

Chapter 4 • Executive summary

■ Introduction

In 2009, the Fraser River sockeye salmon fishery experienced its worst return since the 1940s. It was the third consecutive year in which the

commercial fishery had remained closed. For nearly two decades, there had been a steady and profound decline in “abundance” – the number of fish returning to the river to spawn (see Figure 3.4.1).

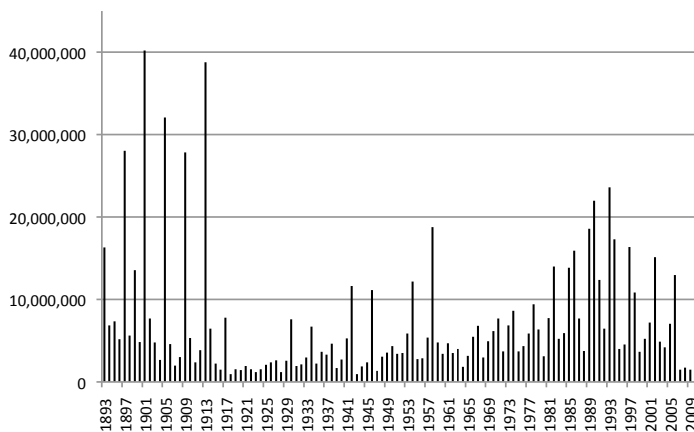


Figure 3.4.1 Total Fraser River sockeye returns, 1893–2011

Note: The 2011 estimate is preliminary.
Source: Exhibit 1967, p.4.

Between the early 1990s and 2009, there was also a steady and profound decline in “productivity” – the number of adults returning to spawn (recruits) compared with the number of spawning adults four years previously (see Figure 3.4.2). When the number of recruits is lower than the parental numbers, a stock is in decline. By 2009, the number of recruits per spawner was well below the replacement level. The steady decline of this resource over the past several decades has put enormous pressure on Aboriginal and non-Aboriginal communities that depend on Fraser River sockeye salmon.

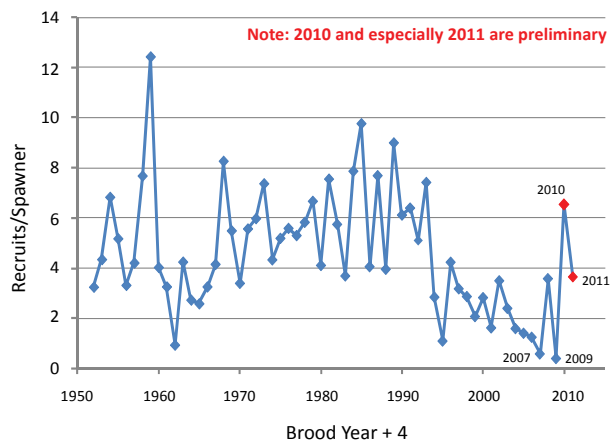


Figure 3.4.2 Annual variation in total Fraser River sockeye salmon productivity, 1952–2011

Source: Exhibit 1851.

In November 2009, the Governor General in Council issued Order in Council 2009-1860 establishing this Commission of Inquiry under Part 1 of the *Inquiries Act* and appointing me as sole Commissioner to investigate this decline of sockeye salmon in the Fraser River. The Terms of Reference direct me

- “to consider the policies and practices of the Department of Fisheries and Oceans” (DFO) with respect to the Fraser River sockeye salmon fishery;
- “to investigate and make independent findings of fact regarding ... the causes for the decline,” the current state of stocks, and the long-term projections for those stocks; and
- “to develop recommendations for improving the future sustainability of the ... fishery.”

The year 2010 was one of abundance: 29 million sockeye returned to the Fraser River. However, while demonstrating the sockeye’s capacity to produce at historic levels, this dramatic improvement in a regular peak year in the four-year life cycle of sockeye did not point to a reversal of the long-term decline. The previous years’ decline must be understood and evaluated in the context of the rebound in 2010.

It should be remembered that this rebound was not consistent among all Fraser River sockeye stocks, and it will take at least two more years before any conclusion about trends will be prudent.

I conducted the Inquiry over two-and-a-half years. Commission staff and contractors worked tirelessly to complete my broad mandate in that time. The Commission held 10 public forums, conducted 14 site visits, and held 128 days of evidentiary hearings, with 21 participant groups having standing at those hearings. We received 2,145 exhibits and heard testimony from 179 witnesses. Through the disclosure process, the Government of Canada produced more than 525,000 documents to the Commission, including more than 242,000 emails. In addition, participant groups and members of the public produced about 7,800 documents. The Commission issued a discussion paper, 21 policy and practice reports, 15 technical reports, and five status reports. I issued 34 rulings and made nine funding recommendations. In October 2010, as directed by the Terms of Reference, I published an Interim Report, *Fraser River Sockeye Salmon: Past Declines. Future Sustainability?*

I heard extensive evidence on the possible causes for the decline of Fraser River sockeye salmon and on the way DFO manages the fishery. I also heard suggestions on how to improve the long-term sustainability of the Fraser River sockeye fishery. This Final Report contains a summary of the evidence, my findings, and my recommendations to the Government of Canada regarding the future sustainability of the Fraser River sockeye salmon fishery.

Volume 1 of this Report discusses in detail the evidence before me about the Fraser River sockeye fishery. Chapters focus on the life cycle of the sockeye, the legal framework governing the fishery, an overview of DFO, management of the fishery, habitat management, enforcement, salmon farm management, fish health management, the Wild Salmon Policy, and the case history of Cultus Lake

sockeye. Volume 2 discusses the evidence on causes of the decline of Fraser River sockeye, including other investigations into the decline, a summary of decline-related evidence, and my findings on the causes of the decline. Volume 3 contains my annotated recommendations, discussion of legislative amendments that affect the findings and recommendations made by this Commission, this executive summary, and a review of the Commission process.

The executive summary offers only a cursory view of the comprehensive work of the Commission and should be considered in conjunction with the Recommendations (Chapter 2 of this volume). I encourage those who are interested to read the Report in full.

■ Commission activities

The Commission established an office in downtown Vancouver and retained administrative, legal, and scientific staff.

In April 2010, I made 21 grants of standing for participation in the Commission. Many of them were shared among applicants who originally applied individually. In total, 53 individuals, groups, and organizations were included in these grants of standing.

The Commission undertook a science program, directed by our in-house fisheries research consultant, to investigate possible causes of the decline of Fraser River sockeye. Researchers knowledgeable in various fields produced 16 technical reports, 15 of which were tendered as exhibits.

Throughout the Inquiry process, members of the public were invited to express their views on issues related to the Commission's mandate by making public submissions on our website. We received about 900 submissions, some of which are referred to throughout this Report.

Early in my mandate, in order to gain a deeper appreciation of the importance of Fraser River sockeye and its recent decline to British Columbians, I conducted 10 public forums on the mainland and Vancouver Island. I also made 14 site visits to hydroacoustic counting stations, fish hatcheries, land- and ocean-based salmon farms, canneries, a pulp mill, spawning grounds, and First Nations drift net and dip net fisheries.

The significance of the Fraser River sockeye fishery is reflected in the several dozen examinations, investigations, and reports into various aspects of the fishery that have been undertaken over the preceding three decades, focusing on DFO's management of the fishery, fleet reduction, salmon allocation, the Aboriginal role in the fishery, salmon farms, conservation, habitat protection, and consultative arrangements. These reports resulted in more than 700 recommendations, most of which were directed at DFO. I summarized those reports, the recommendations contained in them, and DFO's response to the recommendations in my Interim Report. Between October 2010 and December 2011, I conducted evidentiary hearings, which were open to the media and the public. Hearings were held at the Federal Court in downtown Vancouver and at the Morris J. Wosk Centre for Dialogue at Simon Fraser University. Each witness testified under oath or affirmation, either alone or as a member of a panel. Each one was questioned by Commission counsel and cross-examined by participants or participants' counsel. Witnesses included former and current DFO senior management and staff, employees from other federal departments, employees from the Province of British Columbia and local governments, scientists, conservationists, representatives of the aquaculture industry, and representatives of the commercial, recreational, and Aboriginal fisheries. Authors of the Commission's technical reports were also examined on their reports.

Exhibits and transcripts were posted on the Commission's website, giving the media and public full access to our proceedings. Transcripts of the hearings and the exhibits referred to in this Report are included in the DVD accompanying this Report.

Commission counsel also prepared 21 policy and practice reports on a range of legal topics and on various aspects of salmon management. These reports were circulated to all participants in advance of the hearings on the corresponding topics and were also filed in the hearings. They are included in the DVD.

At the conclusion of the evidentiary hearings, I received extensive written and oral final submissions from participants respecting the matters into which I had been directed to inquire, including recommendations for improving the

future sustainability of the Fraser River sockeye salmon fishery. In April 2012, I invited participants to provide supplementary submissions, if they wished, on how their submissions were affected by the proposed legislative changes to the *Fisheries Act* and to the *Canadian Environmental Assessment Act* contained in Bill C-38, *An Act to implement certain provisions of the budget tabled in Parliament on March 29, 2012 and other measures*.

All the sources of information and evidence discussed above have informed my findings of fact and recommendations.

A unique provision of the Terms of Reference to this Inquiry is the direction “to conduct the Inquiry without seeking to find fault on the part of any individual, community or organization.” Instead, I was mandated to encourage broad co-operation among stakeholders. I am pleased to be able to report that, throughout the Inquiry, counsel for the participants, while vigorously advancing their clients’ interests, acted with a high degree of professionalism in adopting a collaborative and co-operative approach. This attitude not only enabled the Commission to gather information and evidence on which to build an understanding of the past declines but also placed it in a position to recommend the necessary steps and solutions for restoring Fraser River sockeye salmon to its once abundant stocks.

■ No “smoking gun”

Some, I suspect, hoped that our work would find the “smoking gun” – a single cause that explained the two-decade decline in productivity. The idea that a single event or stressor is responsible for the 1992–2009 decline in Fraser River sockeye is appealing but improbable. Throughout the hearings I heard that sockeye experience multiple stressors that may affect their health and their habitats and that can cause death at various stages of their life. Several witnesses emphasized the importance of considering the cumulative effects of these stressors rather than stressors in isolation.

Although the technical reports and the testimony of the many witnesses revealed the current state of knowledge regarding the causes of the decline, this Commission has also demonstrated how much we still do not know. Key gaps in our knowledge remain.

It is not, in my view, a matter of choosing one potential cause over another. The available evidence shows that stressors specific to the Fraser River (such as development along the river or contaminants in the water), as well as region-wide influences (such as marine conditions in the Strait of Georgia, Queen Charlotte Sound, or North Pacific Ocean), may have contributed to the long-term decline in productivity. Factors in the marine environment appear particularly implicated in the broad-based regional decline of salmon stocks. Regrettably, that is as far as the evidence takes me.

Filling the gaps in our knowledge will be a major endeavour. In this Report, I make recommendations for specific scientific research that will, if undertaken, develop important baseline data, provide better information about Fraser River sockeye and the stressors they face throughout their life stages, and increase DFO’s capacity to identify cause-effect relationships.

■ DFO’s management of the fishery

During the course of this Inquiry, some (but certainly not all) presenters at public forums and witnesses at hearings spoke critically of DFO, alleging that it has mismanaged the fishery or that it is responsible for the decline.

By any measure, the Fraser River sockeye salmon fishery is a challenge to manage, given the anadromous life cycle of this fish, the many different stocks (some of which are threatened), and the multitude of natural and human-caused stressors that sockeye experience throughout their life. From what I have learned over the past two-and-a-half years, I am satisfied that DFO’s front-line staff in the Pacific Region have done a creditable job in challenging circumstances.

DFO operates through a variety of policy initiatives, and I heard about some policies that are under revision or were never fully implemented. I am not opposed to policies themselves, and I do not presume to say how many are necessary to manage a fishery, particularly one as complicated as the Fraser River sockeye fishery. However, creating a policy is not enough; it is through implementation that policies bring change. In my recommendations,

I call for action on two pivotal DFO policies that have yet to be fully implemented – the 1986 Habitat Policy and the 2005 Wild Salmon Policy.

Through this Commission's ability to require DFO to produce documents, along with the evidentiary hearings and the technical reports, a great deal of information about DFO's inner workings and in-house research has come into the public domain. In my view, such transparency is healthy. I urge DFO to continue such openness, by developing and maintaining an inventory of information about Fraser River sockeye salmon research and by making this research available to non-DFO scientific researchers.

Given my conclusion that the causes of the decline are most likely to be found in the cumulative effects of numerous stressors as well as in mechanisms operating on larger, regional spatial scales, it would not be appropriate to fault DFO for failing to take decisive action on any particular stressor. However, DFO's lack of research into the various stressors discussed in this Report means that it had no capacity to draw firm conclusions about the decline as the years unfolded and was thereby precluded from taking remedial action in a timely manner.

The Inquiry has identified aspects of the Fraser River sockeye management system that would benefit from reforms. In some management areas, however, the evidence indicates that DFO is doing a good job. It is not my role to micromanage DFO by suggesting detailed improvements to every element of its work relevant to Fraser River sockeye. Instead, my recommendations reflect those matters so important to the future sustainability of the Fraser River sockeye fishery that I must urge DFO or the Government of Canada to act.

As a result of this Inquiry, there is now a better understanding of the plausible mechanisms by which a variety of fresh- and saltwater stressors may have contributed to the two-decade decline. Much remains to be learned, however, about the actual impact of these stressors on Fraser River sockeye, and for that reason, I recommend a range of scientific research activities designed to improve DFO's capacity to find cause-effect relationships.

In making these recommendations, I am mindful of the economic climate within which we live. At the same time, I recognize that it is not my role as Commissioner to present a pared-down

set of recommendations compatible with current funding limitations which ignores what truly needs to be done. Rather, it is to make recommendations to improve the future long-term sustainability of the Fraser River sockeye fishery – and I cannot compromise that mandate.

■ An uncertain future

Fraser River sockeye face an uncertain future. First, shrinking resources, which may result in delays in implementing reforms and research, mean that the stressors to which sockeye are exposed will continue and that deterioration of sockeye habitat will get worse. If implementing the recommendations called for in this Report is delayed, the ongoing threats to the stocks will make remedial action all the more challenging when it does begin.

Second, the waters constituting Fraser River sockeye habitat are warming. Fraser River sockeye live near the southern limit of the Pacific sockeye range, and rising water temperatures will be particularly difficult for them. To the extent that warming waters result from increasing greenhouse gas emissions, solutions will require national and international attention, though local action is also possible.

Many of the amendments to the *Fisheries Act* passed in June 2012 will have an impact on the policies, procedures, and habitat protection measures examined by this Commission. I discuss this important issue below.

■ Findings and recommendations

The following sections summarize the themes of my findings and recommendations, which are described in Chapter 2, Recommendations.

The minister's ultimate decision-making authority

The ultimate authority over the management of the Fraser River sockeye salmon fishery should rest with the minister of fisheries and oceans.

DFO ought to act in a manner that respects this authority.

Fisheries management is a complex and demanding task, and some aspects require a high degree of technical understanding. DFO operates within a decreasing and uncertain funding environment. Funds must first be applied to meeting the organizational and technical capacity needs of DFO to enable it to fulfill its multiple responsibilities, as described throughout this Report. The fiscal reality is that such expertise cannot reasonably be replicated among all the parties who seek to participate in fisheries management. However, First Nations and stakeholders ought to continue to play an influential role in informing the decisions DFO makes regarding fisheries management.

The fishery should be managed for the benefit of everyone. In my view, while DFO should seek out and carefully consider input from those groups most directly involved in the fishery (such as First Nations, fishing sectors, and environmental groups), this kind of consultation does not mean it should share ultimate decision-making authority with them. No matter how inclusive a shared management process may be, to the extent that it reduces the minister's ultimate authority over the fishery, it may also reduce DFO's ability to manage the fishery in a way that accounts for the interests of all Canadians, including those not privy to a shared management process.

I know that many First Nations groups assert an Aboriginal right to manage the fishery. However, it is not within my mandate to assess the merits of such claims.

Although I strongly encourage consultation, cooperation, and collaboration with First Nations and stakeholders, I find that DFO should consistently articulate in unambiguous terms its respect for the minister's ultimate authority over Fraser River sockeye conservation and fisheries management decisions.

DFO's responsibility to conserve wild sockeye salmon stocks

Historically, DFO's mandate in relation to Fraser River sockeye salmon has been twofold: to conserve the wild stocks, and to ensure the future sustainability of the fishery. The goals of

conservation and a sustainable wild fishery are complementary.

In relation to wild fisheries, DFO's paramount regulatory objective is the conservation of Fraser River sockeye salmon and other wild fish species. DFO sets strict rules about who may fish for what species, and when and where they may fish for those species. In addition, Parliament has given DFO impressive statutory powers to protect the environment in which wild stocks live. Such statutory powers acknowledge the importance of productive habitat for a sustainable fishery and form a core component of DFO's mandate. These ideas were affirmed in the 1986 Habitat Policy and, more recently, in the Wild Salmon Policy (discussed below). Still, I heard evidence of confusion on DFO's part respecting its paramount regulatory objective. For example, several DFO witnesses testified about the need for DFO's Science Branch to provide advice to its "clients" rather than focusing on research to support the department's conservation mandate. In my view, in relation to wild fisheries, DFO should act at all times in accordance with its paramount regulatory objective to conserve wild fish.

In relation to salmon farming, the current role of DFO extends to promotion of salmon farming as an industry and farmed salmon as a product. When one government department (in this case, DFO) has mandates both to conserve wild stocks and to promote salmon farming, there are circumstances in which it may find itself in a conflict of interest because of divided loyalties. Although DFO also has an interest in promoting the wild fishery and its products, that interest is tempered by its duty to conserve those same wild stocks. Promoting salmon farms while protecting wild stocks is qualitatively different because there are no inherent checks and balances. Promotion of salmon farms might, in some circumstances, prejudice the health of wild salmon stocks. As long as DFO has a mandate to promote salmon farming, there is a risk that it will act in a manner that favours the interests of the salmon-farming industry over the health of wild fish stocks. The only way to address this potential conflict is by removing from DFO's mandate the promotion of the salmon-farming industry and farmed salmon products, and by transferring the promotion of salmon farming to a different part of the Executive Branch of government.

Implementation of the Wild Salmon Policy

The goal of the Wild Salmon Policy (WSP) is to restore and maintain healthy and diverse salmon populations and their habitats for the benefit and enjoyment of the people of Canada in perpetuity. The policy contains six strategies, which are implemented by specific action steps. The WSP is far more than a guiding principle. Rather, it provides a plan for maintaining biodiversity within Pacific salmon species and sets out the specific steps by which Canada's commitment to the precautionary principle is to be applied to the conservation of Pacific wild salmon. In essence, the precautionary principle holds that, where a risk of serious or irreversible harm exists, a lack of scientific certainty should not be used as a reason for postponing or failing to take reasonable and cost-effective conservation and management measures to address that risk.

Seven years after the release of the WSP, little progress has been made in implementing it beyond developing the methodologies required to monitor and assess the status of salmon Conservation Units* and some of their habitats. Although the policy itself promised that an implementation plan would be prepared, that commitment has not been met. DFO should develop and publish a detailed implementation plan as set out in the Wild Salmon Policy itself and, without further delay, honour its commitment to implementation.

Given the seminal importance of the WSP and DFO's professed commitment to its implementation, the level and manner of funding for WSP implementation is inadequate and disappointing. Although the WSP is a national DFO policy, the Pacific Region has been left to fend for itself in finding the funds within its own annual allocation to move forward with implementation. The blunt truth is that, in terms of dollars, the Pacific Region attaches greater importance to programs such as salmonid enhancement, promotion of salmon farming, and building the management capacity of First Nations than it does to the implementation of the WSP. If this funding model for WSP implementation continues, I have no confidence that the policy will ever be implemented. The Government

of Canada must step forward and provide the necessary funding for implementation. I am of the view that, once implementation costs are quantified, the Government of Canada should set aside segregated funds sufficient to complete implementation, making it clear that those funds are available only for WSP implementation and are protected from diversion to other DFO programs.

A specific expert within the Pacific Region must be made accountable to the regional director general for pulling together all the various elements of the WSP to make implementation happen. This official should endeavour to break down barriers between the different sectors and branches, ensuring that everyone works together with common cause throughout the implementation process. As I recommended in Chapter 2, DFO should establish in the Pacific Region a new associate regional director general position with the lead responsibility for developing and then executing the WSP implementation plan. This individual should report to the public annually on progress made toward full implementation.

Implementation of the first four strategies of the WSP is incomplete. Although measurable progress has been made under Strategy 1 (standardized monitoring of wild salmon status) and Strategy 2 (assessment of habitat status), it has largely been in developing the methodologies required to monitor and assess the status of salmon Conservation Units and their freshwater habitats. Little progress has been made toward actually using these methodologies, and almost nothing has been done to assess or monitor Fraser River sockeye Conservation Unit habitat status under Strategy 2. Also, despite Canada's express commitment to ecosystem-based management, there has been no demonstrable progress on implementing Strategy 3 (inclusion of ecosystem values and monitoring) as it applies to Fraser River sockeye. Strategy 4 (integrated strategic planning) requires a transparent process to ensure that DFO, the minister, and all interested parties understand the competing interests and how those interests are balanced. DFO has done little of the basic groundwork necessary to begin integrated strategic planning for Conservation Units. As a result, the only lever DFO is using to address

* A Conservation Unit is a group of wild salmon sufficiently isolated from other groups that, if extirpated, is very unlikely to recolonize naturally within an acceptable time frame.

weak stocks is curtailing harvest. Other measures contemplated by Strategy 4, including restoration measures, habitat improvements, and local development planning, have not occurred. Specific activities under strategies 2, 3, and 4 need priority attention, and I recommend that the new associate regional director general (discussed above) shepherd the completion of several key deliverables as set out in my recommendations.

Management of salmon farms

In December 2010, when DFO took over as the primary regulator for BC aquaculture, it adopted many of the procedures, practices, and systems – with some variations and improvements – that the province already had in place. DFO also chose to maintain the status quo by licensing all of the approximately 120 net-pen salmon farms then licensed by the province.

Fish health data and samples from salmon farms

In 2003, the province completed a fish health database and required industry to self-report information to that database. The quality and quantity (in terms of breadth of data collected) of the fish health database are impressive, especially when compared with monitoring programs in other sectors. However, the short data record (from 2004 to 2010) means that the statistical power of that data to show relationships (if they exist) between salmon-farm variables and measures of sockeye health or productivity is very low. DFO should continue to require the collection of fish health data to extend the length of this data record.

DFO recognizes that transparency about fish farm data is an issue that needs to be addressed, and it has taken steps to provide more information to the public than has previously been available. However, DFO needs to be even more transparent and to allow non-government and non-industry researchers access to the fish health database for their own purposes or for original analysis. Indeed, DFO's conservation mandate may be advanced by the provision of data to non-government and non-industry scientists, who may apply fresh perspectives and analysis to these data.

Also, the ability of DFO researchers to request and promptly receive fish samples from salmon farms is crucial to support a proactive research agenda that meets DFO's conservation mandate for wild stocks. Beyond routine monitoring, DFO should require, as a condition of licence, that salmon farm operators provide fish samples on reasonable demand by DFO researchers.

Minimizing risks and uncertainty

The evidence suggests that waste and chemical discharges from salmon farms are unlikely to have any population-level effect on Fraser River sockeye. I reached the same conclusion about Atlantic salmon escapes from fish farms. However, the state of scientific research about sockeye-fish farm interactions is not sufficiently developed to rule out diseases and pathogens on salmon farms as contributing to the decline of Fraser River sockeye and posing future risks. Fraser River sockeye face some likelihood of harm from disease and pathogens on salmon farms. However, I cannot quantify the likelihood of harm occurring. That requires further study.

Salmon farms along the sockeye migration route in the Discovery Islands have the potential to introduce exotic diseases and to exacerbate endemic diseases which can have a negative impact on Fraser River sockeye. Disease can cause significant population declines, and, in some situations – for example, if a disease were to wipe out a vulnerable stock of Fraser River sockeye – such effects could be irreversible. I therefore conclude that the potential harm posed by salmon farms to Fraser River sockeye salmon is serious or irreversible.

DFO's Wild Salmon Policy indicates that the risk to wild stocks from salmon farming is mitigated through measures such as improved cage structure, proper farm siting, and fish health management plans (FHMPs). Farm siting holds the potential to mitigate risk to Fraser River sockeye, but current siting criteria do not explicitly require consideration of Fraser River sockeye migration routes. When siting salmon farms, DFO should explicitly consider proximity to migrating Fraser River sockeye, and it should approach farm siting with the goal of the Wild Salmon Policy in mind. DFO should revisit siting decisions as more information about the impact of salmon farms on Fraser River sockeye becomes available.

The management practices applied within net cages, as set out in the FHMPs, are intended to reduce the risk to wild fish as much as possible. However, the evidence before me indicates several plausible mechanisms for harm as well as many knowledge gaps. DFO has not yet completed research into the effects of diseases and pathogens from fish farms on Fraser River sockeye. As a result, significant scientific uncertainty remains around the effect of salmon farms on Fraser River sockeye salmon.

Mitigation measures should not be delayed in the absence of scientific certainty. Precautionary measures should focus on filling the knowledge gaps and enabling DFO to adapt mitigation measures to new scientific information. It is appropriate to take measures to prevent any risk of serious harm from increasing. For that reason, I recommend that there should be no increase to net-pen salmon farm production in the Discovery Islands until September 30, 2020. I have chosen that date because DFO should by then be able to adequately assess the likelihood of net-pen salmon farms causing serious harm to Fraser River sockeye. If, by that date, DFO cannot confidently say the risk of serious harm is minimal, it should then prohibit all net-pen salmon farms from operating in the Discovery Islands. If DFO is satisfied before September 30, 2020, that the risk is more than minimal, it should order a stop to net-pen salmon farming at that earlier date.

Management and regulation of salmonid enhancement facilities

Salmonid enhancement (or production) facilities include hatcheries, spawning channels, and other improvements designed to produce fish.

Regulatory development for salmonid enhancement facilities is in its infancy. Diseases and pathogens at these facilities pose risks to Fraser River sockeye. Without set health standards for fish, standardized procedures, and proper monitoring and record keeping, scientists and regulators cannot accurately assess the risks and take informed preventive actions to reduce them. DFO ought to adopt a precautionary approach to the management of disease at salmonid enhancement facilities. First it should establish conditions of licence and

a monitoring and compliance program aimed at standardizing procedures and collecting information on fish health.

Enhanced salmon may compete with wild Fraser River sockeye in the marine environment. Wild salmon may also be subject to over-harvesting or depletion when wild stocks co-migrate with enhanced salmon. The evidence satisfies me that interactions between Fraser River sockeye salmon and enhanced fish in the marine environment pose a risk of serious harm to Fraser River sockeye. However, in the absence of a risk assessment, it is not possible to quantify the likelihood of the potential harm. I question whether the department's prioritizing of salmonid enhancement over habitat enhancement and restoration is consistent with its conservation mandate. It is therefore important that DFO undertake a risk assessment without further delay, so that a decision can be made respecting the future of salmonid enhancement facilities.

Because approximately 5 billion salmon fry and smolts are released from various Pacific Rim countries each year, the management of any risk posed by salmonid enhancement to Fraser River sockeye will likely require international co-operation.

Management of the sockeye salmon fishery

DFO's management of the Fraser River sockeye fishery is as complex as the fishery itself. Together with the Fraser River Panel of the Pacific Salmon Commission, DFO is responsible for planning and managing the recreational and Aboriginal fisheries as well as the commercial sockeye fishery (though the Fraser River Panel manages the commercial Fraser River sockeye fishery only in a set geographic area).

Licensing: equalizing fees for commercial, recreational, and economic opportunity fisheries

Although I do not make a recommendation regarding licensing, the current licensing regime applied to the Fraser River sockeye fishery contains several inequities. Commercial and recreational licence fees have not been adjusted for at least 15 years. Communal licences for Aboriginal

economic opportunity fishing are issued without fee, even though the economic opportunity fishery is a commercial fishery. DFO should consider a licensing regime in which all these sectors of the fishery (commercial, recreational, and economic opportunity) pay their fair share.

Pre-season forecasting and escapement target planning

DFO's pre-season forecasting serves a useful purpose in the management of the fishery. The department has made efforts to improve both the methodology of the pre-season forecasts and its communication of these forecasts to those interested in the fishery.

The Pacific Salmon Treaty stipulates that DFO must set escapement targets (the number of fish that return to the spawning grounds and are not harvested in a fishery). I am satisfied that DFO's Fraser River Sockeye Spawning Initiative (FRSSI) process and the model developed for that purpose are serving a valuable function and are an improvement over DFO's earlier rebuilding strategy.

I encourage DFO to follow through with its stated intention to review the FRSSI model and address the criticisms of it, including whether the total allowable mortality as a function of run size should have a maximum 60 percent cap. Although I note that FRSSI is a highly technical process, DFO needs to be more explicit about both the values it is considering in setting the escapement targets under FRSSI (for example, economic trade-offs to protect a weak stock) and the way it weighs these values.

The Integrated Harvest Planning Committee and the Integrated Fisheries Management Plan

To improve relationships among DFO and various sectors, DFO created the Integrated Harvest Planning Committee (IHPC), which involves participants in the fisheries as well as other interested parties (e.g., representatives of the Province of British Columbia and the Marine Conservation Caucus). The IHPC serves a useful purpose in commenting on the draft Integrated Fisheries Management Plan (IFMP) and as a way for DFO to communicate with stakeholders and some First Nations. However, I

heard concerns about the need for increased First Nations' representation in the IHPC process, and I encourage DFO to address this issue.

I commend DFO for its efforts to improve communication about the IFMP and to modernize it. I am hopeful that DFO can implement its stated goal of including an economic profile and an assessment of the current economic health and viability of the fishery in the IFMP and in making it a multi-year document.

Although I am satisfied that the process around the IFMP is sound, First Nations and stakeholders who participate in the IHPC are frustrated when the recommendations they make during that process are excluded without any explanation from the final version of the IFMP approved by the minister. The minister has the discretion to approve this final version, but those who have invested much time and energy in the IHPC process deserve to understand the reasoning behind the minister's ultimate decision about the content of the IFMP. I encourage DFO to address this issue.

I understand that those who draft the IFMP try to anticipate every conceivable eventuality. In urgent or unforeseen circumstances, however, DFO's managers in the Pacific Region must have the flexibility to make in-season management decisions to respond to circumstances not contemplated in the plan without first receiving ministerial approval.

Extensive advisory meetings create "meeting fatigue" for those involved, including DFO employees. Although some of these meetings are a necessary and important component of DFO's management of the fishery, I encourage DFO to rationalize and streamline its advisory processes in order to alleviate meeting fatigue and conserve DFO resources.

Test fishing and hydroacoustic monitoring

The test-fishing program operated by the Pacific Salmon Commission and DFO provides valuable information about stock composition, run sizes, and run timing, all of which are crucial to making prudent harvesting and escapement decisions. It is essential that DFO's contribution to the cost of the test-fishing program continue.

The hydroacoustic monitoring programs at Mission and Qualark are important and contribute valuable data to the management of the fishery. I heard from witnesses that, in estimating the

in-season run size, the single most important source of information is the Pacific Salmon Commission's facility in Mission, and that the data from DFO's Qualark facility provide a good cross-check or confirmation of the Mission data. However, DFO has not made any commitment to the future funding of its Qualark facility. In my view, DFO should continue to provide sufficient funding to enable the Pacific Salmon Commission to continue to operate its Mission facility, and DFO to operate the Qualark facility.

Selective fishing

Since the mid-1990s, Canadian and international initiatives have attempted to minimize unintended bycatch (harvesting of fish and other animals that are not the target of the fishery). Between 1998 and 2002, DFO funded the Pacific Salmon Selective Fisheries Program, which generated scientific information about selective fishing techniques. In 2001, DFO released its Policy for Selective Fishing in Canada's Pacific Fisheries (Selective Fishing Policy). Also in 2001, DFO introduced selective fishing measures in the IFMP, which were then translated into commercial fishing licence conditions, including brailing in the seine fleet, maximum set times for the gillnet fleet, barbless hooks for the troll fleet, and revival boxes for all three fleets.

The Selective Fishing Policy and these licence conditions are still in force, but no directed programs currently address selective fishing, and in-depth research needs to be done on post-release survival rates. To ensure that this research gap is filled and selective fishing practices continue to develop, it is essential that DFO designate an individual to coordinate scientific, educational, and management efforts in relation to selective fishing practices.

Fisheries monitoring and catch reporting

One important component in managing the fishery in the Pacific Region is knowing the number of fish that are harvested in the commercial, recreational, and Aboriginal fisheries (both the Aboriginal food, social, and ceremonial [FSC] fisheries and the economic opportunity fisheries). This information is also essential to the conservation and long-term sustainability of the fishery.

Even though the catch-reporting programs differ among the commercial, recreational, and Aboriginal sectors, and among the gear types and areas in the commercial fishery, the quality of the catch estimates ought to be comparable. Most catch-reporting data are estimates only, and I accept that, where catch reporting is primarily fisher dependent, the potential for inaccurate reporting of catch exists, whether inadvertent or intentional. Indeed, there has been a crisis of confidence among harvesters and the general public as to the accuracy and reliability of DFO's catch estimates. DFO should work toward a catch estimation regime for all Fraser River sockeye salmon fisheries which achieves an enhanced level of fisheries monitoring and catch reporting. An enhanced level of monitoring means that catch estimates achieve a statistical quality of precision within 5 percent of actual harvest, and that more than 20 percent of the catch is validated (counted) by an independent party.

To improve the completeness and accuracy of fisher-dependent catch reports, DFO should enforce penalties for non-compliance. Fishery officers should report illegal harvest so that DFO's catch estimates are able to consider credible observations of illegal harvests in addition to legal harvest.

DFO should provide sufficient and stable resources to support the enhanced level of fisheries monitoring (described above), including funds for independent validation of catch. Such effective monitoring will help rebuild public confidence. Also, if DFO determines that commercial fishers should bear some or all of the costs associated with catch monitoring, it should also seek similar costs from those engaged in Aboriginal economic opportunity fisheries.

Stock assessment

Stock assessment is essential to fisheries management. It includes data obtained through assessments of nursery lakes, juveniles, and escapement. I encourage DFO to assess smolt outmigration at the mouth of the Fraser River. DFO's escapement enumeration methods are adequate, with the caveat that the department needs to determine the calibration factor for visual counting methods in populations ranging from 25,000 to 75,000. Further funding cuts to DFO's stock-assessment programs for both Fraser River sockeye and other Fraser River salmon

stocks could adversely affect the conservation of the resource and the sustainability of the Fraser River sockeye fishery.

Definition for food, social, and ceremonial fishing

DFO has no specific definition for the term “food, social, and ceremonial” (FSC) fishing. Not surprisingly, then, there is a lack of consistent understanding within DFO and between DFO and First Nations as to what this term means. Although DFO has articulated guidelines for fisheries managers in allocating FSC access, in many cases the resulting allocations remain controversial. FSC allocations that are too low or too high have the potential to affect the future sustainability of the Fraser River sockeye salmon fishery. To the extent that any FSC fishing allocations may be less than what is needed by Aboriginal groups to sustain the fisheries practices, customs, and traditions integral to their distinctive Aboriginal cultures, that shortfall may put at risk the sustainability of the traditional Aboriginal FSC fishery as well as the Aboriginal cultural connection to that fishery.

My Terms of Reference do not grant me the jurisdiction to make findings on the existence or content of Aboriginal rights. I make no findings on the appropriate definition or quantification of FSC fisheries. However, I conclude that DFO requires a clear policy definition for food, social, and ceremonial fishing if it is to manage and allocate fisheries for FSC purposes well and ensure that the quantity of access provided to FSC fisheries is appropriate, given its effect on the sustainability of Aboriginal, commercial, and recreational fisheries.

Share-based management

Share-based management (SBM), which assigns catch shares or quotas to specific user groups or individuals, serves conservation objectives, and DFO is moving toward this model for legitimate reasons. DFO recognizes that managing the entire commercial salmon fishery as a competitive derby fishery (in which licensed fishers catch as much of the target species as they can while the fishery is open) is not sustainable. However, I accept the evidence that there are complexities in implementing SBM and that DFO has not yet fully assessed

the socio-economic implications of moving to this management system. It is vital to understand these implications both for commercial fishers and for coastal communities. DFO should conduct a socio-economic analysis before it decides on the particular management model (or models) it should employ. In the meantime, it should not impose SBM on fleets that are not willing to participate. Once it has completed the socio-economic analysis and developed an approach that accords with the principles and objectives of the Wild Salmon Policy, DFO should clearly and quickly communicate what it intends to do and then promptly see those commitments through.

In-river demonstration fisheries

In theory, because of their selective nature, terminal fisheries (fisheries near or at spawning grounds) may assist DFO in meeting its conservation objectives for Fraser River sockeye. However, I was not directed to any analysis of those benefits. I find that DFO has not done the work necessary to assess or quantify the actual conservation benefits that can be expected from a shift to harvesting in-river or in terminal areas.

In addition, the evidence of the economic viability of in-river or terminal fisheries is limited and not on the whole encouraging. I therefore conclude that DFO should proceed cautiously before it devotes additional resources to support in-river demonstration fisheries.

Implementing an in-river economic fishery is especially challenging for Fraser River sockeye for at least two reasons: (1) the geography of the Fraser River watershed, with many different stocks returning to the same river; and (2) the long history of the commercial fishery in marine and approach areas. Given these challenges, DFO must carefully consider the complex issues involved in shifting commercial harvest to in-river areas. Such issues should be considered within the integrated strategic planning process contemplated under Action Step 4.2 of the Wild Salmon Policy.

Transparency in the reallocation of the Fraser River sockeye salmon fishery

Since 2008, DFO has been developing the Aboriginal Fisheries Framework, which, among

other things, sets out an overall percentage of the available salmon harvest to be allocated to First Nations for both FSC and economic opportunity fisheries. DFO has not made public the overall allocation percentage contained in the Aboriginal Fisheries Framework. Insofar as this allocation contemplates a change in the overall composition of the fishery, the policy regarding it may also have a significant impact on the sustainability of the commercial and recreational fisheries.

In the course of this Inquiry, the salmon allocation percentage contained in the Aboriginal Fisheries Framework was certified as a cabinet confidence. This allocation has the potential to influence the future allocation of the fishery significantly, and that, in turn, may affect the sustainability of the Fraser River sockeye fishery. More specifically, increases in FSC allocations could reduce commercial and recreational allocation. DFO should develop any policy that may change inter-sectoral allocation of the Fraser River sockeye fishery openly and collaboratively, following a process such as Action Step 4.2 of the Wild Salmon Policy.

Habitat

Habitat degradation and loss pose risks to Fraser River sockeye. If current trends persist, there will be a significant decline in the productive capacity of the Fraser River sockeye habitat.

Implementation of the 1986 Habitat Policy

The 1986 Habitat Policy is a key national policy intended to guide DFO's protection of fish habitat. It is based on the recognition that a suitable fish habitat is essential to sustaining fisheries resources, and, over the long term, its objective is to achieve a net gain in the productive capacity of fish habitat.

The 1986 Habitat Policy and the Wild Salmon Policy are distinct but complementary. Implementation of one policy will advance implementation of the other, and the ultimate goal of both policies is to maintain and restore fish populations, including Fraser River sockeye.

At present, DFO is not achieving its goal of a net gain in productive fish habitat. Nor is it achieving "No Net Loss" of this habitat, which is a guiding principle of the 1986 Habitat Policy. DFO does not

measure either habitat loss or gain. Nevertheless, fish habitat is in a better state today than it would have been without the No Net Loss principle. Without a doubt, the 1986 Habitat Policy is a valuable tool for the protection of productive Fraser River sockeye habitat.

I am concerned that, notwithstanding findings in previous reports that DFO has not met the objectives of its 1986 Habitat Policy, the department has not completed implementing this policy. Instead, it has decided to develop a new habitat policy. Although the policy may need updating in order to address changes in case law and legislation over the past two decades, the goals of the 1986 Habitat Policy and its No Net Loss principle are sound and should be retained.

The 1986 Habitat Policy recognizes that the cumulative impact of development is a serious concern. DFO needs to manage this incremental harm that, over time, could have a substantial effect on Fraser River sockeye habitat productivity.

DFO's Habitat Management Program and habitat monitoring

DFO's Habitat Management Program is largely focused on ensuring compliance with the prohibition of harmful alteration, disruption, or destruction of fish habitat set out in subsection 35(1) of the *Fisheries Act* and other statutory provisions.

In recent years, the Habitat Management Program has shifted away from project-by-project review and toward a proponent or professional-reliance model – one that relies on the judgment of resource professionals. Such a change demands a strong emphasis on monitoring. Although DFO acknowledges that monitoring for compliance, effectiveness, and the overall health of fish habitat are all important for ensuring the sustainability of Fraser River sockeye, at the time of the hearings the department was engaged in only limited monitoring for compliance and did no monitoring at all for effectiveness or for the health of fish habitat.

Given the importance of habitat monitoring to ensure the future sustainability of Fraser River sockeye, I note with concern that, in June 2012, the media reported that a number of Habitat Management Program staff positions in the Pacific Region will be eliminated. In light of this cutback, I question whether DFO can adequately monitor

Fraser River sockeye habitat, given the ever-increasing pressures for economic development and the evidence I heard at the time of the hearings that DFO had not yet fully implemented the 1986 Habitat Policy.

Freshwater habitat

Loss or degradation of riparian habitats poses risks to the sustainability of Fraser River sockeye. It is not possible to maintain a healthy fish-bearing stream without a healthy riparian zone. In 2006, British Columbia brought into force the *Riparian Areas Regulation* (RAR), which provided direction to local governments on how to improve the protection of fish and fish habitat.

The provincial Ministry of Environment has found that compliance with the RAR by qualified environmental professionals (QEPs), local governments, and developers is low and does not meet the agreed-on target of 90 percent compliance with 90 percent confidence levels. Given the high incidence of non-compliance with the RAR, I invite DFO not only to encourage the Province of British Columbia to continue to monitor compliance with the RAR but also to work with the province to achieve the compliance target.

In addition, there is a gap in the province's regulation of development works, between the high-water level in the *Water Act* and the one-in-five-year level in the *Riparian Areas Regulation*. I invite DFO to encourage the Province of British Columbia to resolve this legal anomaly. DFO should also encourage the province to amend the *Riparian Areas Regulation* to require provincial approval of setback variances. The province should, in my view, consider DFO's input into the impact of these variances on fish and fish habitat.

Water use in the Fraser River watershed

As I discuss in Volume 2, altering water flow and temperature may have a negative effect on Fraser River sockeye salmon. I commend the Province of British Columbia for its work on modernizing the *Water Act*. I invite DFO to encourage the province to complete that process and to address

- regulation of groundwater extraction in a manner that meets the needs of Fraser River sockeye;

- increased reporting and monitoring of water use; and
- allocation of sufficient resources to complete the modernization process.

The development of water-use plans for BC Hydro power projects has been beneficial to the protection of sockeye habitat. In addition, the Summer Temperature Management Program is an effective strategy to protect Fraser River sockeye.

Gravel removal

It is unlikely that gravel removal will have a negative effect on Fraser River sockeye and the sockeye habitat. However, there are gaps in the data, and I note that DFO is aware of the need for long-term planning, comprehensive monitoring, and adequate habitat compensation from the gravel developers. I encourage DFO to support research on the annual pattern of fish activities within the gravel reach.

Forestry

While DFO is responsible for protecting fish and fish habitat, the Province of British Columbia has the exclusive authority to make laws for the development, conservation, and management of forestry resources, which it does under the *Forest and Range Practices Act* and the *Forests Act*. DFO's role in forestry issues and in fish-forestry interaction has decreased in recent years. Given the importance of fish habitat to the health of Fraser River sockeye salmon and other species, DFO needs to re-engage with the Province of British Columbia and to identify an individual to serve as the forestry contact person for the entire Pacific Region. DFO also needs to resume its review of proposed forestry activities that may harm fish habitat.

Marine habitat spill response

Given that the long-term decline in productivity in Fraser River sockeye salmon appears to be primarily due to conditions experienced by the fish in the marine environment, the spill-response process in the marine habitat is potentially critical to ensuring the sustainability of Fraser River sockeye. In order for the spill-response process to consider the health of these fish more effectively, responsibility for

post-emergency mitigation and long-term monitoring of the impact of marine spills should be transferred from the Coast Guard to the Environment Canada co-chair of the Regional Environmental Emergency Team. In addition, DFO's Oceans, Habitat and Enhancement and Science staff, who have specialized expertise in contaminants, fish, and fish habitat issues, should always be included as members of the marine spill-response team.

Harmful algal blooms

Despite the possible contribution of harmful algal blooms to the decline in Fraser River sockeye salmon productivity, DFO is no longer involved in the harmful algae monitoring program (HAMP). At the time of the hearings, DFO was not doing any research or monitoring in this area, meaning that pertinent information and advice about harmful algal blooms might not be available to DFO fisheries managers or scientists. To the extent that DFO requires this information for the management and control of the fishery, it could work with the salmon-farming industry and HAMP as well as with non-DFO scientists to obtain it.

Contaminants research and monitoring

Chemical contaminants in the salt- and freshwaters that sockeye salmon inhabit may have a serious negative impact on Fraser River sockeye salmon. Unfortunately, there are gaps in non-point source contaminant research and monitoring because of differences between what DFO and Environment Canada each views as its respective responsibilities. I note with concern that, in May 2012, the media reported that DFO is closing its Marine Environmental Quality section at its Institute of Ocean Sciences. If this section is closed, I question whether DFO will have the ability to fulfill its responsibility for research into the toxicological effects of contaminants on Fraser River sockeye and for monitoring these effects.

Pesticides

The broad application of pesticides to crops, lawns, and forests results in the non-point source pollution of Fraser River sockeye habitat. Such pollution can have lethal and sublethal effects on these fish.

In order to understand the full impact of pesticides on the Fraser River watershed, it is essential to have improved data on the use of pesticides.

Pulp and paper, metal mining, and municipal wastewater effluents

In recent years there have been improvements in effluent, or liquid waste, discharged from pulp and paper mills along the migratory route of Fraser River sockeye salmon. At present, however, the risk of harm to Fraser River sockeye is not being assessed.

Effluents from wastewater treatment plants are known to contain a variety of substances of concern to Fraser River sockeye salmon. Neither DFO nor Environment Canada is involved in monitoring or researching the impact of municipal wastewater on Fraser River sockeye or other salmon. In March 2010, Environment Canada proposed draft Wastewater Systems Effluent Regulations, which, if enacted, would apply nationwide. I commend Environment Canada for developing these regulations, but I urge that it be extended to include provisions for the following three points:

- public reporting on the results of environment effects monitoring;
- ongoing requirements for environmental effects monitoring similar to those found in the *Pulp and Paper Effluent Regulations* and in the *Metal Mining Effluent Regulations*; and
- environmental effects monitoring of contaminants of emerging concern and of endocrine-disrupting chemicals discharged from large wastewater treatment facilities.

Fisheries and habitat enforcement

Fisheries enforcement priorities and funding

Funding activities that will best support conservation should be the overarching principle that directs the allocation of resources for fisheries enforcement. Conservation is best served by proactively preventing fish from being taken illegally from the water. This objective will likely involve a combination of community education and stewardship

along with on-the-ground enforcement activities such as effective catch monitoring of all sectors and the realistic allocation and identification of FSC fish to Aboriginal groups. I don't want to suggest that after-the-fact investigations are not important; they are. Indeed, enforcement activities aimed at illegal sales may provide an effective deterrent to taking fish illegally out of the water in the first place. However, preventing the illegal taking of fish should be the priority consideration when DFO is faced with focusing its resource expenditure. In my view, there is no substitute for enforcement activities on the ground, on the water, and in the air (overflights), and the Pacific Region's Conservation and Protection Branch needs to continue to receive funding that will allow it to provide these services at the same levels as it did in the mid-2000s following the report of the Honourable Bryan Williams, *2004 Southern Salmon Fishery Post-Season Review* (Williams Report).

Responsibility for administration of section 36 of the Fisheries Act

The administrative responsibility for section 36 of the *Fisheries Act* (prohibition of the deposit of a deleterious substance of any type in water frequented by fish) was delegated to Environment Canada in 1978, although DFO ultimately remains responsible for ensuring that section 36 is enforced. In 2009, the office of the Commissioner of the Environment and Sustainable Development recommended that DFO and Environment Canada clearly establish the expectations for Environment Canada's administration of the pollution prevention provisions of the *Fisheries Act*, but that clarification has not yet been done. DFO and Environment Canada should complete the renegotiation of their relationship without further delay. At the national level, communication, sharing of information, and joint planning of activities relating to the *Fisheries Act* must be improved.

Habitat fishery officers

In the past, Habitat Management Program staff were designated as inspectors, which gave them the authority, for example, to issue an inspector's direction for a stop-work order so as to avoid the deposit of a deleterious substance. At present, however, these same staff members must call for

Conservation and Protection fishery officers, who have inspection powers, to come to the scene to issue the stop-work order. Inspection powers ought to be returned to Habitat Management Program staff.

As well, over the years there have been changes in the way habitat-related work is distributed among fishery officers. In my view, at least one fishery officer within the Pacific Region ought to be designated as a specialized habitat fishery officer with responsibility for four areas in particular:

- to act as the go-to person for habitat occurrences and investigations throughout the region;
- to work closely with the Habitat Management Program;
- to oversee training on habitat enforcement issues; and
- to ensure that there are adequate responses to habitat occurrences.

"Mortally wounded" clause

The general rule is that fishers may keep only the species of fish they are licensed to catch and for which there is a fishery opening. However, some Aboriginal communal fishing licences in the Fraser River include an exception to this rule, known as the "mortally wounded" clause, which provides that certain species of fish that would otherwise be considered unauthorized bycatch may be retained if the fish was mortally wounded when caught. The retention of mortally wounded bycatch of sockeye salmon should not be permitted, because retention could have a negative impact on the conservation of Fraser River sockeye salmon and on the long-term sustainability of the fishery. Also, as a practical matter, the mortally wounded clause is unenforceable. Requiring even "mortally wounded" bycatch to be returned to the ocean or river is consistent with ecosystem-based management.

Science research

Throughout the hearings I heard from many expert witnesses who have spent much or all of their professional careers studying Fraser River sockeye salmon. This iconic species is the most studied of all the Pacific salmon, and for many years DFO has invested much time and energy in learning more about it.

Despite this work, much remains to be done. There are still many aspects of the Fraser River sockeye life cycle about which little is known. Many stressors have been identified, including predators, climate change, infectious diseases, human development, contaminants, municipal wastewater, pesticides, harmful algal blooms, salmon farms, hydroelectric projects, interaction between wild and enhanced salmon, and the effects of agriculture, forestry, and mining. We still have a lot to learn about the relative detrimental impact these stressors actually have on sockeye and their habitat.

This lack of understanding about actual effects applies not only to individual stressors but also to cumulative effects (e.g., the combined effect of contaminants, disease, and warmer waters on the health of a fish) and to delayed effects (e.g., a contaminant or pathogen picked up during the outmigration leading to mortality during the return migration). I therefore recommend that further research is crucial to understanding the long-term productivity and sustainability of Fraser River sockeye salmon, particularly in the areas discussed under the subheadings below.

Fraser River sockeye salmon downstream migration mortality

From the time smolts leave their nursery lakes until they are caught in the test fisheries as adults returning to spawn, very little is known about when and where they die. During all this time, the fish are exposed to a wide range of stressors, and I conclude that there are plausible mechanisms by which some or all of them might have a negative impact on Fraser River sockeye health and survival. I was told that it is technically feasible to determine stock or Conservation Unit abundance, health, condition, and rates of mortality of Fraser River sockeye at the mouth of the estuary. I recommend such research, as it would yield valuable information to identify specific life stages in which dramatic population changes occur.

Fraser River sockeye salmon marine survival

Fraser River sockeye salmon spend about two years, or approximately half of their lifespan, in the Pacific Ocean, yet little is known about what they

experience during that period or what conditions would assist their rate of survival there. In particular, a better understanding is needed of their migratory and feeding patterns in all marine areas; the biological, chemical, and physical oceanographic variables that these salmon currently experience and will experience in the future; and the impact of various natural and human-caused stressors such as warming waters, predators, pathogens, and contaminants.

It would be logical to broaden the scope of this fundamental research into the marine survival of Fraser River sockeye salmon to other salmon stocks, both Canadian and American, and to share responsibility for the research between our countries.

Fish health

Surprisingly little research has been conducted into the health of the Fraser River sockeye population. With so little known about the health of these fish, it is difficult to assess the impact of some activities, such as salmon farms or salmonid enhancement facilities, on these wild stocks. Researchers retained by this Commission were unanimous in their view that more research into the health of wild fish stocks is critical in order to make these sorts of assessments.

Senior DFO Science staff testified that there is a gap in the research on wild fish health. Although DFO is attempting to address it, research priorities, they said, are “very much weighted” by the need for DFO Science to provide advice to its “clients.” DFO’s science managers should encourage innovation and the exploration of new research methods into novel diseases and other conditions that affect wild fish, beyond the interests of specific clients such as aquaculture management or the Canadian Food Inspection Agency. DFO’s fish health research priorities should reflect that its paramount responsibility is the conservation of wild fish.

Harrison River sockeye salmon population

Contrary to most Fraser River sockeye stocks, the Harrison River population has been increasing in productivity and abundance since the 1990s and, in 2010 and 2011, returned in record numbers. Harrison River sockeye exhibit unique freshwater and marine life history patterns, and they appear to

follow migration routes that are distinct from most other Fraser River sockeye populations.

While numerous witnesses commented on these different life history patterns, the reasons underlying the Harrison River population's recent increases in productivity and abundance are not clear. In my view, the success of this population would be a fruitful area of research because it may provide important insights into the production processes of Fraser River sockeye salmon.

Cumulative effects

Cumulative effects can arise from multiple exposures to an individual stressor within an area or life history stage, from exposure to an individual stressor over the life cycle of Fraser River sockeye, or from exposure to multiple types of stressors interacting in a cumulative manner over a number of life history stages. More research into cumulative effects could and should be done. It will not only help scientists understand what is happening to Fraser River sockeye but may also inform the proper management of Fraser River sockeye and their habitats.

Inventory of Fraser River sockeye salmon research

Many of the researchers participating in the Commission's research program encountered difficulty in locating and obtaining access to relevant data. In some cases, different organizations had collected data on the same issue but had used incompatible databases.

The scientific research proposed in my recommendations will generate a wealth of information about Fraser River sockeye salmon and related species, salmon habitat, and the various stressors that threaten sockeye and their habitat. These data will add to those already collected by DFO. It is essential that DFO develop and maintain an accessible inventory of all its research – a central depository for information about existing and new research, who has custody of it, and where it can be located.

With respect to who should have access to this research, DFO must be transparent in its procedures. It should allow non-government scientific researchers who are engaged in original research to

have access to the proposed Fraser River sockeye salmon research. DFO's conservation mandate may be advanced by making existing and new research available to non-government scientific researchers. They may apply fresh perspectives and ideas to this information and, by doing so, prompt DFO to ask new questions that further scientific understanding. This information could, in turn, lead to regulatory advances to protect wild stocks.

Improving future sustainability by addressing warming waters

Water temperatures have increased over several decades in Fraser River sockeye rearing lakes, the Fraser River, the Strait of Georgia, and in other migratory areas. Elevated water temperatures may increase physiological stress on sockeye salmon, in addition to changing the availability of prey and the presence of non-resident predators. Climate change has also been observed in British Columbia in the form of increased precipitation, with more of it occurring as rainfall, earlier snowmelt, and overall unpredictability of climate.

It was beyond the scope of this Inquiry to examine the underlying causes of climate change and how society can address those causes. However, I heard enough evidence about warming waters and the impact on Fraser River sockeye salmon to reach the uncomfortable conclusion that many of my recommendations, and DFO's efforts to implement them, will not improve the fate of the Fraser River sockeye fishery if climate change continues unabated. If solutions are to be found, they will require leadership at the national and international levels. Canadians must look to the Government of Canada as a whole for domestic action and for Canadian support for international initiatives that will reduce the impact of warming waters and climate instability on Fraser River sockeye salmon.

Implementation of this Commission's recommendations

When an independent body, such as a commission of inquiry, makes recommendations to a department of government in accordance with the mandate given to it by the Governor General in

Council, a degree of accountability for those recommendations should follow.

An appropriate level of accountability could be achieved by having an independent and knowledgeable body review the extent to which and the manner in which the Commission's recommendations have been implemented and to make that review public. This process would bring a needed measure of transparency to the government's response to the Commission's work while at the same time preserving the independence of action within the Executive Branch.

The federal office of the Commissioner of the Environment and Sustainable Development has reported on matters relating to wild salmon stocks, habitat, and aquaculture for nearly a decade. In my view, it would be an appropriate body to undertake this type of review, if it were willing and able to do so. Given the ongoing interest of the Standing Committee on Fisheries and Oceans on the issues examined by this Commission, it would be appropriate for the Commissioner of the Environment and Sustainable Development to report to that committee as well as to the public.

■ Legislative changes in Bill C-38 relevant to this Report

Bill C-38, *An Act to implement certain provisions of the budget tabled in Parliament on March 29, 2012 and other measures* (with the short title, *Jobs, Growth and Long-Term Prosperity Act*), was tabled in Parliament on April 26, 2012, five months after the completion of the Inquiry's evidentiary hearings. By that time, my Final Report was in the late stages of being drafted. Bill C-38 received royal assent on June 29, 2012. Many of the amendments will affect fisheries policies and procedures examined by this Commission, along with important habitat protection measures that were in place at the time of the evidentiary hearings.

Bill C-38 repeals the *Canadian Environmental Assessment Act* and enacts the *Canadian Environmental Assessment Act, 2012* (CEAA, 2012), establishing a new federal environmental assessment process. The bill also amends the *Fisheries Act*, most

notably some of the habitat protection provisions, but also the enforcement and fisheries management provisions. I heard no evidence from DFO witnesses relating to the impending amendments, nor was there any documentary evidence in this regard. Because the bill was introduced after the conclusion of the Inquiry's evidentiary hearings, neither Commission counsel nor counsel for participants had the opportunity to explore with witnesses the potential impact of these changes on DFO's fisheries management and habitat protection work. I therefore invited participants to provide written submissions on how the proposed changes in Bill C-38 affect their final submissions.

The Government of Canada suspended several processes pending the results of this Inquiry in order to consider the advice and recommendations made in my Report. It is regrettable that the legislative amendments, especially those related to the *Fisheries Act*, could not also have waited until the Government of Canada had the opportunity to consider this Report. In their responses to my invitation, some participants suggested that the amendments were "pushed through" in a way that undermines the processes established by DFO for consultation before it makes substantive changes to the management of the Fraser River sockeye fishery.

Bill C-38 also repeals the *Kyoto Protocol Implementation Act*, which some participants worry signals a move away from commitments to lead international efforts to address climate change. As I mentioned above, climate change and warming waters present perhaps the most daunting long-term threat to the Fraser River sockeye fishery, and leadership in addressing root causes at the national level is critical.

With respect to the changes to the environmental assessment process, some participants anticipate that the CEAA, 2012, will result in fewer federal environmental assessments. They worry that the potential to offload environmental assessments to the provinces and territories signals an abdication of federal responsibility for environmental protection.

Bill C-38 amends the *Fisheries Act* "to focus that Act on the protection of fish that support commercial, recreational or Aboriginal fisheries." The goals of conservation and a sustainable fishery are complementary. However, the

revisions to the *Fisheries Act* shift the emphasis of the Act from protecting fish and the habitat necessary to sustain them to protecting fisheries. The importance of productive habitat to the long-term sustainability of the Fraser River sockeye fishery was never challenged during this Inquiry. Accordingly, the amendments to the *Fisheries Act* cause me concern. They appear to expand the circumstances in which harm to fish habitat may be authorized, and they allow damage to habitat where there is no *permanent* negative impact or death of fish.

DFO has worked hard over the years to amass fish habitat expertise, which other agencies do not have. The amendments enabling the government to allow other regulators to authorize harm to habitat introduce the possibility that DFO's expertise on fish and fish habitat will not inform these decisions.

The focus on fisheries may leave fish stocks or Conservation Units without protection on the basis that, because they are threatened or endangered, they are not currently fished. While this remains to be seen, it would be a departure from the long-standing principle of maximizing biodiversity espoused in Canadian legislation, in the Wild Salmon Policy, and in Canada's international commitments.

As I discuss in several parts of this Report, DFO has been attempting to move toward ecosystem-based management: its policies indicate a commitment to ecosystem science in order to support an ecosystem approach to management. According to senior DFO officials, ecosystem-based management takes the broader ecosystem into consideration in managing programs such as fisheries, aquaculture, and habitat. It is not clear how DFO will reconcile this ecosystem approach to management with the legislative amendments, which focus on fisheries in isolation.

I find it difficult to avoid the conclusion that the legislative amendments in Bill C-38 lower the standard of protection for Fraser River sockeye salmon. In terms of operation, the way in which the amendments will change the management of Fraser River sockeye is unknown. DFO needs to monitor habitat and manage the incremental harm that threatens the long-term sustainability of the fishery. Less oversight of development is not likely to assist DFO toward this objective.

■ List of recommendations

The minister's ultimate decision-making authority

- 1 In relation to Fraser River sockeye, the Department of Fisheries and Oceans should follow the principle that the minister is the ultimate authority in decisions about conservation, fisheries management (subject to the Pacific Salmon Treaty), and, within areas of federal jurisdiction, fish habitat. DFO should consistently reflect this principle in all its agreements and processes with First Nations and stakeholders.

DFO's mandate in relation to wild fish

- 2 In relation to wild fisheries, the Department of Fisheries and Oceans should act in accordance with its paramount regulatory objective to conserve wild fish.

DFO's obligations in relation to net-pen salmon farms

- 3 The Government of Canada should remove from the Department of Fisheries and Oceans' mandate the promotion of salmon farming as an industry and farmed salmon as a product.

New position of associate regional director general

- 4 The Department of Fisheries and Oceans should immediately create a new position in the Pacific Region at the associate regional director general level with responsibility for
 - developing and implementing the Wild Salmon Policy implementation plan recommended under Recommendation 5; and
 - supervising the expenditure of funds provided under Recommendation 6 for implementation of the policy.

Wild Salmon Policy implementation plan

- 5 The new associate regional director general should, by March 31, 2013, publish a detailed

plan for implementation of the Wild Salmon Policy, stipulating

- what tasks are required;
- how they will be performed and by whom;
- when they will be completed; and
- how much implementation will cost, as set out in a detailed itemization of costs.

Wild Salmon Policy funding

- 6 The Government of Canada should establish dedicated Wild Salmon Policy funding sufficient to carry out the Department of Fisheries and Oceans' implementation plan and to cover ongoing operational costs.

Annual report on progress in Wild Salmon Policy implementation

- 7 The new associate regional director general responsible for implementation of the Wild Salmon Policy should, by March 31, 2014, and each anniversary thereafter during implementation, report in writing on progress in implementation of the policy, and the Department of Fisheries and Oceans should publish that report on its website. Each annual report should invite responses from First Nations and stakeholders, and all responses should be promptly published on the DFO website.

Wild Salmon Policy: strategies 2 and 3

- 8 By January 31, 2013, the new associate regional director general should decide whether the Habitat Management Program (Ecosystem Management Branch)* or the Science Branch should take the lead role in implementing strategies 2 and 3 and what support should be provided by the other branch. The new associate regional director general should also identify who is responsible for, and set deadlines respecting, the following activities:

- preparing habitat status reports;
- monitoring and assessing habitat using the habitat indicators and benchmarks developed by Stalberg et al.;[†] and
- finalizing habitat indicators and benchmarks where possible.

The new associate regional director general should coordinate with the Habitat Management Program to ensure consistency in implementing both this Recommendation and Recommendation 41.

Wild Salmon Policy: Strategy 4

- 9 In order to begin integrated strategic planning under Strategy 4 in relation to Fraser River sockeye without further delay, these key deliverables should be completed according to the following schedule:
 - By March 31, 2013, identification of red zone Conservation Units under Strategy 1, based on the Grant Draft Paper 2011.[‡]
 - By September 30, 2013, preparation of overview reports for the Fraser River watershed and marine areas relevant to Fraser River sockeye salmon, based on the best available information at that time. Knowledge gaps of concern to the drafters should be identified in the overview reports and a plan developed to address those knowledge gaps.
 - By December 31, 2013, development of habitat indicators and benchmarks for assessment for the Strait of Georgia, Juan de Fuca Strait, Johnstone Strait, and Queen Charlotte Sound.
- 10 As part of the implementation of Strategy 4 in relation to Fraser River sockeye, these key deliverables should be completed according to the following schedule:
 - By March 31, 2013, the Department of Fisheries and Oceans should complete a socio-economic framework for decision making

* The Ecosystem Management Branch was formerly known as the Oceans, Habitat and Enhancement Branch, and this latter term has been used throughout the Report.

† Exhibit 175.

‡ Exhibit 1915.

in the integrated strategic planning process; it should also integrate meaningful socio-economic input into fisheries management decision making, beginning with planning for the 2014 fishing season.

- By January 31, 2014, integrated strategic planning processes should begin for Fraser River sockeye salmon using the best currently available information and following the procedure outlined in Appendix 2 (A structured five-step planning procedure) of the Wild Salmon Policy.
- By March 31, 2013, response teams should be formed for all Conservation Units in the red zone and for those that could significantly limit fishing and other activities.
- By December 31, 2014, response teams should complete plans for the protection and restoration of priority Conservation Units, and in developing such plans, they should give full consideration to approaches beyond curtailing fisheries.

Fish health data from salmon farms

- 11 In order to provide a longer time series of data on which to test for relationships between stressors found at salmon farms and the health of Fraser River sockeye salmon, the Department of Fisheries and Oceans should continue to require the collection of fish health data directly from operators of salmon farms and through DFO audits.
- 12 For research purposes beyond routine monitoring, the Department of Fisheries and Oceans should require, as a condition of licence, that the operator of a salmon farm provide, on reasonable demand by DFO, fish samples, including live fish or fresh silvers (recently deceased fish), in a quantity and according to a protocol specified by DFO.
- 13 The Department of Fisheries and Oceans should give non-government scientific researchers timely access to primary fish health data collected through DFO's routine monitoring programs, including data that relate to farmed or wild salmon.

Limiting salmon farm production and licence duration

- 14 Beginning immediately and continuing until at least September 30, 2020, the Department of Fisheries and Oceans should ensure that
 - the maximum duration of any licence issued under the *Pacific Aquaculture Regulations* for a net-pen salmon farm in the Discovery Islands (fish health sub-zone 3-2) does not exceed one year;
 - DFO does not issue new licences for net-pen salmon farms in the Discovery Islands (fish health sub-zone 3-2); and
 - DFO does not permit increases in production at any existing net-pen salmon farm in the Discovery Islands (fish health sub-zone 3-2).

Revising and applying siting criteria for salmon farms

- 15 The Department of Fisheries and Oceans should explicitly consider proximity to migrating Fraser River sockeye when siting salmon farms.
- 16 After seeking comment from First Nations and stakeholders, and after responding to challenge by scientific peer review, the Department of Fisheries and Oceans should, by March 31, 2013, and every five years thereafter, revise salmon farm siting criteria to reflect new scientific information about salmon farms situated on or near Fraser River sockeye salmon migration routes as well as the cumulative effects of these farms on these sockeye.
- 17 The Department of Fisheries and Oceans should apply revised siting criteria to all licensed salmon farm sites. Farms that no longer comply with siting criteria should be promptly removed or relocated to sites that comply with current siting criteria.

Re-evaluating risk and mitigation measures for salmon farms

- 18 If at any time between now and September 30, 2020, the minister of fisheries and oceans

determines that net-pen salmon farms in the Discovery Islands (fish health sub-zone 3-2) pose more than a minimal risk of serious harm to the health of migrating Fraser River sockeye salmon, he or she should promptly order that those salmon farms cease operations.

- 19 On September 30, 2020, the minister of fisheries and oceans should prohibit net-pen salmon farming in the Discovery Islands (fish health sub-zone 3-2) unless he or she is satisfied that such farms pose at most a minimal risk of serious harm to the health of migrating Fraser River sockeye salmon. The minister's decision should summarize the information relied on and include detailed reasons. The decision should be published on the Department of Fisheries and Oceans' website.
- 20 To inform the decision under Recommendation 19, the minister and the Department of Fisheries and Oceans should take the following steps:
 - Conduct the research and analysis recommended in Recommendation 68 and publish the results of this research.
 - Assess any relationships between salmon farming variables compiled in the fish health database and Fraser River sockeye health or productivity.
 - Invite from the salmon-farming industry and from other interested parties written submissions respecting the risk that net-pen salmon farms pose to the health of migrating Fraser River sockeye salmon.
 - Publish on the DFO website the full text of all submissions received.
 - Provide to submitters a reasonable opportunity to respond in writing to other submissions and publish such responses on the DFO website.

Fish health management at salmonid enhancement facilities

- 21 The Department of Fisheries and Oceans should, by September 30, 2013, establish conditions of licence and a monitoring /

compliance program in relation to salmonid enhancement facilities which contains the following minimum elements:

- mandatory standard operating practices and record keeping;
 - mandatory fish health management plans for all salmon enhancement facilities, whether DFO, provincial, or Community Economic Development Program; and
 - audits / site visits of all enhancement facilities at least once per year by a fish health professional.
- 22 The Department of Fisheries and Oceans should establish and maintain a database of enhancement facility fish health – possibly under the Aquaculture Resource Information Management System (ARIMS) that DFO is constructing for salmon farm data. In future years, DFO should use these data to evaluate the effect of diseases and pathogens at fish enhancement facilities on the health of Fraser River sockeye salmon. DFO should provide access to these data to non-government scientists for research purposes.

Interactions between Fraser River sockeye and enhanced salmon

- 23 The Department of Fisheries and Oceans should, by September 30, 2013, complete and make public a risk assessment of the interactions of Fraser River sockeye salmon with enhanced salmon in the marine environment.
- 24 The Department of Fisheries and Oceans should work with the North Pacific Anadromous Fish Commission or an analogous international organization to address potential interactions in the high seas among wild and enhanced salmon from different countries, including developing plans for enhancement regulation and activities.

Integrated Fisheries Management Plan

- 25 Within 30 days of the minister of fisheries and oceans approving the Integrated Fisheries Management Plan (IFMP), the Department

of Fisheries and Oceans should make public the rationale for the harvest rules set out in the Fraser River Sockeye Decision Guidelines section of the IFMP.

Escapement target planning

- 26 The Department of Fisheries and Oceans should, by September 30, 2013, complete its planned review of the Fraser River Sockeye Spawning Initiative model and address the criticisms of the model:
- whether the maximum total allowable mortality as a function of run size should be 60 percent;
 - whether the model could more explicitly state what values are being weighed and how they are weighed; and
 - whether habitat considerations and large escapements could be brought into escapement planning.

Fraser River temperature and flow monitoring

- 27 The Department of Fisheries and Oceans and Environment Canada should continue to monitor, at not less than 2010 levels, Fraser River temperature and flow.

Test-fishing program

- 28 The Department of Fisheries and Oceans should continue to contribute to the Pacific Salmon Commission's test-fishing program so it is capable of operating at the 2010 level.

Funding of hydroacoustic facilities

- 29 The Department of Fisheries and Oceans should continue to provide sufficient funding to enable the Pacific Salmon Commission's hydroacoustic facility at Mission and DFO's hydroacoustic facility at Qualark to operate at the 2010 level.

Selective fishing

- 30 The Department of Fisheries and Oceans should

- designate an individual to coordinate scientific, educational, and management efforts in relation to selective fishing practices; and
- study post-release survival rates for all fisheries.

Fisheries monitoring and catch reporting

- 31 The Department of Fisheries and Oceans should ensure that all Fraser River sockeye salmon fisheries are monitored at an enhanced level (achieving catch estimates within 5 percent of actual harvest, with greater than 20 percent independent validation). To meet this objective, DFO should
- enforce penalties for non-compliance with catch-reporting requirements;
 - confirm the role of fishery officers in reporting illegal harvest numbers to fisheries managers and establish a system to incorporate such numbers into official catch estimates;
 - establish a program for independent catch validation;
 - provide sufficient and stable funding to support enhanced catch-monitoring programs; and
 - treat commercial and Aboriginal economic opportunity fishers equally regarding any requirement of fishers to contribute toward the cost of catch monitoring, subject to any accommodation required in support of an exercise of an Aboriginal right.

Stock assessment

- 32 With respect to escapement enumeration for Fraser River sockeye salmon returning to their spawning grounds, the Department of Fisheries and Oceans should
- continue enumeration at not less than the level of precision recommended by DFO Stock Assessment staff for Fraser River sockeye spawning populations in 2010; and
 - determine the calibration (or expansion index) for spawning populations in the 25,000–75,000 range.

- 33 The Department of Fisheries and Oceans should double, from two to four, the number of lakes in the Fraser River basin in which it conducts annual lake stock assessments as well as annual monitoring programs to estimate fall fry populations.
- 34 The Department of Fisheries and Oceans should allocate funding for stock assessment of other salmon species that share the Fraser River with sockeye salmon.
- 35 The Department of Fisheries and Oceans should support the involvement of members of First Nations in escapement enumeration and other stock assessment activities in their traditional territories.

Definition of food, social, and ceremonial (FSC) fishing

- 36 Following consultation with First Nations, the Department of Fisheries and Oceans should
- articulate a clear working definition for food, social, and ceremonial (FSC) fishing; and
 - assess, and adjust if necessary, all existing FSC allocations in accordance with that definition.
- 37 In the context of negotiating an agreement with a specific First Nation, the Department of Fisheries and Oceans should encourage the First Nation to provide DFO with information on its practices, customs, and traditions that is relevant in determining its food, social, and ceremonial needs.

Share-based management

- 38 The Department of Fisheries and Oceans should, by September 30, 2013, complete its analysis of the socio-economic implications of implementing the various share-based management models for the Fraser River sockeye fishery, decide which model is preferable, and, promptly thereafter, implement that model.

In-river demonstration fisheries

- 39 The Department of Fisheries and Oceans should conduct the research and analysis necessary to determine whether in-river demonstration fisheries are, or are capable of, achieving tangible conservation benefits or providing economic benefits to First Nations in an economically viable or sustainable way before it takes further action in expanding in-river demonstration fisheries.

Transparency in the reallocation of the commercial Fraser River sockeye salmon fishery

- 40 The Department of Fisheries and Oceans should develop its future policies and practices on the reallocation of the commercial Fraser River sockeye salmon fishery (including allocations for marine and in-river fisheries) in an inclusive and transparent manner, following a strategic and integrated planning process such as Action Step 4.2 of the Wild Salmon Policy.

Implementation of the 1986 Habitat Policy

- 41 The Department of Fisheries and Oceans should complete implementation of the 1986 Habitat Policy. By March 31, 2013, DFO should, for the benefit of Fraser River sockeye salmon, set out a detailed plan addressing these points:
- how DFO will work toward a net gain in productive capacity of Fraser River sockeye habitat by conserving existing habitat, restoring damaged habitat, and developing new habitats;
 - how DFO will measure the amount of productive capacity of Fraser River sockeye habitat in order to assess whether the net gain objective is being achieved on an ongoing basis;
 - how DFO will take into account the cumulative impact on Fraser River sockeye habitat potentially arising from individual projects that are currently considered only on a project-by-project basis, if at all;
 - how the tasks will be performed, and by whom;

- when the tasks will be completed; and
- how much implementation will cost, as set out in a detailed itemization of costs.

The Habitat Management Program should coordinate with the new associate regional director general (proposed in Recommendation 4) to ensure consistency in implementing this Recommendation and Recommendation 8.

DFO's Habitat Management Program

- 42 The Department of Fisheries and Oceans should strengthen the monitoring component of DFO's Habitat Management Program as follows:
- Require that project proponents relying on operational statements and best management practices notify DFO before beginning work on their proposed projects.
 - Fully implement compliance monitoring of projects whether or not the projects are reviewed in advance by DFO, including those falling under the *Riparian Areas Regulation*.
 - Implement effectiveness monitoring, including for activities under the *Riparian Areas Regulation*.
 - Give Habitat Management Program staff discretion to require, on a project-by-project basis, measures that are additional to those set out in operational statements and best management practices.

Riparian Areas Regulation

- 43 The Department of Fisheries and Oceans should encourage the Province of British Columbia to resolve differences of interpretation on the application of section 9 of the provincial *Water Act* and the provincial *Riparian Areas Regulation* to ensure that there are no physical gaps in coverage of the *Water Act* and the *Riparian Areas Regulation*.
- 44 The Department of Fisheries and Oceans should encourage the Province of British Columbia
- to continue to monitor compliance with the provincial *Riparian Areas Regulation*;

- to conduct effectiveness monitoring of projects completed in compliance with the *Riparian Areas Regulation*; and
- to consider DFO's input into the impact of *Riparian Areas Regulation* setback variances on fish and fish habitat.

45 The Department of Fisheries and Oceans should work with the Province of British Columbia to achieve the *Riparian Areas Regulation* target of 90 percent compliance with 90 percent confidence levels.

- 46 The Department of Fisheries and Oceans should encourage the Province of British Columbia to amend the *Riparian Areas Regulation*
- to require provincial approval of setback variances; and
 - to require local governments to enforce compliance with the assessment reports on which development proposals are approved.

Water use in the Fraser River watershed

- 47 The Department of Fisheries and Oceans should encourage the Province of British Columbia to complete modernization of the *Water Act*, which would include the following points:
- regulation of groundwater extraction in a manner that addresses the needs of Fraser River sockeye;
 - increased reporting and monitoring of water use; and
 - allocation of sufficient resources to complete the modernization process.

Forestry

- 48 The Department of Fisheries and Oceans should re-engage in managing the impact of forestry activities on Fraser River sockeye by
- reviewing proposed forestry activities that may cause harmful alteration, disruption, or destruction of fish habitat under section 35

of the *Fisheries Act*, protocols for receiving operational plans / referrals, riparian standards for small streams and their tributaries, and the circumstances in which watershed assessments are required; and

- identifying an individual in DFO with regional responsibility to serve as forestry contact person for the Pacific Region to provide support to Habitat Management Program area offices, to provide a consistent approach throughout the region with respect to forestry activities and referrals, and to select policy issues and make recommendations to senior management.

Marine habitat spill response

- 49 Responsibility for decision making about post-emergency mitigation and long-term monitoring of the impact of marine spills should be moved from the Canadian Coast Guard to the Environment Canada co-chair of the Regional Environmental Emergency Team.
- 50 Membership of the Regional Environmental Emergency Team should always include the Department of Fisheries and Oceans' Habitat Management Program (Ecosystem Management Branch)* and Science staff.
- 51 The Environment Canada co-chair of the Regional Environmental Emergency Team should, when considering whether to follow the team's advice regarding post-emergency mitigation and long-term monitoring, take account of the impact of the marine spill on fish and fish habitat, logistics, ecosystem values, cost recovery, and socio-economic effects.
- 52 The Department of Fisheries and Oceans should identify an individual in DFO who has regional responsibility to act as a liaison with the Canadian Coast Guard, Environment Canada, and the Province of British Columbia on marine habitat spill response.

Contaminants monitoring

- 53 The Department of Fisheries and Oceans and Environment Canada should co-operate in regularly testing and monitoring fresh and marine water for contaminants of emerging concern and for endocrine-disrupting chemicals affecting Fraser River sockeye salmon.

Pesticides

- 54 The Department of Fisheries and Oceans should encourage the Province of British Columbia
- to require users of pesticides in forestry and agriculture to record, and report annually to the province, the areas where pesticides were applied and the amounts used; and
 - to develop and maintain a pesticide-use database that includes information on location, volume / concentration, and timing of use, and make that information publicly available.

Pulp and paper, metal mining, and municipal wastewater effluents

- 55 The Department of Fisheries and Oceans and Environment Canada should co-operatively
- ensure that environmental quality monitoring and environmental effects monitoring related to pulp and paper, metal mining, and municipal wastewater discharges include consideration of Fraser River sockeye salmon, and the two federal departments should work with the Province of British Columbia and with regional and municipal governments to that end;
 - work with BC municipalities on a public education campaign aimed at reducing toxicants in municipal wastewater, especially pharmaceuticals and personal-care products; and
 - immediately recommence their participation in the Metro Vancouver Environmental Monitoring Committee.

* The Ecosystem Management Branch was formerly the Oceans, Habitat and Enhancement Branch.

- 56 Canada should promptly finalize the Wastewater Systems Effluent Regulations to include
- public reporting on environmental effects monitoring results;
 - ongoing environmental effects monitoring requirements similar to those found in the *Pulp and Paper Effluent Regulations* and in the *Metal Mining Effluent Regulations*; and
 - environmental effects monitoring of contaminants of emerging concern and endocrine-disrupting chemicals discharging from large wastewater treatment facilities.

- 57 Canada should finalize a regulatory strategy to limit the impact of wastewater biosolids on fisheries resources.

Fisheries enforcement priorities and funding

- 58 The Department of Fisheries and Oceans should, at a minimum, fund its enforcement activities, including overflight, on-the-ground, and on-the-water fishery officer presence, to ensure the same level of enforcement that was achieved in response to the Honourable Bryan Williams's 2004 *Southern Salmon Fishery Post-Season Review*, plus amounts necessary for aquaculture-related enforcement.

Responsibility for administration of section 36 of the *Fisheries Act*

- 59 The Department of Fisheries and Oceans and Environment Canada should, by September 30, 2013, renegotiate their relationship in regard to Environment Canada's responsibility to enforce section 36 of the *Fisheries Act* in the Pacific Region in accordance with the 2009 report from the office of the Commissioner of the Environment and Sustainable Development. Clarification should include each department's respective roles and responsibilities with respect to communication, sharing of information, and joint planning of *Fisheries Act* activities.
- 60 The Department of Fisheries and Oceans and Environment Canada should improve

the ability of their on-the-ground staff to co-operate and respond to occurrences by conducting joint training and joint investigation post-mortems and by sharing resources and expenses in remote locations where feasible.

Powers of inspection

- 61 The Department of Fisheries and Oceans should restore powers of inspection to Habitat Management Program staff.

Specialized habitat fishery officer

- 62 The Department of Fisheries and Oceans should re-establish within the Conservation and Protection Branch in the Pacific Region at least one specialized habitat fishery officer whose duties would include
- acting as the go-to person for habitat occurrences and investigations throughout the region;
 - working closely with the Habitat Management Program with access to its Program Activity Tracking for Habitat database;
 - overseeing the training and mentoring of fishery officers for habitat investigations; and
 - recording habitat occurrences and ensuring that there are responses to them.

The "mortally wounded" clause

- 63 The Department of Fisheries and Oceans should not include in fishing licences a clause that allows for retention of "mortally wounded" Fraser River sockeye salmon.

Mortality of Fraser River sockeye salmon during downstream migration

- 64 The Department of Fisheries and Oceans should undertake or commission research on Fraser River sockeye salmon smolts at the mouth of the Fraser River estuary, before they enter the Strait of Georgia, to determine stock / Conservation Unit abundance, health, condition, and rates of mortality.

Marine survival of Fraser River sockeye salmon

- 65 The Department of Fisheries and Oceans should undertake or commission research, in collaboration with academic researchers and, if possible, the Pacific Salmon Commission or another appropriate organization, into where and when significant mortality occurs in the nearshore marine environment, through studies of the outmigration from the mouth of the Fraser River through to the coastal Gulf of Alaska, including the Strait of Georgia, Juan de Fuca Strait, the west coast of Vancouver Island, Johnstone Strait, Queen Charlotte Sound, and Hecate Strait. Studies should examine
- abundance, health, condition, and rates of mortality of Fraser River sockeye salmon;
 - biological, chemical, and physical oceanographic variables, including water temperature, the presence or absence of harmful algal blooms, and disease;
 - predators, pathogens, competition, and interactions with enhanced salmon affecting Fraser River sockeye salmon; and
 - contaminants, especially contaminants of emerging concern, endocrine-disrupting chemicals, and complex mixtures.
- 66 In furtherance of Canada's understanding about what regulates Fraser River sockeye abundance and distribution, Canada should propose an international, integrated ecosystem research program to measure biological, chemical, and physical oceanographic variables in the offshore Gulf of Alaska. Some or all of the research would be conducted in collaboration with academic researchers, the North Pacific Marine Science Organization (PICES), and/or the North Pacific Anadromous Fish Commission.

Fish health

- 67 The fish health research priorities of the Department of Fisheries and Oceans should reflect its responsibility for the conservation of wild fish. To that end, DFO's science managers should encourage innovation and new research into novel diseases and other conditions affecting wild fish, beyond the interests of specific "clients" such as the Canadian Food Inspection Agency or aquaculture management.
- 68 The Department of Fisheries and Oceans should undertake or commission research into the health of Fraser River sockeye salmon, including the following issues:
- determining, in conjunction with the research proposed in Recommendations 64 and 65, what pathogens are encountered by Fraser River sockeye salmon along their entire migratory route, and the cumulative effects of these pathogens on Fraser River sockeye salmon;
 - the hypothesis that diseases are transmitted from farmed salmon to wild sockeye;
 - the hypothesis that diseases are transmitted from salmonid enhancement facility salmon to wild sockeye; and
 - the thresholds of sea lice infection and resilience in sockeye and the patterns of sea lice distribution and infection on juvenile sockeye.
- ### Harrison River sockeye population
- 69 The Department of Fisheries and Oceans should undertake or commission research into the life history of the Harrison River sockeye population.
- ### Research into regional production dynamics
- 70 The Department of Fisheries and Oceans should initiate, along with the appropriate state agencies in Oregon, Washington, and Alaska, a long-term working group devoted to coordinating the collection and analysis of data on the productivity of their sockeye salmon populations. The working group should invite a knowledgeable and independent entity, such as the Pacific Salmon Commission, to act as coordinator for the working group.
- ### Cumulative effects
- 71 The Department of Fisheries and Oceans should develop and carry out a research

strategy to assess the cumulative effects of stressors on Fraser River sockeye salmon and their habitats. Cumulative effects may include multiple sources of a stressor, exposure to stressors over the life cycle of Fraser River sockeye, or exposure to multiple types of stressors interacting in a cumulative manner.

- 72 The Department of Fisheries and Oceans should consider the cumulative effects of stressors on Fraser River sockeye health and habitat in its management of fisheries and fish habitat.

Inventory of Fraser River sockeye salmon research

- 73 The Department of Fisheries and Oceans should develop and maintain a central inventory of information about existing and new Fraser River sockeye salmon research, including who has custody of it and where it can be located. DFO should make the inventory available to the public, and make the information in the inventory available to non-DFO scientific researchers.

Improving future sustainability by addressing the causes of warming waters

- 74 To improve future sustainability of the Fraser River sockeye, the Government of Canada should champion, within Canada and internationally, reasonable steps to address the causes of warming waters and climate change.

Implementation of this Commission's recommendations

- 75 An independent body such as the office of the Commissioner of the Environment and Sustainable Development should report to the Standing Committee on Fisheries and Oceans and to the public as follows:

- By March 31, 2014, and every two years thereafter during implementation of the Wild Salmon Policy, on progress in implementing the policy in relation to Fraser River sockeye salmon.
- By September 30, 2015, on the extent to which and the manner in which this Commission's recommendations have been implemented.