necessary to provide for the drainage of surface water in the municipality.⁸⁶ These works can divert water from the municipality.⁸⁷

Local governments are also authorized to make bylaws relating to runoff control requirements.⁸⁸ These bylaws may establish maximum permitted amounts of impermeable material and may require for land owners to provide for ongoing disposal of surface runoff and storm water.⁸⁹

⁷⁵ *Local Government Act*, *supra* note 71 at s.306

⁷⁶ *Ibid* at s.308

⁷⁷ *Community Charter*, *supra* note 72 at s.75; *Local Government Act*, *supra* note 68 at s.309

⁷⁸ *Community Charter*, *supra* note 72 at s.72(3)

⁷⁹ *Local Government Act*, *supra* note 71 at s.309

⁸⁰ *Ibid* at s.313

⁸¹ *Ibid* at s.313(3)

⁸² *Ibid* at s.314

⁸³ *Community Charter*, *supra* note 72 at s.69

⁸⁴ *Ibid* at s.69(b)

⁸⁵ *Ibid* at s.69(c)

⁸⁶ *Ibid* at s.70

⁸⁷ *Ibid*

⁸⁸ *Local Government Act*, *supra* note 71 at s.523

⁸⁹ *Ibid*

In short, through authority over drainage, local governments have the ownership, responsibility for, and control over much of the infrastructure associated with drainage. The responsibility for the maintenance and construction of these works is that of local government if related to a service that benefits the local government area. Through this broad authority, and excluding flood infrastructure located on private land that is not owned by the local government, local governments are responsible for the choice of whether to install fish-friendly infrastructure.

3.3.2 Local Government Authority over Floodplain Management

The second branch of local government authority relating to flood control is the authority over floodplain management. Authority for floodplain management enables local governments to enact bylaws that regulate building in floodplains. This is largely through setback and height requirements for buildings.

Local governments can provide for flood management and can create floodplain bylaws, authority is set out below. This authority includes setting standards for works. However, the “works” contemplated through floodplain management are those for setbacks and structural support to elevate buildings above the floodplain and are not instream works that could protect fish.

Local governments can designate land as a flood plain and may make bylaws relating to the flood level and setback from the watercourse.⁹⁰ When making bylaws under this section, the local government must consider the Provincial guidelines.⁹¹ Further, these bylaws can make provisions for a variety of matters related to flood plain management and this can include the standard of works and services for the setback from a watercourse, body of water or dike of any landfill or structural support required to elevate a floor system or pad above the flood level.⁹² When making these bylaws, local governments must consider and comply with provincial guidelines that have been published under the *Environmental Management Act* and that relate to flood control, flood hazard management and the development of land that is subject to flooding.⁹³

In conclusion, local government authority over floodplain management does not have any practical impact on flood management works and is primarily a regulatory power relating to the regulation of land through zoning. However, local government authority over drainage is directly related to control and management of flood control infrastructure. Local governments also act as diking authorities. Through their authority over drainage and role as diking authority, local governments own flood control infrastructure and have an essentially unfettered discretion to determine the type of infrastructure installed and upgraded. Therefore, local governments have the ultimate choice whether to make flood control infrastructure fish friendly. Often, the issue that weighs against the installation of and upgrade to fish friendly infrastructure is cost.

⁹⁰ *Ibid* at s.524(2)

⁹¹ *Ibid* at s.524(4)

⁹² *Ibid* at ss.524(3) & (5)

⁹³ *Ibid* at ss.524(4)

3.4 MUNICIPAL EXAMPLES

3.4.1 Surrey

There are a number of diking districts in the City of Surrey. These include the Mud Bay Dyking District, Colebrook Dyking District, and the Surrey Dyking District. There has been some dispute in the past as to the responsibility of these diking districts and contention as to the amount of funding that the City of Surrey should receive if they were to assume responsibility for dissolved diking districts.⁹⁴ In the March 2, 2016 Corporate Report it was acknowledged that the City of Surrey is now willing to accept responsibility for both of the Colebrook Dyking District and the Surrey Dyking District.⁹⁵ Both of these had been incorporated under the *Drainage, Ditch and Dike Act* and needed to be assumed by the City of Surrey prior to the repeal of the Act. The Mud Bay Dyking District is still not managed by the City of Surrey but it was not enacted under the Drainage, Ditch and Dike Act and the province has not requested that Surrey assume responsibility for Mud Bay.⁹⁶ The Mud Bay Dyking District continues to operate effectively on its own to manage the dikes within their area.

In Surrey, there is a Lowland Dyking Stakeholders Committee. The City established the Committee in order to maintain communication with the landowners who formerly managed the Surrey Dyking District. The Committee has a purpose “to establish liaison and maintain communication between the landowners in the lowlands and the City on the operation and maintenance of the dykes”.⁹⁷ The Committee’s main focus is to discuss the high level maintenance and operation of the flood infrastructure. The Committee does not consider the environmental implications of flood management in Surrey.

Surrey’s Bylaws do contain some consideration for fish. In Surrey’s Zoning Bylaw there are provisions that provide for salmonid protection.⁹⁸ This is within the Streamside Protection section.⁹⁹ The Zoning Bylaw also contains a section specifying regulations for flood proofing.¹⁰⁰ The Streamside Protection section of the bylaw classifies all streams as one of three classifications that relate to whether salmonids inhabit or potentially inhabit the streams and to what extent, and if the streams provide significant food and nutrient values to downstream fish populations.¹⁰¹ However, these bylaws only relate to setback requirements for development from watercourses and not to the decisions regarding the installation of instream works.

The City of Surrey has completed Integrated Stormwater Management Plans (ISMPs) for all applicable watersheds in the City. These ISMPs look at the existing watershed drainage system and assess watershed health based on existing and future development conditions. Barriers to fish are often

⁹⁴ City of Surrey, Corporate Report, No. R054, Council date: April 8, 2013, online: < http://www.surrey.ca/bylawsandcouncillibrary/CR_2013-R054.pdf >

⁹⁵ City of Surrey, Corporate Report, No. R047, Council date: March 2, 2016, online: < http://www.surrey.ca/bylawsandcouncillibrary/CR_2016-R047.pdf >

⁹⁶ *Ibid*

⁹⁷ City of Surrey, *Lowland Dyking Stakeholder Committee*, online: Surrey < <http://www.surrey.ca/city-services/13268.aspx> >

⁹⁸ City of Surrey, Surrey Zoning By-law 12000, online: < http://www.surrey.ca/bylawsandcouncillibrary/BYL_Zoning_12000.pdf >

⁹⁹ *Ibid*

¹⁰⁰ *Ibid*

¹⁰¹ *Ibid* at Part 7A

identified through the ISMP process. Surrey also has sophisticated monitoring of water levels throughout the City as well as pump station data and Sea Dam data. This often advises the City as to future upgrades required to meet flood management risk. As the vast majority of the City's watercourses are fisheries sensitive, it includes compliance with the federal *Fisheries Act* and provincial *Water Sustainability Act* for all activities. Operating programs of drainage conveyance have oversight by an environmental consultant, which includes permit submissions, monitoring, and fish/wildlife salvage.

Surrey also has a Biodiversity Conservation Strategy (BCS) which identifies strategic wildlife corridors and hubs and sites and specifies management objectives in each of the areas, which is information that the City takes into consideration when designing and implementing its capital infrastructure upgrades. The City's 10 Year Servicing Plan outlines future projected capital works over a 10 year horizon, with the City having an inventory of all major infrastructure and its projected lifespan. Further, fish and environmental health are considered by the Design and Construction Division and the Environmental Section of the Engineering Department when projects come onstream.

Whenever the City upgrades drainage infrastructure in watercourses inhabited by fish, staff strive to provide fish access. Where appropriate, this may include installing fish friendly pumps, oversized culverts, bridges instead of culverts, and side mounted floodboxes. All new drainage infrastructure is also designed to improve water quality and better manage quantity. The City often incorporates rain gardens, bioswales, ponds and Low Impact Development (LID) designs. These recommendations are often articulated in the ISMPs.

If infrastructure is within a fisheries watercourse then the City typically upgrades to fish friendly pumps upon renovation. Ultimately, these upgrade costs are generally not that significant in the overall capital budget for the project especially if the requirement for fisheries compensation is evaluated and costed out.

3.4.2 Chilliwack

The City of Chilliwack has an extensive network of flood management works along the Fraser River. The City has enacted a floodplain bylaw,¹⁰² and like most municipal floodplain bylaws, it does not address environmental considerations other than noting the requirement to comply with provincial environmental standards and requirements. Environmental protection measures are incorporated into other development permits and bylaws.

The City of Chilliwack in collaboration with Fisheries and Oceans Canada has classified local watercourses according to fish sensitivity, and the classifications guide decision-making with respect to development setbacks, drainage maintenance activities, and upgrades to diking and drainage infrastructure. Development Permit Area 3 in the City's Official Community Plan encompasses all lands within the City of Chilliwack and stipulates setback requirements for the protection of fish habitat in accordance with the provincial *Fish Protection Act* (Riparian Areas Regulation). The City completed a comprehensive Integrated Stormwater Management Plan in 2002, and incorporated design criteria into the City's Land Development Bylaw. The objective is to control runoff volumes so that watersheds behave as though they have less than 10% impervious area in order to protect water quality and habitat, and reduce flood risk.

¹⁰² City of Chilliwack, Floodplain Regulation Bylaw 2004, No. 3080, online: <<https://www.chilliwack.com/main/attachments/attachView.cfm?attachID=999>>

The City assesses the condition of drainage infrastructure on a regular basis and carries out replacements or upgrades as required. Most work is minor in nature and falls more into the maintenance category. The City often incorporates fish protection and habitat improvements into the work (eg. oversizing culverts to allow placement of gravel at the base). The City carries out drainage maintenance annually during the fisheries work window to improve conveyance and water quality. An environmental consultant or the City's in-house environmental staff monitor all instream works.

There are five drainage pump stations in Chilliwack, and four of them have floodboxes that are open most of the year to allow fish access. One of the larger drainage systems, the Camp/Hope system is open to the Fraser River at the downstream end. Connection to the Fraser River at the upstream end was cut off when the dikes were constructed at the end of the 19th century, although there are pipes with slide gates through the dike at the upstream end of the Camp Slough to allow increased flow in the summer when water levels on the Fraser River are sufficiently high. The Camp/Hope system is used extensively by salmon and other aquatic species, and a study is underway to review options to improve flow and water quality.

Unless the provincial standards for flood infrastructure change, the City is not likely to upgrade the current infrastructure except for minor updates and upgrades. The bulk of upgrades required for the diking system is raising already existing dikes to adhere to the recently changed provincial standard. When considering new dikes, the City takes into account environmental considerations such as the watercourse the dike will be located on, environmental assessments requirements, as well as financial and other pragmatic considerations.

There is very little new infrastructure needed in Chilliwack due to the already established extensive network of flood management works. However, for a future drainage pump system the City has considered installing fish friendly works in a new pump station. In this discussion, the City is weighing how often the pumps will be used, and therefore how often it will be harmful to fish and the overall impact on fish health. If a new pump is estimated to be needed only for a few weeks in the next twenty years, the City must weigh the additional cost of investing in a fish friendly pump with the possible one-in-twenty-year harm to fish. The main concern for the City in the coming years will be to continue raising a number of dikes to meet the 2014 flood water elevation estimation made by FLNRO.¹⁰³

3.4.3 Richmond

Richmond approaches flood management from an integrated perspective, developing over the past decade a range of supporting strategies and bylaws, including the 2008-2031 Flood Protection Strategy, the Floodplain Bylaw, flood infrastructure plans, emergency response plans, flood recovery plans, and any other plans.¹⁰⁴ The Flood Protection Strategy notes the support for the principle of sustainability, which includes that flood prevention measures be "environmentally sound and sustainable".¹⁰⁵

Richmond actively monitors infrastructure through the City's Asset Management Plan. Through this planning, the City monitors aging infrastructure and prioritizes which infrastructure is to be replaced. The City has a large budget for infrastructure replacement and they are constantly upgrading the

¹⁰³ City of Chilliwack, Flood Protection Infrastructure, online: <<http://www.chilliwack.ca/main/page.cfm?id=1372>>

¹⁰⁴ City of Richmond, 2008 – 2031 Flood Protection Strategy, online:
< http://www.richmond.ca/cityhall/council/agendas/council/2008/062308_agenda.htm >

¹⁰⁵ *Ibid* at pg.2

existing infrastructure. In Richmond there is an urban containment boundary and therefore there is no need for new infrastructure in flood protection and the City focuses their flood planning efforts on their current infrastructure.

Richmond takes environmental considerations seriously as evidenced by the incorporation of sustainability and environmental concerns and principles into the Flood Protection Strategy. However, the main concern for flood management in Richmond is the ocean rather than the Fraser River. Despite this the City does have flood infrastructure in the Fraser River. The stream in which most flood infrastructure is located is not hospitable to fish due to the presence of iron in the groundwater. Therefore, the City does not weigh fish considerations heavily in their choice for replacement pumps. The City has 39 drainage pump stations and generally tries to replace one each year. The City views its pump infrastructure as reasonably fish friendly as it only operates two times a day and therefore spends most of the time as open gates.

The primary focus is on shore and foreshore habitats rather than instream habitats. The policy in the City is that of 2:1 habitat replacement. If any habitat must be unavoidably destroyed, then it must be replaced two-fold especially if it is important habitat. The City has an internal environmental resources department that ensures that the City takes the necessary environmental considerations into account in development and upgrades.

In 2015, Richmond adopted their Ecological Network Management Strategy. This was set in place to offer “a blueprint for ecological enhancement and the establishment of greener infrastructure”.¹⁰⁶ This strategy helps guide infrastructure decisions throughout the City. Further, under this strategy Bath Slough was recognized as a key focus for the Ecological Network in Richmond. The City is currently working towards revitalizing the slough, which has become degraded.¹⁰⁷

3.5 WATER SUSTAINABILITY ACT

The *Water Sustainability Act* is the primary legislation in British Columbia providing for the management of water resources. The Act regulates changes in and around streams, defines water rights, and provides for the system of water rights allocation. A stream is defined within the Act as “a natural watercourse ... or a natural body of water”.¹⁰⁸

The Act strictly regulates any changes in and about a stream. Changes in and about a stream are defined as “any modification to the nature of a stream, including any modification to the land, vegetation and natural environment of a stream or the flow of water in a stream” and as “any activity or construction within a stream channel that has or may have an impact on a stream or a stream channel”.¹⁰⁹ Any change in and about a stream must be made in accordance with the regulations, an order or a section 11 authorization.¹¹⁰ Other local authorities, such as the Office of the Inspector of Dikes, rely on section 11

¹⁰⁶ City News, Richmond’s new ecological strategy lays out roadmap for environmental enhancement, online: < <http://www.richmond.ca/newsevents/city/econetworkmgmtstrategy2015Oct01.htm> >

¹⁰⁷ City of Richmond, Ecological Network, Bath Slough Revitalization Initiative, online: < <http://www.richmond.ca/sustainability/stewardship/ecology/bathslough.htm?PageMode=HTML> >

¹⁰⁸ *Water Sustainability Act*, SBC 2014, c 15 at s.2

¹⁰⁹ *Ibid*

¹¹⁰ *Ibid* at s.11

authorizations under the *Water Sustainability Act* to account for environmental considerations in projects in streams.

Changes to a stream that require a section 11 authorization may be activities, such as maintenance, replacement, or construction of new works. Therefore, most dikes involved in flood protection, both public and private, and all instream flood protection works will require section 11 authorization for their construction and for modifications that could have additional impacts on the watercourse. Dikes and flood infrastructure that are set back from a stream bank may not require a section 11 authorization. A section 11 authorization is not required for the simple repair or maintenance of existing dikes or erosion protection works “to their original state” provided that the structures were operational in the previous year.¹¹¹ This is a rather limited exemption to the requirement of a section 11 authorization and only applies to dikes that are undergoing restoration to their former state. Dike upgrades are otherwise not treated any differently than other section 11 applications. There is a further limited exemption for flood protection works that are constructed in emergency conditions.¹¹² These are exempt from requiring a section 11 authorization but must be reported to a habitat officer with the Ministry of Forests, Lands and Natural Resource Operations (FLNRO) within 72 hours of the construction.¹¹³

The Ministry of FLNRO is responsible for receiving applications for section 11 authorizations. Application requirements are established in the *Water Sustainability Regulation* and generally that information about the project and about the stream on which the project is to take place be provided.¹¹⁴ As noted above, section 11 applications for dike upgrades and new dike construction are not treated differently than any other section 11 authorization. Often the ecological impact of a simple dike upgrade is minimal.

The basic approach that FLNRO applies to section 11 applications is from the provincial Policy for Mitigating Impacts on Environmental Values (also known as the Environmental Mitigation Policy). The province developed this policy to be used for major resource projects but it is applicable to all other projects involving environmental impacts in British Columbia.¹¹⁵ The Policy provides a stepwise approach known as the mitigation hierarchy where each step is to be considered before the next. The Policy requires that all “feasible measures” be considered and applied at each step prior to moving to the next step.¹¹⁶ The mitigation hierarchy is as follows:

1. Avoid any environmental impacts;
2. Minimize any environmental impacts;
3. Restore or compensate for any environmental impacts;

¹¹¹ *Water Sustainability Regulation*, BC Reg 36/2016 at s.39(1)(k) [*Water Sustainability Regulation*]

¹¹² *Ibid* at s.39(1)(o)

¹¹³ British Columbia, Apply for a Change Approval or Submit Notification of Instream Work, online: < <http://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> >

¹¹⁴ *Water Sustainability Regulation supra* note 110 at s.4

¹¹⁵ The Environmental Mitigation Policy can be accessed at: Ministry of Environment, Environmental Mitigation Policy for British Columbia, online: < <http://www.env.gov.bc.ca/emop/> >

¹¹⁶ Policy for Mitigating Impacts on Environmental Values (Environmental Mitigation Policy), May 13, 2014 - Working Document, online: < http://www.env.gov.bc.ca/emop/docs/EM_Policy_May13_2014.pdf > at s.6

4. If all of the above are not possible, offset environmental impacts through either financial or other means.¹¹⁷

In considering applications for section 11 authorizations, FLNRO staff will often consult with applicants regarding the first and second steps. When considering a project's impact on fish, FLNRO only communicates with the Department of Fisheries and Oceans Canada on more significant projects where authorizations are required by both governments. However, this communication is merely informative and decision making regarding section 11 authorizations is separate from federal decisions. Staff in FLNRO will require environmentally friendly flood infrastructure such as a more fish-friendly pump if it will significantly improve migration opportunities for fish. Although fish friendly pumps have not been required for proponents installing flood infrastructure, it is possible that these could be required in the future. This could be a result of the increased attention from the province, local governments, and non-government organizations to the issue.

Often there are requirements for project proponents to undergo continuous environmental impact monitoring during project construction. For example, projects that occur in sturgeon wintering ground will require continuous monitoring during construction and if a sturgeon is detected the province will issue a stop work order immediately. Sometimes FLNRO will require future maintenance or monitoring of environmental impacts for dike projects following construction. FLNRO requires an environmental impact assessment for every change approval for a proposed dike or other flood infrastructure work. Further, attached to section 11 authorizations are terms and conditions. These terms and conditions may relate to the time when work can take place, to measures protecting the stream ecosystem, the hydraulic integrity of the stream, and the rights of other water users.

In summary, section 11 authorizations under the *Water Sustainability Act* are the main regulatory mechanism to address environmental concerns and impacts from the construction of dikes and flood infrastructure. FLNRO will take into account all environmental factors, the ecological values and the potential impacts that the project will have on these values. Through these authorizations, the *Water Sustainability Act* is capable of addressing the environmental impacts of new flood control infrastructure and to engage proponents in the discussion of how to prevent or mitigate harm that might arise from these works. However, there is essentially no ability to address harmful historic flood infrastructure, the primary culprit of degraded fish habitat and harm to fish, through this Act.

3.6 FARM PRACTICES PROTECTION (RIGHT TO FARM) ACT

The *Farm Practices Protection (Right to Farm) Act* exempts farm operations (activities) from local government bylaws that address nuisance concerns.¹¹⁸ It provides that a farmer is not liable in nuisance to any person for any odour, noise, dust or other disturbance resulting from the farm operation as long as the farm operation is conducted using normal farm practices on land in the agricultural land reserve or where local government zoning allows.¹¹⁹ Likewise, the farmer must not be prevented by injunction or other order of a court from conducting that farm operation.¹²⁰ The farm practice must not be

¹¹⁷ *Ibid*

¹¹⁸ *Farm Practices Protection Act*, RSBC 1996, c 131

¹¹⁹ *Ibid* at s. 2(1)(a)

¹²⁰ *Ibid* at s.2(1)(b)

conducted in contravention of the *Health Act, Integrated Pest Management Act, Environmental Management Act*, the regulations under those Acts or any valid land use regulation.¹²¹

Therefore, while local governments can regulate against nuisances and noise, when they are created by a farm operation on land zoned for food production and the farm business uses normal farm practices, the nuisance or noise is not actionable. Farm business in the agricultural land reserve are exempt from a wider array of activities and the application of specific local government bylaws such as firearms and animal control than are farm land that is outside of the agricultural land reserve.

As noted, this Act exempts farm operations from bylaws addressing nuisance concerns. This is likely not an issue in the context of flood management and drainage services. Flood management and floodplain bylaws do not fall within the nuisance or specific bylaws addressed in the Act. Therefore, this Act and the right to farm should not have an impact on fish or provide excuse for harmful infrastructure.

4 SKAGIT COUNTY, WASHINGTON

The salmon populations in the Skagit River began declining in the 1930s.¹²² In the Skagit watershed, the Puget Sound chinook salmon, the Puget Sound bull trout, and the Puget Sound steelhead have all been listed as threatened under the U.S. *Endangered Species Act*. Like the Canadian *Species at Risk Act*, this designation affords some limited protection to the species. However, the fact that the salmon species in the Skagit watershed are a food source for Orca whales is more significant. Orca whales have been listed as endangered under the US *Endangered Species Act* and this designation imports more serious protection of the whales and their food sources.¹²³

Jurisdiction over flood management in Washington is divided in a manner similar to that in British Columbia. Flood control infrastructure management and installation primarily falls to the counties.¹²⁴ However, the Washington department of ecology coordinates floodplain management regulation as it relates to the national flood insurance program (“NFIP”).¹²⁵ The NFIP is an insurance program that was created by the US congress in 1968 in order to help protect property owners financially from losses due to flood events.¹²⁶ The NFIP stipulates that communities must adopt certain regulatory standards pursuant to Federal Emergency Management Agency (“FEMA”) requirements that will reduce the risk of flooding in order for these communities to qualify for flood insurance.¹²⁷

The restoration of the Skagit salmon populations and environment has been a collaborative effort between a number of governmental and independent organizations. These include, but are not limited

¹²¹ *Ibid* at s.2(2)(c)

¹²² Skagit County, Salmon Strategy, online: < <http://www.skagitcounty.net/Departments/salmonstrategy/main.htm> > [Skagit County]

¹²³ *Ibid*

¹²⁴ *Revised Code of Washington*, Title 86, Chapter 86.12

¹²⁵ *Revised Code of Washington*, Title 86, Chapter 86.16.010

¹²⁶ FloodSmart.gov, About the NFIP, online:

< https://www.floodsmart.gov/floodsmart/pages/about/nfip_overview.jsp >

¹²⁷ *Ibid*

to, the Skagit County Government, the Skagit Watershed Council, the Nature Conservancy and the National Oceanic and Atmospheric Administration.

The Skagit Watershed Council is a community partnership organization that was formed in 1997 and that seeks to protect and restore ecosystems within the Skagit watershed.¹²⁸ The organization ultimately coordinates salmon recovery on the Skagit River and has been designated as the lead entity for the area by the Skagit County Government.¹²⁹

The Nature Conservancy is extensively involved in restoring salmon habitat in Washington. One of their completed projects that has made monumental changes in restoring salmon habitat in the Skagit watershed is the Fisher Slough Project.¹³⁰ This project restored salmon habitat by creating a new rest stop for salmon along the Skagit river. This rest stop helped to mitigate the detrimental effect that the development and flood infrastructure has had on salmon in the Skagit river. Further, while creating the rest stop, the Nature Conservancy replaced harmful diking and drainage infrastructure in the River.¹³¹ This project was initially made possible by a \$5.2 million grant from a United States governmental agency, the National Oceanic and Atmospheric Administration, and was completed in 2011.¹³²

The Skagit County government is also heavily involved in promoting the health and wellness of fish and fish habitat in the Skagit watershed.¹³³ The County government works each year to remove barriers to fish passage. The County government achieves this by removing undersized culverts and also through the creation of an inventory and assigning priority to all barriers to fish passage in county waterways.¹³⁴ The County is also actively engaged in restoring fish habitat through habitat restoration work and through the Salmon Policy Resolution that was passed in 2007. The Salmon Policy Resolution serves as an informational and instructive resource for County departments on the impact that their actions have on salmon habitat and recovery.¹³⁵

¹²⁸ Skagit Watershed Council, History & Mission, online: < <http://www.skagitwatershed.org/about-us/history-mission/> >

¹²⁹ Skagit County, *supra* note 125

¹³⁰ The Nature Conservancy, The Fisher Slough Project, online: < <http://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/washington/explore/fisher-slough-blog.xml> >

¹³¹ *Ibid*

¹³² *Ibid*

¹³³ *Ibid*

¹³⁴ *Ibid*

¹³⁵ *Ibid*

5 RECOMMENDATIONS

The flood management regime in the Lower Fraser Valley involves all levels of government and private landowners, and implicates older infrastructure that may not have been designed to protect fish. This final section offers recommendations for updating this infrastructure to ensure that it reflects fish protection values into the future.

1. Advise municipalities on best practices and best available technology

Local governments are responsible for most practical decisions relating to flood management. While decisions relating to flood management works are subject to provincial and federal approval through the *Dike Maintenance Act*, the *Water Sustainability Act* and the *Fisheries Act*, the choices relating to infrastructure and design are that of the local governments.

If municipalities were made aware of current best practices for fish friendly flood management and the current best available technologies, they would be able to take these into account in future flood management work decisions.

Often, municipalities will weigh the costs and benefits of spending the extra money to obtain fish friendly infrastructure. If municipalities were made aware of the detrimental effects that harmful infrastructure can have on fish and fish habitat they can opt for more fish friendly infrastructure in these developments. They may also be able to take advantage of funding opportunities to install fish friendly pumps and infrastructure.

2. Support municipalities to create policies and bylaws relating to drainage that include requirements to consider fish habitat.

The direction that municipalities set through drainage policies and bylaws establish the factors that go into decision making. Fish and fish habitat health can feature more prominently in flood management planning, regulation and policy. This direction at the level of policies and bylaws will also shape decisions made about flood management infrastructure.

3. Identify and target most offensive/fish destructive works and infrastructure

Much of the flood infrastructure in the lower Fraser River is old and was installed before considerations for fish and the environment were taken into account. If local governments are made aware of the most offensive and harmful flood infrastructure, they can prioritize these works for future upgrades to fish friendly infrastructure sooner than what the operational life cycle of the works would require.

4. Explore with municipalities the potential for obtaining control of abandoned/orphan infrastructure

There are many orphaned dikes in the lower Fraser River. Many of these were erected in times of emergency and are located on private land. These “orphaned dikes” are not subject to any maintenance or monitoring and therefore their impact on fish and the environment is unknown to local authorities. Local governments may be reluctant to accept the responsibility of these dikes due

to financial and resource reasons. However, with pressure from the public to manage these dikes, local governments may take them over.

5. Work with FLNRO to improve Section 11 *Water Sustainability Act* WSA authorizations

Although fish and ecological considerations are taken into account when assessing applications for section 11 *Water Sustainability Act* authorizations, there could be increased focus on the type of infrastructure to be installed for flood management works. Water Managers and staff within the FLNRO could make local governments and others installing flood management infrastructure aware of fish friendly alternatives. This would essentially mean more focus on fish friendly alternatives at the first step of the mitigation hierarchy.

Further, it is entirely within the ability of staff to require fish friendly infrastructure in order to obtain a section 11 authorization. Ministry staff could identify key streams where fish are already harmed and are plentiful, and in these locations make this friendly infrastructure a baseline requirement.

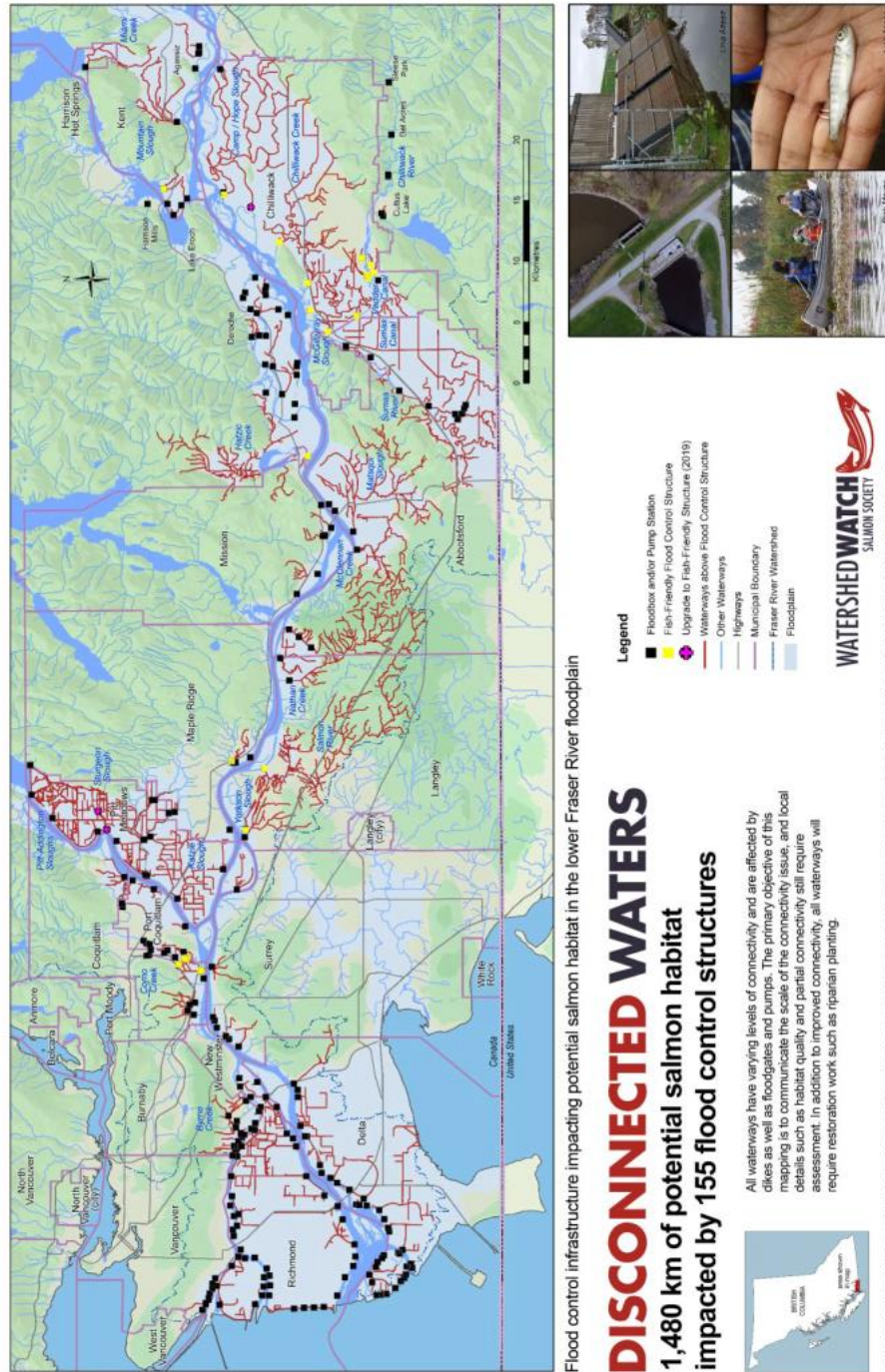
6. Advocate for fish-friendly infrastructure funding.

Advocates such as Watershed Watch could work with the federal government (Fisheries and Oceans Canada and Infrastructure Canada) to raise awareness of the need for fish-friendly infrastructure, for new works that the federal government will be supporting through infrastructure funding. The federal government is one of the partners in the Lower Mainland Flood Management Strategy, and in 2016 announced major “green” infrastructure funding as well as other funds for disaster mitigation, climate innovation and asset management planning. Funding for improving habitat within the tidal reach of the Fraser River could also be made available through the new federal Oceans Protection Plan. In accord with the responsibilities of the federal government, fish-friendliness could be a pre-requisite for federal infrastructure funding. A special fund could also be set up to specifically address the incremental cost of fish-friendly infrastructure in high priority locations, until such time as fish-friendly infrastructure becomes the norm through legislation and/or policy.

6 APPENDICES

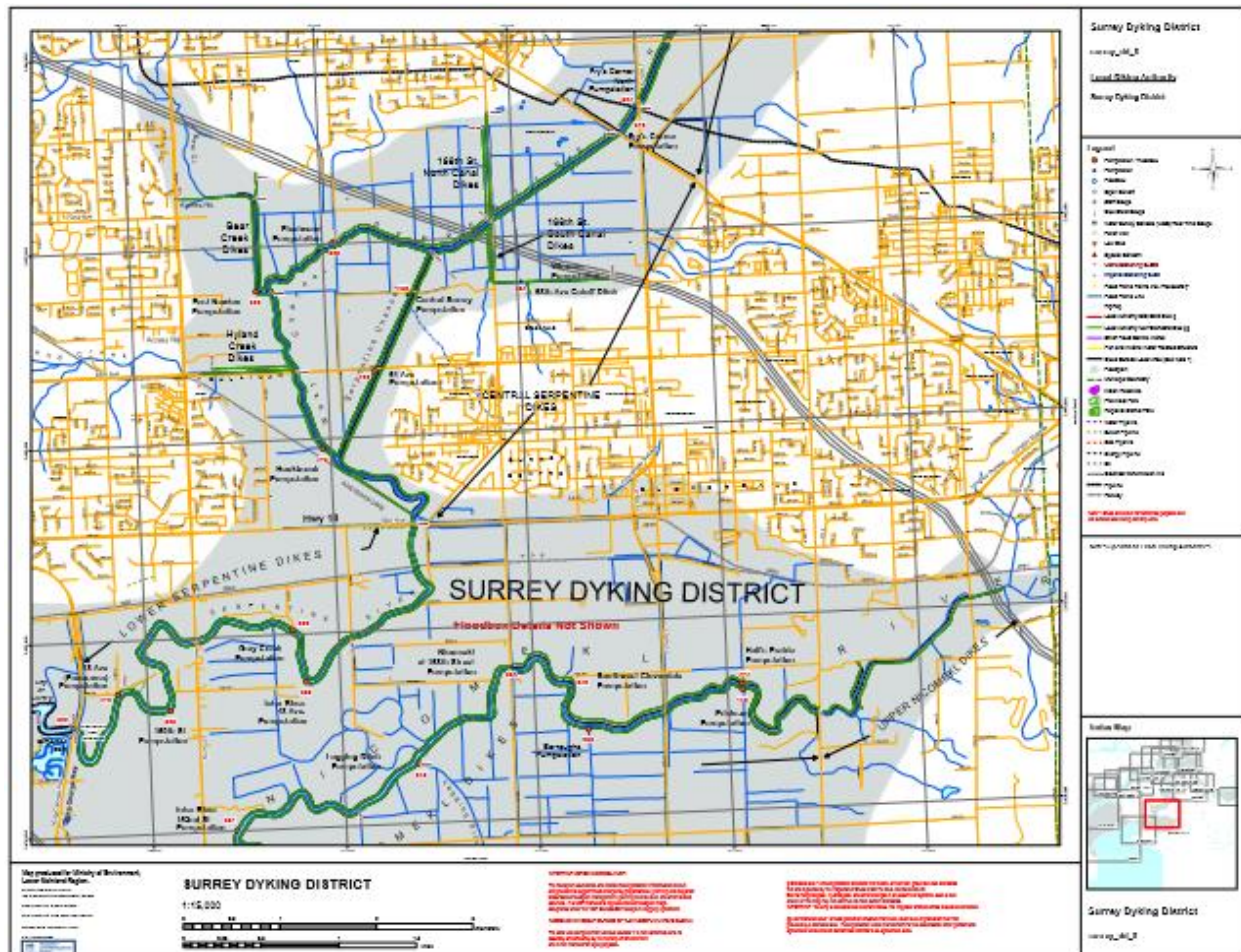
6.1 CONNECTED WATERS CAMPAIGN MAP¹³⁶

Floodboxes and Pumpstations in the Lower Fraser River



¹³⁶ Watershed Watch Salmon Society, provided in personal communication from Tanis Gower on August 1, 2017

6.2 SURREY DYKING DISTRICT



6.3 CHILLIWACK

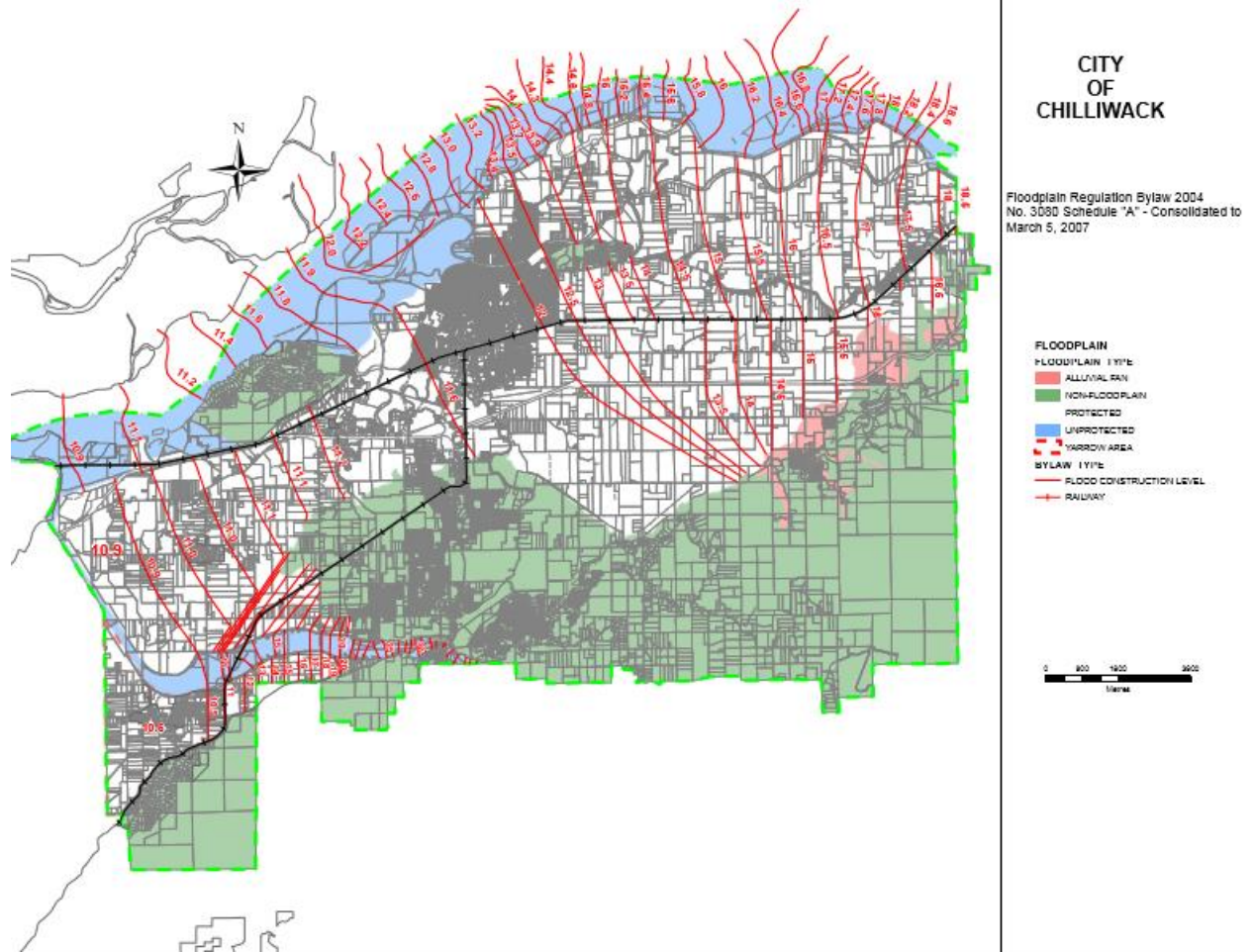


Figure 1 City of Chilliwack Floodplain from City of Chilliwack, Floodplain Regulation Bylaw 2004 No. 3080, Schedule "A"

6.4 RICHMOND'S ECOLOGICAL NETWORK

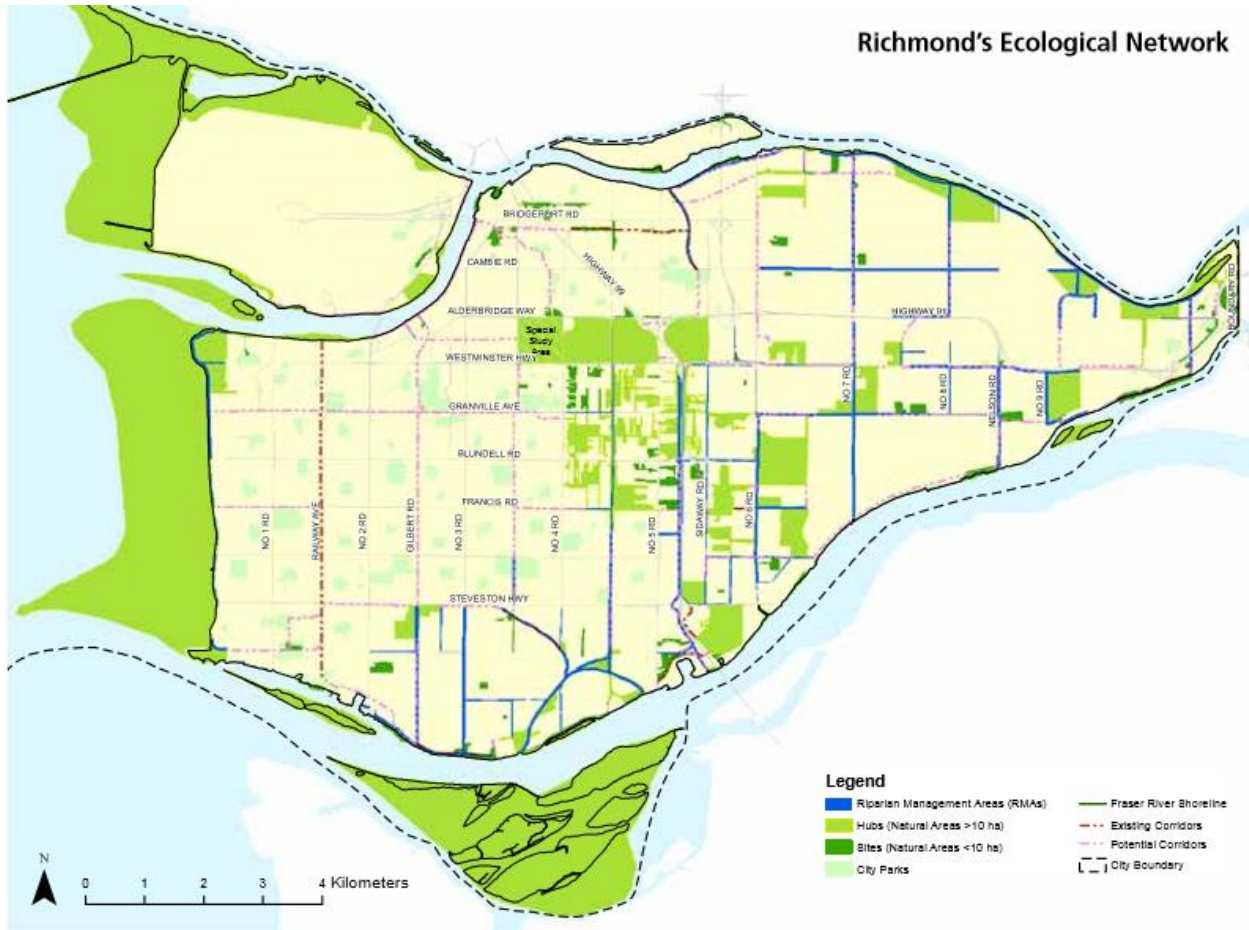


Figure 2 - Richmond's Ecological Network from Richmond's Ecological Network Management Strategy at pg. 2, accessed online at < http://www.richmond.ca/_shared/assets/Ecological_Network_Management_Strategy42545.pdf. >