Commission of Inquiry
into the Decline of
Sockeye Salmon in the Fraser River

Commission d'enquête
sur le déclin des populations
de saumon rouge du fleuve Fraser

The Uncertain Future of Fraser River Sockeye

Volume 3 • Recommendations – Summary – Process

Final Report – October 2012

The Honourable Bruce I. Cohen, Commissioner

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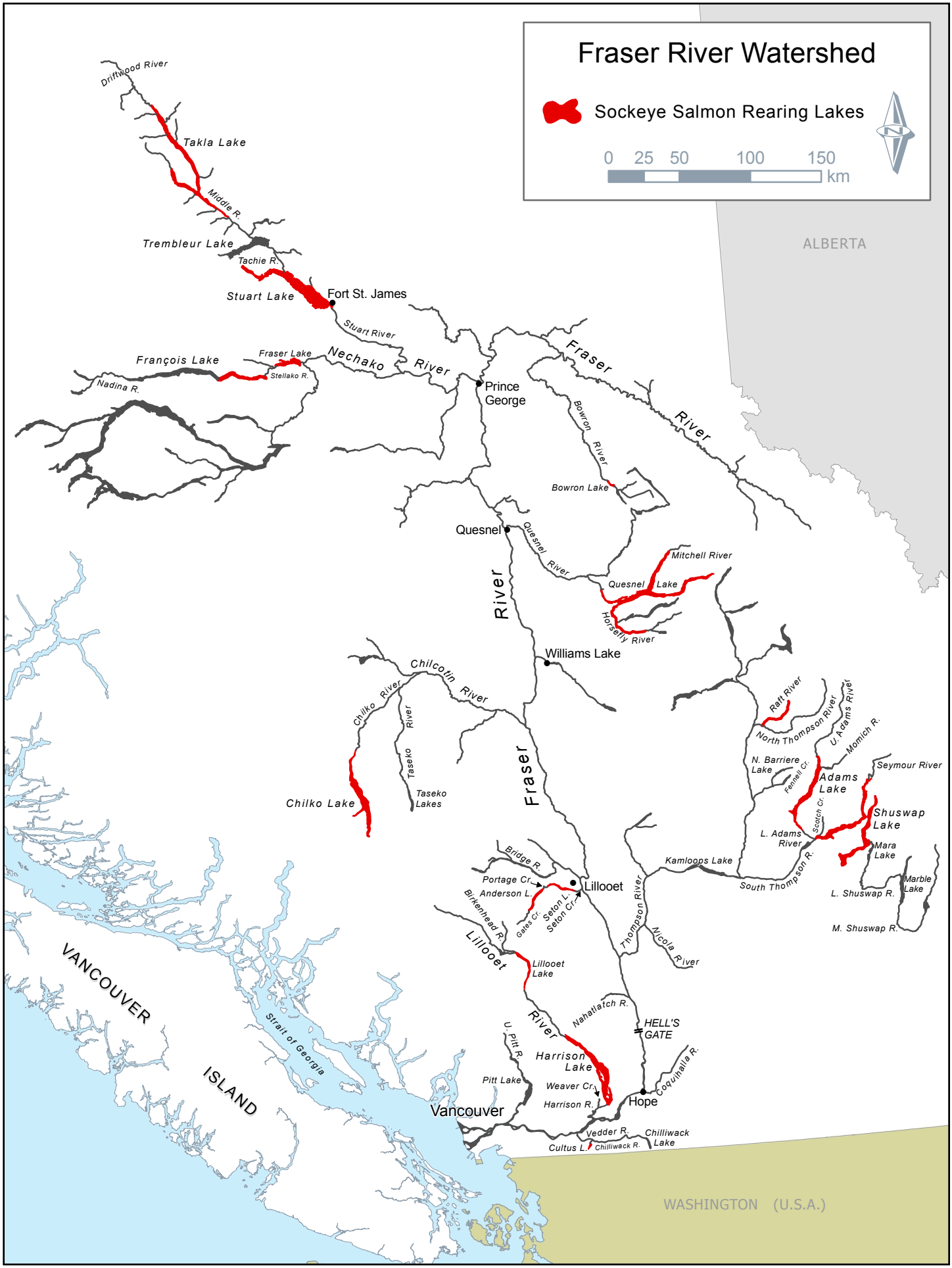
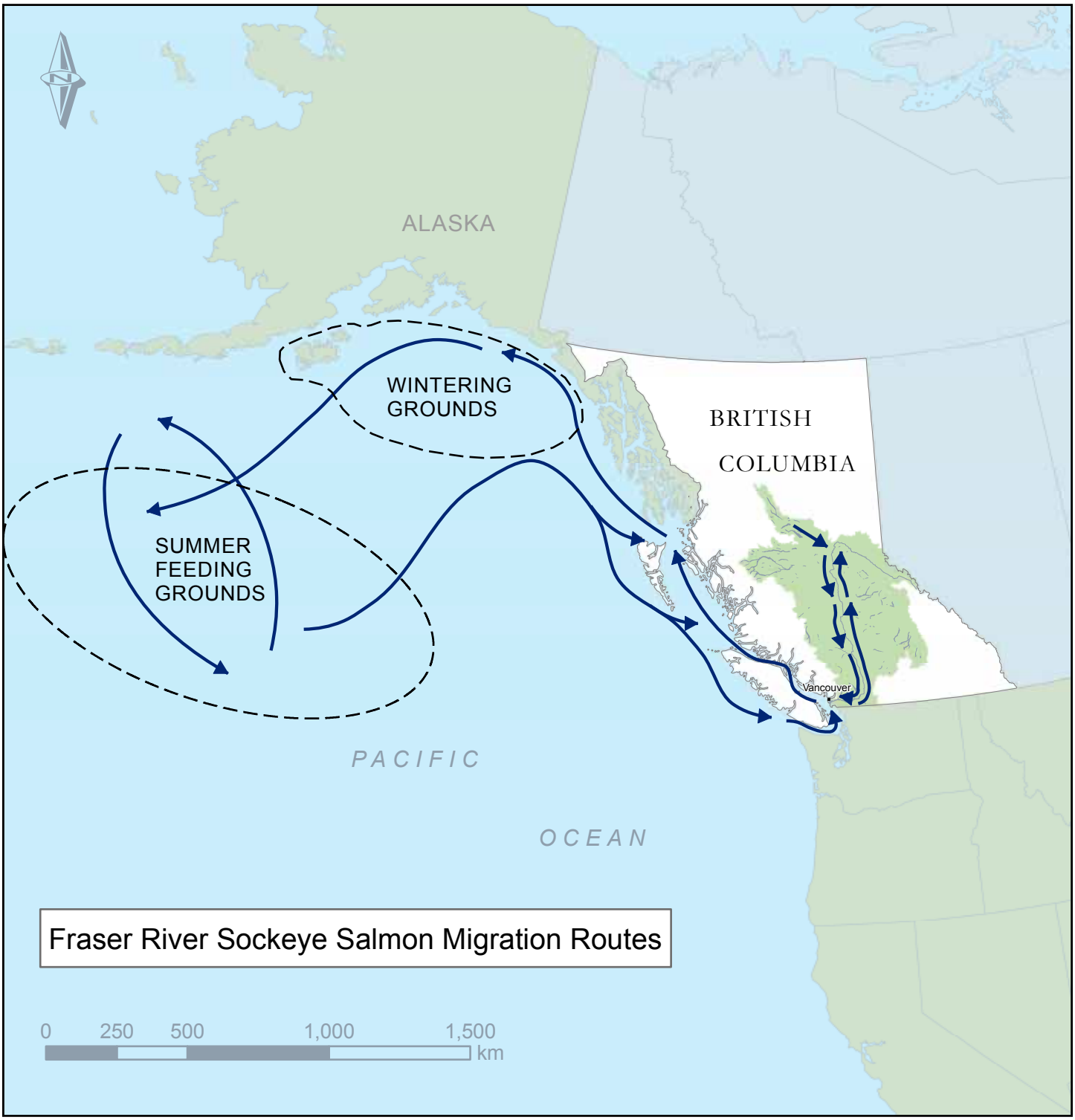

Fraser River Watershed
Sockeye Salmon Rearing Lakes
0 25 50 100 150
km
ALBERTA
Driftwood River
Takla Lake
Middle R.
Trembleur Lake
Tachie R.
Stuart Lake
Fort St. James
Stuart River
François Lake
Fraser Lake
Stellako R.
Nadina R.
Nechako River
Prince George
Fraser River
Bowron River
Bowron Lake
Quesnel
Quesnel River
Quesnel River
Mitchell River
Quesnel Lake
Horsefly River
Williams Lake
Chilcotin River
Chilko River
Taseko River
Taseko Lakes
Chilko Lake
Fraser
Raft River
North Thompson River
U. Adams River
Momich R.
N. Barriere Lake
Fennell Cr.
Adams Lake
Seymour River
Scotch Cr.
Shuswap Lake
L. Adams River
Mara Lake
Kamloops Lake
South Thompson R.
L. Shuswap R.
Marble Lake
M. Shuswap R.
Bridge R.
Portage Cr.
Anderson L.
Lillooet
Birkenhead R.
Gates Cr.
Seton L.
Seton Cr.
Thompson River
Nicola River
Lillooet
Lillooet Lake
Nahatlatch R.
HELL'S GATE
U. Pitt R.
Pitt River
Harrison Lake
Pitt Lake
Weaver Cr.
Harrison R.
Coquihalla R.
Hope
Vancouver
Vedder R.
Chilliwack Lake
Cultus L.
Chilliwack R.
VANCOUVER ISLAND
Strait of Georgia
WASHINGTON (U.S.A.)


ALASKA
WINTERING GROUNDS
SUMMER FEEDING GROUNDS
BRITISH COLUMBIA
Vancouver
PACIFIC
OCEAN
Fraser River Sockeye Salmon Migration Routes
0 250 500 1,000 1,500
km

Commission of Inquiry
into the Decline of
Sockeye Salmon in the Fraser River

Commission d'enquête
sur le déclin des populations
de saumon rouge du fleuve Fraser

October 29, 2012

To His Excellency
The Governor General in Council

May it please Your Excellency:

As Commissioner appointed by Order in Council PC 2009-1860, which was promulgated on November 5, 2009, pursuant to Part I of the *Inquiries Act*, and in accordance with the Terms of Reference assigned therein, I respectfully submit my final report.

The report sets out my findings resulting from public forums and submissions, the extensive review of documents, the conduct of evidentiary hearings, and the careful consideration of participants' submissions.

I trust that my report will contribute to an improved understanding of Fraser River sockeye salmon, and that my recommendations will improve the future sustainability of the sockeye salmon fishery in the Fraser River.

I consider it a privilege and an honour to have served as Commissioner.

The Honourable Bruce I. Cohen
Commissioner

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COHEN COMMISSION OF INQUIRY
into the Decline of Sockeye Salmon in the Fraser River

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Sockeye Salmon in the Fraser River

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Final Report – October 2012

The Honourable Bruce I. Cohen, Commissioner

Contents

Volume 1 The Sockeye Fishery

Chapter 1 The Commission's mandate
Chapter 2 The life cycle of Fraser River sockeye salmon
Chapter 3 Legal framework
Chapter 4 DFO overview: organization, science, policies
Chapter 5 Management of the Fraser River sockeye salmon fishery
Chapter 6 Habitat management
Chapter 7 Enforcement: fisheries and habitat
Chapter 8 Salmon farm management
Chapter 9 Fish health management
Chapter 10 Wild Salmon Policy
Chapter 11 Cultus Lake case history

Figures
Tables
Appendices
Abbreviations and acronyms
Glossary

Volume 2 Causes of the Decline

Chapter 1 Introduction
Chapter 2 Summary of public submissions
Chapter 3 Other investigations into the causes of the decline
Chapter 4 Summary of decline-related evidence
Chapter 5 Findings

Figures
Tables
Appendices
Abbreviations and acronyms
Glossary

Volume 3 Recommendations – Summary – Process

Chapter 1 Introduction 1

The events that precipitated this Commission of Inquiry 1

The importance of the Fraser River sockeye salmon fishery 2

My mandate to encourage broad co-operation among stakeholders 2
Causes of the decline 3
DFO's role in managing the fishery 3
DFO's role in the decline 4
Recommendations 4
The uncertain future 5

Chapter 2 Recommendations 7

The minister's ultimate decision-making authority 7
DFO's responsibility to conserve wild sockeye salmon stocks 10
DFO's mandate in relation to wild fish 10
DFO's obligations in relation to net-pen salmon farms 11
Implementation of the Wild Salmon Policy 12
Implementation plan 13
Wild Salmon Policy fund 13
New position of associate regional director general 14
Strategies 1 to 4 15
Management of salmon farms 17
Fish health data from salmon farms 18
Minimizing risks and uncertainty 20
What is the likelihood of harm occurring? 20
Is the potential harm serious or irreversible? 21
Do current management measures ensure that the risk of serious or irreversible harm is minimal? 22
Could further reasonable and cost-effective measures be employed? 23
Salmonid enhancement facilities 26
Fish health management at salmonid enhancement facilities 26
Interactions between Fraser River sockeye and enhanced salmon 27
Management of the wild fishery 29
Integrated Fisheries Management Plan 29
Escapement target planning 30
Fraser River temperature and flow monitoring 31
In-season management 31
Test-fishing program 31
Funding of hydroacoustic facilities 32
Selective fishing 33
Fisheries monitoring and catch reporting 33
Stock assessment 36
Definition of food, social, and ceremonial fishing 37
Share-based management 38
In-river demonstration fisheries 39
Transparency in the reallocation of the commercial Fraser River sockeye salmon fishery 42

Habitat....43
Implementation of the 1986 Habitat Policy....43
DFO's Habitat Management Program....44
Freshwater habitat....45
Riparian Areas Regulation....45
Water use in the Fraser River watershed....47
Forestry....48
Marine habitat spill response....49
Contaminants monitoring....50
Pesticides....51
Pulp and paper, metal mining, and municipal wastewater effluents....52
Fisheries and habitat enforcement....54
Enforcement priorities and funding....54
Responsibility for administration of section 36 of the *Fisheries Act*....55
Powers of inspection....56
Specialized habitat fishery officer....56
The "mortally wounded" clause....57
Science research....57
Mortality of Fraser River sockeye salmon during downstream migration....58
Marine survival of Fraser River sockeye salmon....59
Fish health....60
Harrison River sockeye population....62
Research into regional production dynamics....62
Cumulative effects....63
Inventory of Fraser River sockeye salmon research....65
Improving future sustainability by addressing warming waters....65
Implementation of this Commission's recommendations....66

Chapter 3 Legislative amendments....71

Summary of legislative changes in Bill C-38 relevant to this Report....72
Changes to the environmental assessment process: CEAA, 2012....72
Changes to management of Fraser River sockeye and sockeye habitat....73
Management of Fraser River sockeye....73
Management of Fraser River sockeye habitat....74
Discussion of legislative changes....75
New environmental assessment process: CEAA, 2012....75
Revised *Fisheries Act*....76
Management of Fraser River sockeye....76
Management of Fraser River sockeye habitat....78
Conclusions....82

Chapter 4 Executive summary....85

Introduction....85
Commission activities....87

No "smoking gun" 88

DFO's management of the fishery....88

An uncertain future 89

Findings and recommendations 89

The minister's ultimate decision-making authority 89
DFO's responsibility to conserve wild sockeye salmon stocks 90
Implementation of the Wild Salmon Policy 91
Management of salmon farms 92
Fish health data and samples from salmon farms 92
Minimizing risks and uncertainty 92
Management and regulation of salmonid enhancement facilities 93
Management of the sockeye salmon fishery 93
Licensing: equalizing fees for commercial, recreational, and economic opportunity fisheries 93
Pre-season forecasting and escapement target planning....94
The Integrated Harvest Planning Committee and the Integrated Fisheries Management Plan....94
Test fishing and hydroacoustic monitoring 94
Selective fishing 95
Fisheries monitoring and catch reporting 95
Stock assessment 95
Definition for food, social, and ceremonial fishing 96
Share-based management 96
In-river demonstration fisheries 96
Transparency in the reallocation of the Fraser River sockeye salmon fishery....96
Habitat....97
Implementation of the 1986 Habitat Policy....97
DFO's Habitat Management Program and habitat monitoring 97
Freshwater habitat 98
Water use in the Fraser River watershed....98
Gravel removal 98
Forestry....98
Marine habitat spill response 98
Harmful algal blooms....99
Contaminants research and monitoring 99
Pesticides 99
Pulp and paper, metal mining, and municipal wastewater effluents 99
Fisheries and habitat enforcement 99
Fisheries enforcement priorities and funding....99
Responsibility for administration of section 36 of the *Fisheries Act*....100
Habitat fishery officers 100
"Mortally wounded" clause 100
Science research 100
Fraser River sockeye salmon downstream migration mortality 101
Fraser River sockeye salmon marine survival 101
Fish health....101
Harrison River sockeye salmon population 101
Cumulative effects 102

Inventory of Fraser River sockeye salmon research 102
Improving future sustainability by addressing warming waters 102
Implementation of this Commission's recommendations 102
Legislative changes in Bill C-38 relevant to this Report 103
List of recommendations 104

Chapter 5 Commission process 115

The Commission 115
Privy Council Office 116
Administration Division 116
Manager, Commissions of Inquiry 116
Informatics and Technical Services Division 116
Accommodation and Building Services 117
Security 117
Selecting and appointing staff 118
Learning phase 118
Role of counsel 119
Budgeting 119
Fisheries Research Program 121
Science Advisory Panel 121
Selection of research themes: discussion paper 121
Research projects 121
Peer reviews 121
Publication of reports 122
Documents 122
Public forums 124
Site visits 125
Written public submissions 125
Hearing process 127
Hearing-room facilities 127
Identification of issues 127
Rules of procedure 129
Preparing and calling evidence 129
Technical reports 130
Policy and practice reports 130
Expert witnesses 131
Limits on examinations by participants 131
Hearings logistics 131
Participants 132
Funding for participants 132
Participants' roundtable 133

Final submissions and replies 134
Rulings 134
Status reports 134
Media / public relations 134
Website 134
Translation services 135
Report production 135
Archives 136
Dismantling of the Inquiry 136

Acknowledgements 139

Figures

Figure 3.4.1 Total Fraser River sockeye returns, 1893–2011 85
Figure 3.4.2 Annual variation in total Fraser River sockeye salmon productivity, 1952–2011 86
Figure 3.5.1 Number of public submissions by date 126
Figure 3.5.2 Public submissions by theme 126
Figure 3.5.3 Cohen Commission timeline 137

Tables

Table 3.5.1 Categories included in Commission budget 120
Table 3.5.2 The Commission's public forums 124
Table 3.5.3 The Commission's site visits 125
Table 3.5.4 Themes covered in Commission hearings, in alphabetical order 128

Appendices

A Terms of Reference 145
B Commissioner and Commission staff 155
C Public forum presenters 157
D Submitters 159
E Witnesses 168
F Hearings 184
G Hearing Counsel 193
H Participants 196
I Rulings 197

Abbreviations and acronyms 199

Glossary 203

Chapter 1 • Introduction

In Volume 1 of this Report, I examined in detail the management of the Fraser River sockeye salmon fishery by the Department of Fisheries and Oceans (DFO) and other organizations, and in Volume 2, I explored the possible causes of the decline of those sockeye stocks. It is now time to draw conclusions and set out my recommendations for improving the future sustainability of the Fraser River sockeye salmon fishery.

The conclusions and recommendations I make in Chapter 2 of this volume are drawn from and rely on my findings as set out in volumes 1 and 2. Although in this chapter I refer to and summarize some of the evidence, volumes 1 and 2 contain greater detail.

As well, not all aspects of the management of the fishery on which I made findings are the subject of recommendations. In some management areas, the evidence indicates that DFO or other organizations are doing a good job, and although I make findings, I have no need to recommend improvements. In other areas, 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 take prompt action. Having said that, it is my hope that DFO will give careful consideration to the evidence I discuss and the findings I make in volumes 1 and 2 because they contain additional suggestions for improved management of the Fraser River sockeye salmon fishery.

The events that precipitated this Commission of Inquiry

Notwithstanding the large amount of information presented in the two preceding volumes, it is important to remember the events that precipitated this Inquiry. When I began my work in November

2009, the Fraser River sockeye fishery had just 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.

As the preamble to the Terms of Reference establishing this Inquiry states, the decline was attributed "to the interplay of a wide range of factors, including environmental changes along the Fraser River, marine environmental conditions and fisheries management." The Government of Canada wished to take all feasible steps to identify the reasons for the decline and the long-term prospects for Fraser River sockeye salmon stocks, and, in addition, to determine whether changes are needed to fisheries management policies, practices, and procedures.

The importance of the Fraser River sockeye salmon fishery

Early in my mandate, in order to gain a deeper appreciation of the importance to British Columbians of Fraser River sockeye and their recent decline, I conducted 10 public forums on the mainland and Vancouver Island. These forums were well attended, and many in attendance made articulate, sincere, and thorough oral and written submissions covering most, if not all, of the issues being investigated by the Commission. Although some of these submissions were critical of the Inquiry process, all shared a common and passionate commitment to the sustainability of Fraser River sockeye salmon, and many offered important insights into the issues under investigation.

I also made 14 site visits to First Nations drift net and dip net fisheries, hydroacoustic counting stations, hatcheries, land- and ocean-based salmon farms, canneries, a pulp mill, and spawning grounds. At the evidentiary hearings in October 2010, I spoke about my appreciation for these experiences:

> For me, it was an honour and a privilege to have the opportunity to travel to many locations in the Fraser watershed and along sockeye migratory routes where the Fraser sockeye has played a key role in the cultural, social and economic fabric of these communities and where there is a commitment to preserving this iconic fish in the interests of all British Columbians and Canadians. On a personal note, I was often moved by the warmth and passion with which presenters made their submissions at the public forums, addressing the sustainability of the Fraser sockeye.[1]

The significance of this fishery is reflected in the several dozen examinations, investigations, and reports into various aspects of it that have been undertaken over the past three decades, focusing on DFO's management of the fishery, fleet reduction, salmon allocation, Aboriginal fishing, 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 October 2010 Interim Report.

Many of these previous reports were limited in scope to a specific aspect of the fishery, such as habitat or salmon farms, or to a specific year's return. Also, unlike most previous investigations, this Commission is the first inquiry, since the 1982 Pearse Commission on Pacific Fisheries Policy, dealing with the Fraser River sockeye fishery under the authority of the *Inquiries Act*. This authority gave the Commission powers to compel document production and summon witnesses to testify under oath or affirmation.

My mandate to encourage broad co-operation among stakeholders

One of the provisions of the Terms of Reference unique to this Commission was the direction "to conduct the Inquiry without seeking to find fault on the part of any individual, community or organization." Rather, I was mandated to encourage broad co-operation among stakeholders. I am pleased to

be able to report that, throughout the Inquiry's proceedings, counsel for the various participants, while vigorously advancing their clients' interests, acted with a high degree of professionalism in adopting a collaborative and co-operative approach. This response enabled me not only to gather information and evidence on which to build a better and clearer understanding about the past declines but also to recommend the necessary steps and solutions toward ensuring the future sustainability of the Fraser River sockeye salmon fishery.

Causes of the decline

As a result of the Commission's extensive evidentiary hearings and scientific research program, the public now knows much more about Fraser River sockeye salmon, the stressors they face throughout their fascinating life cycle, and DFO's work in managing the fishery and protecting sockeye habitat. The Commission investigated several potential causes of decline across the five different life stages of Fraser River sockeye salmon. Those potential causes included predation, infectious disease, contaminants, climate change, stressors in the freshwater environment (logging, agriculture, gravel removal, pulp and paper mills, metal mining, municipal wastewater, and other development-related impacts on fish habitat), and stressors in the marine environment (harmful algal blooms, salmon farms, sea lice, variations in marine productivity, and competition with hatchery and other species / stocks of wild salmon). Some individuals, I suspect, hoped that our work would find the "smoking gun" – a single cause that explained the two-decade decline. 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 which can cause death. Several witnesses emphasized the importance of considering the cumulative effects of these stressors rather than individual stressors in isolation. In Chapter 2, Recommendations, I state that DFO should develop and carry out a research strategy to assess the cumulative effects of stressors on Fraser River sockeye.

Because of the scientific research projects I commissioned for this Inquiry and the testimony of the many expert witnesses, much more is now known about the reasons for the decline in abundance and productivity (the number of adult recruits returning per spawner) of Fraser River sockeye salmon. In addition, more is known about what we do not understand. Key knowledge gaps remain.

Where does that leave us? In Volume 2, Causes of the Decline, I concluded that the evidence led before this Commission has identified numerous stressors that may have negatively affected Fraser River sockeye salmon over the past 20 years. At the same time, there are patterns of declining productivity at a regional scale which suggest that mechanisms operating on larger, regional spatial scales, and/or in places where a large number of correlated sockeye stocks overlap, should be seriously examined. I also concluded that it is not a matter of choosing one potential cause over the other. The available evidence shows that both Fraser River–specific stressors (such as development along the river or contaminants in the water) and region-wide influences (such as marine conditions in the Strait of Georgia or Queen Charlotte Sound) may have contributed to the long-term decline. 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 knowledge gaps will be a major endeavour.

DFO's role in managing the fishery

I turn now to DFO's role in managing the Fraser River sockeye salmon fishery. During the course of this Inquiry, some (but certainly not all) presenters at public forums and some witnesses at hearings spoke critically of DFO, alleging that it has mismanaged the fishery, is responsible for the decline, or is otherwise dysfunctional or out of control. DFO was criticized for its frequently unreliable pre-season forecasts and for falling behind in habitat protection.

Throughout the Inquiry, I have repeatedly reminded myself that the Fraser River sockeye salmon

fishery is only one narrow slice of a wide range of DFO programs and activities in the Pacific Region and that the Pacific Region is but one of six regions in DFO's Canada-wide organization. It would be inappropriate for me to comment on DFO's overall management and administration, except insofar as it has an impact, directly or indirectly, on the Fraser River sockeye fishery.

During the evidentiary hearings, scores of DFO employees testified about their work. DFO personnel, especially those at the field level, communicated a sincerity about and dedication to sockeye salmon and its conservation that I found compelling. Some expressed frustration at being pulled in many different directions. Others regretted having to cut back on core programs because of reduced funding. Many told me they were worried about the health of Fraser River sockeye and other stocks and the uncertain future that lies ahead.

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

At the higher levels within the department, I perceived a preoccupation with the development and revision of policies – an attitude that the solution to any problem is a new policy. I am not opposed to policies, and I do not presume to say how many are sufficient. However, creating a policy is not enough; it is through implementation that policies bring change. In Chapter 2, 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.

One of the great benefits of a commission of inquiry is the light it sheds on the operations of our government institutions. This Inquiry is no exception. Through the Commission's ability to require production of DFO documents, our extensive evidentiary hearings, and our scientific research program, 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. In the next chapter, I recommend that DFO 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.

DFO's role in the decline

To what extent, if any, can DFO be held responsible for the two-decade decline in Fraser River sockeye salmon? It is, I think, fair to say that DFO has been aware for years of declining salmon populations and of the existence of many of the stressors discussed in Volume 2, Causes of the Decline, and that it has had some understanding of the plausible mechanisms by which those stressors may have cumulatively contributed to the decline. What DFO has done little of, however, is undertake or commission research into these stressors in order to gain a better understanding of whether cause-effect relationships exist.

Given my conclusion in Volume 2 that the causes of the decline are most likely to be found in the cumulative effect 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 the department had no capacity to draw firm conclusions about the decline as the years unfolded and, therefore, was precluded from taking remedial action in a timely manner. For example, as one DFO research scientist, Dr. Jim Irvine, told me, if DFO had implemented the Wild Salmon Policy, managers could not have prevented the low return of 2009, but they would have had the information to better predict, understand, and react to the low return.[2] (The Wild Salmon Policy is discussed in Volume 1, Chapter 10, Wild Salmon Policy, and in Chapter 2, Recommendations, of this volume.)

Recommendations

Through this Inquiry, I have been able to identify inadequacies in the management system for Fraser River sockeye salmon. That system would benefit from reforms, and my recommendations on these matters are set out in Chapter 2 of this volume.

As a result of this Inquiry, there now exists a better understanding of the plausible mechanisms by which a variety of freshwater and saltwater stressors may have contributed to the two-decade decline. However, there is much to be learned about the actual impact of these stressors on Fraser River sockeye. For that reason, in Chapter 2, I make recommendations for specific scientific research projects 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.

In making these recommendations, I am mindful of the economic times in which we live. In recent years, DFO has had to do more with less, and the March 2012 federal budget presages further reductions in staff and programs. However, my role is to make recommendations to improve the future sustainability of the Fraser River sockeye salmon fishery, not to present a pared-down set of recommendations that may be more compatible with current funding limitations but ignores what truly needs to be done.

The uncertain future

The recommendations to which I now turn will, I believe, improve the management of the Fraser River sockeye fishery and augment our understanding of the stressors threatening those stocks. I wish the narrative ended there but, regrettably, it does not: Fraser River sockeye face an uncertain future.

First, the shrinking resources I referred to earlier, which may result in delays in implementing reforms and research, mean that the stressors to which sockeye are exposed and the deterioration of sockeye habitat will continue. If implementation of the recommendations called for in this Report is delayed, the continuing threats to stocks may make remedial action all the more challenging when it does begin.

Second, the waters constituting the habitat for Fraser River sockeye are warming, and because Fraser River sockeye live near the southern limit of the Pacific sockeye range, this change will be particularly difficult for them. To the extent that warming waters result from climate change, solutions will be found primarily at national and international levels. But action is possible, as I recommend near the end of Chapter 2, Recommendations.

Finally, many of the amendments to the *Fisheries Act* will have a significant impact on policies and procedures examined by this Commission and on important measures of habitat protection. As I describe further in Chapter 3, Legislative amendments, I am not in a position to make recommendations regarding these changes. As required by my Terms of Reference, I have set out my findings and recommendations in this Report for the future sustainability of the Fraser River sockeye fishery. Notwithstanding the recent legislative amendments, I urge the federal government, in the interests of conserving this iconic species of salmon, to heed my findings and to implement these recommendations.

Notes

1 Transcript, October 25, 2010, p. 2.
2 Transcript, December 7, 2010, pp. 45–48.

Chapter 2 • Recommendations

The minister's ultimate decision-making authority

Several previous reports have emphasized that the federal minister of fisheries and oceans must hold ultimate decision-making authority over the Fraser River salmon fishery. In 1995, the Honourable John Fraser wrote that the Department of Fisheries and Oceans (DFO) "has no right to transfer Canada's constitutional responsibilities to protect the [fisheries] resource to anyone, Native or otherwise," and that "[t]his responsibility must be retained always by the Government of Canada."[1] That position was reflected in two recommendations of the Fraser River Sockeye Public Review Board chaired by Mr. Fraser:

> We recommend that DFO retain and exercise its constitutional conservation responsibilities and not in any way abrogate its stewardship of resources under federal jurisdiction.
> …
> We recommend that DFO ensure that AFS [Aboriginal Fishing Strategy] agreements clearly identify the Minister's responsibility for conservation, and that final authority to regulate and protect fish and fish habitats remain vested in DFO.[2]

The report of the Standing Committee on Fisheries and Oceans on the 2001 Fraser River salmon fishery also recommended that "the Minister of Fisheries and Oceans reassert his authority to manage the fishery."[3]

In 2005, the Honourable Bryan Williams strongly criticized DFO's efforts to share management of the fishery with First Nations, commercial fishers, sport fishers, and environmental organizations, noting that "[s]triving to achieve solutions that satisfy every interest may result in actions that satisfy none." He concluded that, although public involvement is a good thing, ultimately "the public expect DFO to maintain responsibility for good resource management and will hold DFO accountable." Mr. Williams

recommended that costly collaborative management approaches be evaluated explicitly against the goals set for fisheries management and compared with the costs and benefits of in-house or independent delivery of programs.[4]

For the reasons that follow, it is my view that the ultimate authority over the management of the Fraser River sockeye salmon fishery should continue to rest with the minister and that DFO ought to act in a manner that respects this authority. However, I recognize that, in relation to the conservation of Fraser River sockeye salmon habitat, jurisdiction is shared between the Parliament of Canada and the Legislative Assembly of British Columbia.

In the 1996 case of *R. v. Nikal*, the Supreme Court of Canada stated that "[i]f the salmon fishery is to survive, there must be some control exercised by a central authority," and this central authority is the federal government.[5] The requirement for a central authority in managing the fishery became apparent to me over the course of the hearings. The management of the Fraser River sockeye salmon fishery is a complex task requiring technical expertise and the rapid synthesis of great volumes of constantly changing information. Decisions critical to both fishers and the conservation of the resource must be made frequently and swiftly throughout the fishing season, requiring those involved in fisheries management to devote considerable time to carrying out their responsibilities. Some aspects of fisheries management require a high degree of technical understanding. For example, I heard from DFO and non-DFO witnesses alike of the difficulty stakeholders and First Nations faced in understanding the Fraser River Sockeye Spawning Initiative (FRSSI), which relies on a mathematical simulation model to provide information for setting the escapement targets for returning fish – an essential component of DFO's fisheries management function.[6]

Aboriginal fisheries organizations expressed a desire to participate in the management of the fishery at the highest levels. In recognizing the complexity of fisheries management, many of these groups submit that they require stable, long-term government funding in order to engage meaningfully in fisheries decision making.[7] This funding would be used to build their organizational and technical capacity for fisheries management, including hiring fisheries advisors and biologists. As I set out in Volume 1, Chapter 5, Sockeye fishery management, many millions of dollars have already been spent for this purpose.

During the hearings, I also heard that DFO is faced with a funding environment that has forced its fisheries managers to make do with less. With decreasing or uncertain funds available for test fishing, stock assessment, catch estimation, and science, for example, the department is faced with making difficult decisions on how to maintain its own organizational and technical capacity for fisheries management, let alone provide funds for others to join in this function.

In my view, the fishery must be managed by the federal government as the central authority, not only for the reason that fisheries management is a complex and demanding task but also because of the fiscal reality that the technical expertise required to manage the fishery cannot reasonably be replicated among all the parties that seek to participate in fisheries management. Where funds are limited, they must first be applied to meeting the organizational and technical capacity needs of DFO so it can fulfill its responsibilities, as described throughout this Report. However, this authority is not to take away from the pivotal role that First Nations and stakeholders ought to continue to play in informing DFO's management decisions for the fisheries. As I explain below in my discussion of the strategic and integrated planning process under the Wild Salmon Policy, First Nations and stakeholders bring with them important contributions and perspectives that should be considered.

Complementary to the minister's ultimate decision-making authority over fisheries management is DFO's ultimate responsibility for conservation of the fisheries resource. As the Supreme Court of Canada noted in *R. v. Marshall II*, the minister's primary objective under the *Fisheries Act* is the conservation of the resource, and "this responsibility is placed squarely on the Minister and not on aboriginal or non-aboriginal users of the resource."[8] In circumstances where DFO has shared its authority with another organization, I heard concerns that this co-management has created uncertainties or gaps as to which organization was responsible for certain obligations. For example, as I discuss below in my recommendations on habitat enforcement, DFO has delegated authority for the administration and enforcement

of section 36 of the *Fisheries Act* to Environment Canada. Despite a series of memoranda of understanding and working agreements between the two departments, uncertainty and public confusion remain as to which responsibilities are held by each one. In my view, maintaining the minister's ultimate authority over fisheries management also serves to clarify the ultimate responsibility of the minister for fisheries conservation.

Consideration of whom, exactly, fisheries management is intended to serve also supports the argument that the minister must have the ultimate decision-making authority over the fisheries. The Supreme Court of Canada has stated that "Canada's fisheries are a 'common property resource' belonging to all the people of Canada," and that the minister is to "manage, conserve and develop the fishery on behalf of Canadians in the public interest."[9] While I recognize that constitutionally protected Aboriginal and treaty rights carry unique priorities in the fishery, the fishery overall should be managed for the benefit of everyone.

Throughout the hearings, members of First Nations, fishing sectors, environmental groups, and the public have shared their concerns and suggestions about the management of the Fraser River sockeye salmon fishery. Each group carries unique interests and ambitions. Although there were some areas of agreement among the views expressed, there were also many points of conflict. In this situation, DFO must play a special and necessary role. First, as Kaarina McGivney, former regional director of the Treaty and Aboriginal Policy Directorate, noted, "Ultimately, if there is a broad range of interests in the fishery and different views, there needs to be someone to make a final decision to move things forward."[10] Second, as the only organization at the table that is accountable to all Canadians, the Government of Canada, through DFO, is tasked with making fisheries management decisions that take into account the public interest. In my view, while DFO should seek out and carefully consider input from those groups most directly involved in the fishery, it does not need to share ultimate decision-making authority with them. No matter how inclusive a shared-authority 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 manner that accounts for the interests of all Canadians, including those not privy to the shared-authority management structure.

I conclude from Canada's final submissions, Ms. McGivney and from internal DFO documents that DFO has no present intention to enter into agreements that abrogate the ultimate decision-making authority of the minister.[11] Moreover, DFO's Wild Salmon Policy clearly asserts that, even in the context of a strategic and integrated management process involving First Nations and stakeholders, the minister "retains the authority and accountability for the protection and sustainable use of fisheries resources and their habitat."[12] However, I also note that several of the department's other policies and practices over the years have created an expectation among some First Nations and stakeholders that a management process with shared ultimate authority over the fisheries is possible. For example:

- Since 2004, DFO's Aboriginal Aquatic Resource and Oceans Management (AAROM) program has provided Pacific Region Aboriginal fisheries organizations with approximately $6 million to $7 million per year to build their capacity to participate in "co-management."
- In 2005, DFO introduced Pacific Fisheries Reform, which identified the sharing of fisheries management responsibility and accountability with First Nations, stakeholders, and others as a key element. DFO envisioned that First Nations and stakeholders would be "involved in decision-making and share accountability for the conduct of the fishery" and would assume "a greater role in operational decision-making and program delivery" through "effective co-management processes."[13] The Integrated Harvest Planning Committee grew out of the Pacific Fisheries Reform initiative.
- In 2006, the Integrated Aboriginal Policy Framework set out seven strategies for the management of Aboriginal fisheries, including "increased Aboriginal participation in co-management of aquatic resources."[14] The framework defined co-management as "the sharing of responsibility and accountability for fisheries management" between DFO and resource users, eventually encompassing the sharing of authority. It also states that it is DFO's policy to shift away from its "top-down

of section 36 of the *Fisheries Act* to Environment Canada. Despite a series of memoranda of understanding and working agreements between the two departments, uncertainty and public confusion remain as to which responsibilities are held by each one. In my view, maintaining the minister's ultimate authority over fisheries management also serves to clarify the ultimate responsibility of the minister for fisheries conservation.

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centralized management of the fisheries resource" to a "shared stewardship" model that includes the "devolution of certain fisheries management authorities to resource users."[15]
- In 2008, DFO established the Fraser River Salmon Roadmap, a forum where Aboriginal groups could meet with each other and with DFO staff to design a permanent co-management process for Fraser River salmon.

In summary, previous reports on the Fraser River salmon fishery and judgments of the Supreme Court of Canada have supported maintaining the minister's ultimate decision-making authority over fisheries management and conservation. The evidence before me also suggests that, although First Nations and stakeholders have an important role to play in informing fisheries management decisions, there are important reasons for maintaining the minister's authority over the decisions ultimately made. In coming to this conclusion, I am aware that many Aboriginal groups assert an Aboriginal right to manage the fishery. However, it is not within my mandate to assess the merits of such claims.

While I strongly encourage consultation, co-operation, 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.

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 juristiction, fish habitat. DFO should consistently reflect this principle in all its agreements and processes with First Nations and stakeholders.

DFO's responsibility to conserve wild sockeye salmon stocks

DFO's mandate in relation to wild fish

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. Conservation measures are intended to promote abundant, healthy wild stocks that may in turn permit harvesting, while fisheries management activities regulate the catch so that future productivity is assured. There are checks and balances within the regulatory regime aimed at ensuring that harvesting activities do not threaten conservation, and except when low abundances threaten the health of stocks, conservation measures allow a measure of harvesting.

In relation to fisheries, DFO's paramount regulatory objective is the conservation of Fraser River sockeye salmon and other wild fish species.[16] 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. For example, section 35 of the *Fisheries Act* makes it an offence to "carry on any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat." Section 36 makes it an offence to "deposit or permit the deposit of a deleterious substance of any type in water frequented by fish." These provisions acknowledge the importance of productive habitat for a sustainable fishery and comprise a core component of DFO's mandate. They have, more recently, been affirmed in the Wild Salmon Policy. DFO's conservation mandate extends to all fish habitat. It also extends to all fish, not just fish that are important to a fishery.* I accept that diversity in Fraser River sockeye stocks is

* I note that on June 29, 2012, Bill C-38, *An Act to implement certain provisions of the budget tabled in Parliament on March 29, 2012 and other measures*, received royal assent. It amends the habitat protection provisions in section 35 of the *Fisheries Act*. I will comment on this amendment in Chapter 3, Legislative amendments.

essential for conservation and future sustainability of the species.

I heard evidence that suggests confusion on the part of DFO respecting its paramount regulatory objective to conserve the health of wild fish stocks. For example, several DFO witnesses testified about the need for DFO's Science Branch to provide advice to its "clients," such as the Canadian Food Inspection Agency (whose mandate includes trade and economic concerns, not the conservation of wild fish), or to aquaculture management within DFO (whose focus includes sustainability of the aquaculture industry).[17] A similar concern arises in relation to DFO's former Toxic Chemicals Research Program, which had dedicated funding through the Environmental Sciences Strategic Research Fund (ESSRF). When the ESSRF was dissolved in 2004–5, DFO researchers on toxic chemicals were expected to fund all their work under a "client-based" funding system from other DFO sectors, other government departments, and non-government sources.[18]

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

Given the paramount regulatory objective to conserve wild fish, DFO faces a challenge in relation to net-pen salmon farming along the BC coast. Salmon farming per se is not the problem. However, before introducing salmon farms into wild salmon habitat, DFO managers and scientists need to assess the risk to wild stocks and institute regulatory measures to minimize or eliminate the risk. If they conclude that regulatory measures cannot protect wild stocks, they can exercise their powers under the *Fisheries Act* to prohibit net-pen salmon farming. DFO's response to the introduction of salmon farms should be no different from its response to other stressors: DFO must protect the health of wild stocks.

However, the current role of DFO in relation to salmon farming is broader than the protection of wild stocks. It extends to promotion of the salmon-farming industry and farmed salmon as a product. In testimony, Claire Dansereau, deputy minister, said that DFO's role is to assist with "market access."[19] DFO's 2002 Aquaculture Policy Framework contains principles to guide DFO's work on aquaculture, including the following:

> Principle 1. DFO will support aquaculture development
> …
> Principle 5. Recognizing that aquaculture is a legitimate use of land, water and aquatic resources, DFO will work with provincial and territorial governments to provide aquaculturists with predictable, equitable and timely access to the aquatic resource base.
> Principle 6. DFO will strive to ensure that its own legislative and regulatory frameworks enable the aquaculture sector to develop on an even footing with other sectors.
> Principle 7. … DFO will support responsible development of the aquaculture sector.
> Principle 8. DFO will make every effort to understand the needs of the aquaculture industry and to respond in a manner that is solutions oriented and supportive of aquaculture development.[20]

DFO also provides support to the commercial wild fishery; for example, DFO has supported certification of the wild fishery under the Marine Stewardship Council (MSC), as described in Volume 1, Chapter 10, Wild Salmon Policy. However, this support is qualitatively different from that provided to the salmon farming industry. Programs promoting the wild fishery should be consistent with conservation of the natural resource. MSC certification requires both compliance with important components of the Wild Salmon Policy and restriction of harvests in order to achieve conservation goals. There are no comparable links between conservation of the wild stocks and promotion of the salmon farming industry.

As I noted in Volume 1, Chapter 8, Salmon farm management, DFO's promotion of and support for the salmon-farming industry are reflected in departmental funding. For example, the Sustainable Aquaculture Program is a $70 million national program, running from 2008 to 2013, designed to enhance global competitiveness and environmental

performance of Canada's aquaculture industry. Of that sum, $25 million is devoted to innovation to enhance the aquaculture sector's competitiveness and productivity, and a further $10 million supports the aquaculture sector's ability to meet domestic market demands along with rigorous international trade and marketing requirements.[21]

I understand the rationale behind the Government of Canada promoting the salmon-farming industry and its products or providing funds to assist with that sector's competitiveness. What does concern me, however, is that, when one government department (in this case DFO) has mandates both to conserve wild stocks and to promote the salmon-farming industry, there are circumstances in which it may find itself in a conflict of interest because of divided loyalties. For example:

- There is a risk that DFO will not proactively examine potential threats to migrating sockeye salmon from salmon farms, leaving it up to other concerned parties to establish that there is a threat.
- There is a risk that DFO will impose less onerous fish health standards on salmon farms than it would if its only interest were the protection of wild fish. Farmed salmon may tolerate certain diseases or pathogens differently from wild salmon, such that the farmed fish would not necessarily require treatment except for their potential to spread disease or pathogens to wild fish. (The treatment of sea lice is a good example: see the discussion in Volume 1, Chapter 9, Fish health management.)
- There is a risk that DFO will be less rigorous in enforcing the *Fisheries Act* against the operators of salmon farms.

I do not suggest that in every case DFO will favour the interests of salmon farms over the interests of wild fish; rather, it is the *risk* that it will do so that creates the conflict of interest. Because of its mandate to promote the salmon-farming industry, there is a risk that DFO will act in a way that favours the industry to the detriment of wild fish.

I recognize that, in relation to wild salmon stocks, DFO's mandate extends to promoting the commercial fishery as well as conserving those stocks. If that creates the potential for a conflict of interest, it can be largely addressed by the checks and balances I referred to in the section above on DFO's mandate in relation to wild fish. DFO's interest in promoting the wild fishery is tempered by its duty to conserve those same wild stocks: without a healthy resource, there can be no commercial fishery to promote. Protecting wild stocks while promoting salmon farms is, in my view, 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 DFO 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 salmon farming as an industry and farmed salmon as a product, and by transferring the promotion of salmon farming to a different part of the Executive Branch.

I draw no conclusion about whether the Government of Canada as a whole should promote the salmon-farming industry or farmed salmon as a product. There may be meritorious reasons for the federal government to do so. If it chooses to do so, it is inevitable that conflicts will arise from time to time between the protection of wild stocks and the promotion of farmed salmon. In my view, when those conflicts do arise, they ought to be dealt with at the cabinet level.

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.

Implementation of the Wild Salmon Policy

When, in June 2005, after five years of development, Minister Geoff Regan released the Wild Salmon Policy (WSP), he stated that it "significantly transforms the management and conservation of wild salmon, their habitats and dependent

ecosystems."[22] Ms. Dansereau described the policy in her testimony as DFO's "guiding document for the management of Fraser sockeye."[23] The Wild Salmon Policy is Canada's expression of the precautionary principle* applied to Pacific salmon.[24]

The WSP sets out an integrated approach to the management of wild salmon on the Pacific coast, including the gathering of information relating to salmon and salmon habitat as well as planning for conservation and use of salmon. Its stated goal 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."[25] The policy comprises six strategies, which are implemented by specific action steps. The first four strategies are as follows:

Strategy 1	Standardized monitoring of wild salmon
Strategy 2	Assessment of habitat status
Strategy 3	Inclusion of ecosystem values and monitoring
Strategy 4	Integrated strategic planning

Implementation plan

Seven years after the release of the policy, 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 after the policy's finalization, one that would stipulate what tasks were required, how they would be performed, and when they would be completed, that commitment has not been met.[26]

In Volume 1, Chapter 10, Wild Salmon Policy, I found that documents such as annual staff work plans do not constitute an implementation plan. The current regional director general testified that there used to be an implementation plan but that it is no longer in effect. Instead, there was a "current timetable" for WSP implementation, but she could provide no indication of what WSP tasks would be implemented within the next two or five years.[27] I also heard evidence that DFO performed no comprehensive costing exercise in anticipation of the policy or after its release.[28]

During the final witness panel, the deputy minister, the associate deputy minister, and the regional director general presented me with their interpretation of what is meant by the implementation of the Wild Salmon Policy. In essence, these witnesses suggested that WSP implementation is largely achieved through DFO considering the intent, spirit, and principles underlying the policy when taking regulatory decisions and making recommendations to the minister.[29] As I said in Volume 1, Chapter 10, I do not accept that interpretation. The policy is far more than a guiding principle. Rather, it 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.

The Wild Salmon Policy is in theory the guiding document for the management of Fraser River sockeye and other salmon species. Successive ministers have committed DFO to its implementation. DFO should, in my view, honour its commitment to implementation and, without further delay, develop and publish a detailed implementation plan as promised in the policy itself. The implementation plan should include a detailed breakdown of implementation costs.

Wild Salmon Policy fund

The current funding model for implementation of the Wild Salmon Policy arises from the policy itself, which states that "implementation must be accomplished within DFO's existing resource capability and will be phased in over time."[30] Pat Chamut, former assistant deputy minister, Fisheries and Aquaculture Management, and former special advisor on the WSP, testified that he was able to cobble together implementation funds from various sources within DFO, which were included in the $1.1 million announced by the minister when releasing the policy in June 2005.[31]

* The essence of the precautionary principle is 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. (See Volume 1, chapters 3, Legal framework, and 4, DFO overview, and the description below in the section on management of salmon farms.)

Funds for WSP implementation average slightly more than half a million dollars annually and are largely pieced together from contributions from the branches within the region – for example, Science and Fisheries and Aquaculture Management. Contributions from the Oceans, Habitat and Enhancement Branch dwindled notably after 2008.[32]

Given the seminal importance of the Wild Salmon Policy and DFO's professed commitment to its implementation, I was surprised and disappointed at the clearly inadequate level of annual funding and the manner in which annual contributions to WSP implementation are made. The evidence satisfies me that, 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 Pacific Region must set priorities for how it will spend the funds it receives annually from Ottawa. The blunt truth is that, measured in dollars, it attaches greater importance to programs such as salmonid enhancement, promotion of salmon farming, and building the management capacity of First Nations than to implementation of the Wild Salmon Policy.

If this funding model for WSP implementation continues, I have no confidence that the policy will be implemented in the foreseeable future, if ever. Implementation suffers on two counts – low priority within the Pacific Region and lack of interest by DFO nationally to fund one of its national policies properly. I see no sign that DFO, at either level, is committed enough to WSP implementation to quantify the costs and set a realistic time frame for implementation, let alone set aside adequate funds for implementation.

If Canadians cannot count on DFO's Pacific Region or its national headquarters to champion a program that the former minister described as "transformative", then the Government of Canada as a whole must step forward and provide the necessary funding for implementation. It is for that reason that the funding recommendation below is directed at the Government of Canada, not DFO.

Although all strategies of the Wild Salmon Policy require funding, I draw particular attention to Strategy 4, which contemplates a new integrated strategic planning process to guide fisheries management. DFO needs to direct funding and efforts toward the creation of this planning process, which will provide for input from First Nations, commercial fishers, recreational fishers, and others subject to the final decision-making authority of the minister. To facilitate effective Aboriginal participation in this integrated strategic planning, DFO's funding commitment to the Wild Salmon Policy must include funding support for relevant Aboriginal Tier 1 processes. (Tier 1, 2, and 3 processes are described in Volume 1, Chapter 5, Sockeye fishery management, in the Aboriginal fishing policies and programs section.)

In bringing all the processes into one integrated process under Strategy 4, DFO needs to identify and cease funding any duplicative organizations or processes. Funds made available through the elimination of duplicative organizations and processes should be redirected to support the development of the strategic planning process under the Wild Salmon Policy and other aspects of Wild Salmon Policy implementation.

Having regard to the history of WSP development and implementation discussed in Volume 1, Chapter 10, Wild Salmon Policy, 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 into other DFO programs.

New position of associate regional director general

I heard evidence that, since 2005, there has been talk of identifying a "champion" for WSP implementation, but to date no such person has been appointed. Members of the WSP Implementation Team expressed frustration with a lack of oversight, leadership, and direction by senior management.

The regional director general is ultimately responsible for implementation of the policy and all other Pacific Region programs and activities but cannot be expected to assume day-to-day management of any specific program or activity. I agree with Mr. Chamut who suggested that someone within the Pacific Region should be accountable to the regional director general for pulling together all the various elements of the WSP to make

implementation happen.[33] Several witnesses talked about the problem of "stovepiping," when officials directing a particular branch are more focused on their branch's priorities than on the organization as a whole. I agree with those who said there needs to be someone above the branch level who can break down barriers among the different sectors and branches – the Fisheries and Aquaculture Management, Science, and Oceans, Habitat and Enhancement branches, for example – ensuring that everyone works together with a common cause throughout the implementation process.[34]

At the same time, implementation of the Wild Salmon Policy will be a challenging, time-consuming, multi-year task, and it would not be appropriate to add this responsibility to the workload of any existing person or position within DFO's Pacific Region. In my view, DFO should establish in the Pacific Region a new position of associate regional director general with lead responsibility for developing the implementation plan for the Wild Salmon Policy and for executing it.

Given the importance of WSP implementation to the future of the Fraser River sockeye salmon fishery and the broader Pacific salmon fishery, I also recommend that the new associate regional director general report annually on progress made toward full implementation and that DFO publish that report on its website.

Finally, the new associate regional director general should, once implementation is substantially complete, estimate ongoing operational expenses under the specific strategies of the WSP. The Government of Canada should ensure that the Wild Salmon Policy fund is sufficiently resourced to cover these expenses.

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.

Strategies 1 to 4

In Volume 1, Chapter 10, Wild Salmon Policy, I discuss in detail the extent to which DFO has implemented strategies 1 to 4 of the WSP. I concluded that, while measurable progress has been made under strategies 1 and 2, 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. For Fraser River sockeye Conservation Units, there has been only one limited, incomplete status

assessment under Strategy 1. No discernible management action was taken on this status assessment (including no recovery plan).

Almost nothing has been done to assess or monitor Fraser River sockeye Conservation Unit habitat status under Strategy 2. In Volume 1, Chapter 11, Cultus Lake, I observed that the Cultus Lake sockeye Conservation Unit likely would have benefited from DFO's completion of a habitat status report under Strategy 2. The lack of implementation of Strategy 2 parallels DFO's failure to fully implement the 1986 Habitat Policy, which, similarly, although 20 years earlier and for more than just Pacific salmon, envisioned habitat monitoring, including studies to determine baseline habitat conditions. Finally, despite Canada's expressed commitment to ecosystem-based management, there has been no demonstrable progress on implementing Strategy 3 as it applies to Fraser River sockeye.

Strategy 4 also requires transparent and informed decision making, using the best available information. It requires a transparent process to ensure that DFO, the minister, and all interested parties understand the competing interests and how those interests are balanced. While in some cases DFO may continue to have an obligation to consult directly with First Nations, the collaborative and integrated strategic planning process under Action Step 4.2 should be the central process through which DFO receives external policy advice. Although DFO may need to negotiate arrangements with First Nations, the Province of British Columbia, and/or municipalities to achieve some of its long-range planning objectives, DFO can and must make many decisions in the first instance in relation to habitat and harvest.

Seven years after adoption of the Wild Salmon Policy, DFO has done little of the basic groundwork necessary to begin integrated strategic planning for Conservation Units. Apart from the WSP's own Appendix 2 (A structured five-step planning procedure), DFO has not adopted an integrated strategic planning procedure to consult with other levels of government, First Nations, and stakeholders.

The failure to implement Strategy 4 (integrated strategic planning) raises the concern, expressed by fishers, that the only lever DFO is using to address weak stocks is curtailing harvest through the use of harvest-planning tools.[35] As a result, the harvesters are left to bear the cost of preserving Conservation Units through forgone harvest. The companion measures contemplated by Strategy 4, including restoration measures and habitat improvements, local development planning, and other measures involving all levels of government, have not occurred.

The new integrated strategic planning process contemplated under Action Step 4.2 needs to integrate fisheries management processes, including local fisheries management or advisory processes established under future treaties, such as Joint Fisheries Committees. Similarly, if DFO continues to develop any policy that may change inter-sectoral allocation of the Fraser River sockeye salmon fishery, such as the Aboriginal Fisheries Framework, it should do so through Action Step 4.2 in a transparent and inclusive manner and in consultation with all fishing sectors and the public. (The Aboriginal Fisheries Framework is described in Volume 1, Chapter 5, Sockeye fishery management, in the Aboriginal fishing policies and practices section.)

In my view, specific activities under strategies 2 to 4 need priority attention. In the recommendations that follow, I have identified those activities and have attached dates by which they should be completed. The activities and associated dates are based on the evidence I heard. If the implementation plan prepared by the new associate regional director general varies substantially from what I propose below, it would, in my view, be appropriate to explain the rationale for that course of action in the annual public implementation progress reports proposed in Recommendation 7.

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

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

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 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.**

Management of salmon farms

Although promoting salmon farming conflicts with DFO's core mandate to conserve wild stocks (see section above concerning DFO's obligations in relation to net-pen salmon farms), regulating and managing salmon farming do not. My review of the regulatory system for salmon farms, the information that system generates, and the state of scientific knowledge about the effects of salmon farms on Fraser River sockeye lead to a number of recommendations for the future sustainability of the Fraser River sockeye fishery.

Much of the current regulatory regime for salmon farms stems from the 1997 Salmon

* Exhibit 175.

† Exhibit 1915.

Aquaculture Review (SAR) prepared by the BC Environmental Assessment Office. The SAR concluded that salmon farming presented a "low overall risk to the environment."[36] In response to the 49 SAR recommendations, the province enacted legislation and regulations and set up policies and procedures for the management of salmon farms.[37]

For practical reasons, 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. For example, DFO implemented a system using a combination of industry self-reporting and government audits that was similar to the provincial system for monitoring salmon farms.[38] It continued to use the diagnostic laboratory run by the BC Animal Health Centre in Abbotsford for analyzing fish samples collected as part of DFO audits of salmon farms.[39] As well, DFO adopted the siting criteria established after the SAR and implemented a similar application process to that formerly used under the provincial regime (though it has delayed any significant decisions about new applications until it has had the opportunity to consider the recommendations of this Inquiry).[40] DFO also chose to maintain the status quo by licensing, without further review, all of the approximately 120 net-pen salmon farms then licensed by the province.[41]

It has now been 15 years since the SAR. In reviewing the state of aquaculture regulation, my mandate is much more specific than the SAR. I have been tasked with identifying recommendations for the future sustainability of the Fraser River sockeye salmon fishery, not the broader environmental, social, and economic impact of aquaculture. I have had the benefit of testimony about how the system is working – in particular, its achievements and its shortcomings in protecting Fraser River sockeye.

My review of the regulatory system for salmon farms and the state of knowledge about the effects of salmon farms on Fraser River sockeye has led me to make recommendations in two areas: fish health data from salmon farms; and minimizing risks and uncertainty. I make related scientific research recommendations concerning the health of Fraser River sockeye salmon later in this chapter.

Fish health data from salmon farms

The SAR recommended that British Columbia improve the quality and accessibility of information about fish health from salmon farms. Toward that end, in October 2003, the province completed a fish health database and required industry to self-report information to that database. It used information in the database to generate quarterly and annual reports. Public access to this information occurred through summaries in the annual reports.[42]

Information held in this fish health database formed the basis for Technical Report 5A, Salmon Farms and Sockeye Information. As I describe in Volume 2, Chapter 5, Findings, I accept the evidence of Dr. Josh Korman (author of Technical Report 5A, Salmon Farms and Sockeye Information), Dr. Donald Noakes (author of Technical Report 5C, Noakes Salmon Farms Investigation), and Dr. Craig Stephen (lead author of Technical Report 1A, Enhancement Facility Diseases) that 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.[43] However, I also accept Dr. Korman's evidence that 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." Additionally, I accept the evidence of Dr. Korman and Dr. Lawrence Dill (author of Technical Report 5D, Dill Salmon Farms Investigation) that this limitation in the data should disappear with another 10 years of data collection.[44]

Transparency and accessibility of fish health data from salmon farms have been topics of considerable controversy. In the past, the public and non-government / non-industry scientists have not been given access to the raw data in the fish health database. Instead, they have been given summaries of overall fish health in the provincial annual reports. As I describe in Volume 1, Chapter 8, Salmon farm management, I received many public submissions about a lack of transparency in the provision of information about salmon farms to the public. As well, non-government researchers told me of the difficulties they faced in accessing data about fish farms.[45] A salmon-farming industry

representative told me that the public has never had access to the kind of information that was made available during this Inquiry.[46] DFO recognizes that transparency is an issue that needs to be addressed, and it has taken steps to provide more information to the public than has been available previously.[47] However, at the time of the hearings on salmon farms in August and September 2011, DFO had not made fish health data (other than sea lice monitoring data) publicly available, even though it had made other salmon farm data – such as incidents of Atlantic salmon escapes and incidental catch – available through its website.

In my view, DFO needs to be even more transparent and should allow non-government and non-industry researchers to have access to the fish health database for the purposes of original analysis. The information in the database is collected to assist in the assessment of risks posed to wild stocks and should not be treated as proprietary. Although DFO has a mandate to analyze these data, it does not hold an exclusive mandate to do so. 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 and, by doing so, prompt DFO to ask new questions that further scientific understanding about the impact of salmon farms on wild stocks. This input could ultimately lead to regulatory advances that protect wild Fraser River sockeye.*

Also in relation to DFO's collection of fish samples from salmon farms, I note that, beyond routine auditing, DFO has not accounted for the need for fish samples for research. This gap became apparent in the testimony of DFO research scientist Dr. Kristina Miller about her difficulty accessing samples of farmed Atlantic salmon to test for a mortality-related signature, or parvovirus (see description of mortality-related signature in Volume 2, Chapter 4, Decline-related evidence).[48] The ability of DFO researchers to request and promptly receive fish samples – either live fish or fresh silvers (recently deceased fish) – from salmon farms is crucial to support a proactive research agenda that meets DFO's conservation mandate for wild stocks. While routine monitoring looks for known diseases, DFO also needs to look for changes in salmon farms (such as new or novel diseases and pathogens) and to be able to relate conditions it finds in the broader environment (such as conditions affecting wild salmon) to what is happening on salmon farms.

The privilege of being allowed to conduct a business that poses risk to wild stocks should carry a concomitant requirement to provide access to government scientists for research purposes beyond the scope of routine monitoring. It is through such research that new discoveries are made which can lead to better monitoring and the implementation of better precautionary measures to protect wild stocks. Diseases and pathogens are dynamic; they evolve and adapt to their environment. Researchers and managers alike must be equipped to look for and deal with the unexpected in order to manage new risks to Fraser River sockeye proactively as soon as they develop.

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

* I note that, on April 30, 2012, the Government of British Columbia tabled Bill 37, *Animal Health Act*, for first reading in the British Columbia Legislature. Part 3, Division 1, of Bill 37 addresses the collection, use, and disclosure of information related to animal health. It appears to contemplate a much more restrictive release of information than what I have recommended in this Report.

monitoring programs, including data that relate to farmed or wild salmon.

Minimizing risks and uncertainty

As discussed in Volume 2, Chapter 5, Findings, salmon farming is an activity that poses some risk to Fraser River sockeye, though the extent of that risk is far from certain. The precautionary principle addresses situations involving risk and scientific uncertainty. As discussed in Volume 1, chapters 3, Legal framework, and 4, DFO overview, the precautionary principle – expressed in international agreements to which Canada is a party (such as the *Convention on Biological Diversity*), domestic legislation (such as the *Oceans Act* or the *Species at Risk Act*), and various DFO policies – guides my consideration of the management and conservation of Fraser River sockeye. The essence of the precautionary principle is 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. The precautionary principle does not mandate specific conservation and management actions to be taken once the principle is engaged. Canada's approach to the application of precaution is "flexible and responsive" to various situations.[49] One witness referred to the precautionary principle as an "elegant connection between risk-based management and adaptive management."[50]

Over the course of 128 days of hearings, 10 public forums, and numerous submissions from the public and formal participants in the Inquiry, I have formed the view that Fraser River sockeye are extremely important to British Columbians. They generally expect a high level of protection for this iconic species. However, this expectation does not mean that British Columbians accept no risk to this species. Virtually all development along the Fraser River sockeye migratory route (e.g., logging, agriculture, urban development, pulp mills) poses some risk to Fraser River sockeye. British Columbians may well accept some risk of serious harm in return for benefits such as the employment arising from salmon farms. However, based on the evidence and submissions I heard, I am satisfied that British Columbians will not tolerate more than a minimal risk of serious harm to Fraser River sockeye from salmon farming.

In using the precautionary principle to guide my consideration of the appropriate response to the risks that salmon farms pose to the future sustainability of Fraser River sockeye, I have asked myself four questions:

- What is the likelihood of harm occurring?
- Is the potential harm serious or irreversible?
- Do current management measures ensure that the risk of serious or irreversible harm is minimal?
- Could further reasonable and cost-effective measures be employed to reduce the risk and/or the scientific uncertainty?

I discuss each of these questions in the sections below, and then make recommendations for minimizing the risk and uncertainty around salmon farms and their effects on Fraser River sockeye.

What is the likelihood of harm occurring?

In Volume 2, Chapter 4, Decline-related evidence, I set out the evidence relating to whether salmon farms have contributed to the decline of Fraser River sockeye and whether they pose future risks to Fraser River sockeye. The evidence suggests that waste and chemical discharges from salmon farms are unlikely to have any effects on Fraser River sockeye at the population level. I reached the same conclusion about Atlantic salmon escapes from fish farms. However, researchers testifying before me did not agree on whether diseases and pathogens from fish farms may have contributed to the decline or may pose risks of significant harm to Fraser River sockeye. I accept the evidence that the state of scientific research about sockeye–fish farm interactions is not sufficiently developed to rule out diseases on salmon farms as contributing to the decline of Fraser River sockeye and posing future risks.

Of all the expert witnesses I heard from on the topics of salmon farms or diseases, no one told me there is no likelihood of harm occurring to Fraser River sockeye from diseases and pathogens on fish farms. Some said the risk could never be zero, and

others told me that salmon farms do increase the risk to Fraser River sockeye. (See the discussion of salmon farms in Volume 2, Chapter 4, Decline-related evidence.) Dr. Noakes, who ventured to quantify the likelihood of harm occurring, told me that, because of proactive policies and practices, it was "low." Others (Dr. Dill, author of Technical Report 5D, Dill Salmon Farms Investigation, for instance) said the state of information was such that the likelihood of harm occurring could not be quantified, and therefore disease and pathogens on salmon farms could not be ruled out as posing a significant threat to Fraser River sockeye. I accept the undisputed evidence that Fraser River sockeye face some likelihood of harm occurring from diseases and pathogens on salmon farms.

However, I cannot quantify the likelihood of harm occurring based on the evidence before me. Scientists do not know enough about farmed–wild fish interactions, and about how pathogens present on salmon farms affect Fraser River sockeye, to be able to quantify those risks to wild sockeye. Dr. Noakes and Dr. Dill agreed that more research into the effects of diseases on wild stocks such as sockeye is necessary, and Dr. Michael Kent, author of Technical Report 1, Infectious Diseases, and other witnesses told me that little population-level research about disease has been done on Fraser River sockeye.[51] As David Marmorek, lead author of Technical Report 6, Data Synthesis, aptly described the situation: in the absence of research, scientists are left with plausible hypotheses and mechanisms whereby salmon farms might cause disease in wild fish.[52] The likelihood of this outcome occurring and resulting in harm requires further study.

Is the potential harm serious or irreversible?

Having concluded that there is some likelihood of harm occurring to Fraser River sockeye as a result of salmon farms, the next question is whether the potential harm is serious or irreversible.

As described by Dr. Dill in Technical Report 5D, Dill Salmon Farms Investigation, Fraser River sockeye migrate through a "complex of passages through the Discovery Islands." Many of these passages are narrow channels containing salmon farms. One passage through the Discovery Islands (in fish health sub-zone 3-2)* is the focus of particular concern by conservation organizations and has been dubbed the "Wild Salmon Narrows" by those groups.[53] Once sockeye smolts have made their way through the Discovery Islands, they encounter fewer salmon farms. For example, Fraser River sockeye smolts do not swim into the Broughton Archipelago – the next major salmon farm area along the coast – though they may interact with salmon migrating out of that area.[54] During the course of this Inquiry I heard concerns in public submissions, from participants, and from witnesses, that salmon farms sited on the migration route of Fraser River sockeye may transfer diseases and pathogens to Fraser River sockeye.[55] Some suggested that net-pen salmon farms should be removed completely from the Discovery Islands; others suggested removing salmon farms from the Wild Salmon Narrows in order to "clear one migratory route through the Discovery Islands for wild salmon."[56]

I also heard expert evidence that farmed fish carry diseases and pathogens.[57] These diseases and pathogens can be transmitted directly to wild Fraser River sockeye through the water or indirectly – for example, sea lice may carry other pathogens from fish to fish. (See the discussion of sea lice and salmon farms in Volume 2, Chapter 4, Decline-related evidence.) Dr. Kent told me there are two ways that fish farms can affect wild fish: by introducing new or novel diseases, and by making endemic diseases worse.[58] New diseases would include infectious salmon anemia (ISA), which scientists had not confirmed in British Columbia at the time of the hearings and which has been a problem on salmon farms in other areas such as Atlantic Canada. Endemic diseases are those already present in wild Pacific populations, such as bacterial kidney disease or infectious hematopoietic necrosis. Farmed fish catch endemic diseases from wild fish. The high numbers of hosts on fish farms can then "bio-magnify" such diseases. As well, high numbers and densities of hosts on fish farms may "select for fast-growing, early-transmitted and more virulent pathogens," which could, as noted above, be transmitted back to wild Fraser River sockeye.[59]

* Fish health sub-zones are depicted in Figure 1.9.3 in Volume 1, Chapter 9, Fish health management.

(See the discussion in Volume 1, Chapter 9, Fish health management.)

Further, Dr. Kent said a devastating disease could sweep through a wild population, killing large numbers of wild fish without scientists being aware of it.[60] And, as I discussed in Volume 2, Chapter 3, Other investigations, other scientific investigations into the causes of the decline of Fraser River sockeye (such as the June 2010 Pacific Salmon Commission workshop) identified pathogens and disease as strong contenders for causes of the decline. Irrespective of whether the source of any particular disease is a fish farm or wild fish, the potential for disease to cause significant population declines indicates "serious harm." If a disease were to wipe out a vulnerable stock of Fraser River sockeye, such harm could also be irreversible.

I therefore conclude that the potential harm posed to Fraser River sockeye salmon from salmon farms is serious or irreversible. Disease transfer occurs between wild and farmed fish, and I am satisfied that salmon farms along the sockeye migration route have the potential to introduce exotic diseases and to exacerbate endemic diseases that could have a negative impact on Fraser River sockeye.

Do current management measures ensure that the risk of serious or irreversible harm is minimal?

Having concluded that there is some (at present unquantifiable) likelihood of harm to Fraser River sockeye from salmon farms, and that the potential harm is of a serious or irreversible nature, the next question is whether current management measures ensure that the risk of harm is minimal. As I noted above, based on the information before me, British Columbians will not tolerate more than a minimal risk of serious harm to Fraser River sockeye from salmon farms.

DFO's Wild Salmon Policy indicates that the risks to wild stocks from salmon farming are mitigated through measures such as improved cage structure, proper farm siting, and Fish Health Management Plans (FHMPs).[61] I heard little evidence on improved cage structures; however, I infer they may reduce the risk of Atlantic salmon escapes, though, as stated above, Atlantic salmon escapes do not pose a risk of serious harm to Fraser River sockeye.

For farm siting to mitigate risks to Fraser River sockeye, consideration must be given to the Fraser sockeye migration route and the potential negative cumulative effects to sockeye from migrating past multiple salmon farms. In my view, proper farm siting holds the potential to address the risks of disease and pathogen transfer that salmon farms pose to Fraser River sockeye because it can address issues of increased risk that come with the proximity of Fraser River sockeye to a fish farm. However, as described below, current siting practices need to be revised to achieve this result.

When salmon farmers apply for new aquaculture sites, DFO and the province apply siting criteria to screen out unsuitable applications. In early 2000, the province established the current siting criteria in consultation with DFO. These siting criteria do not explicitly require consideration of Fraser River sockeye migration routes. Instead, they state that salmon farms should not be located within 1 km of the mouth of a "salmonid bearing stream determined as significant."[62] However, this criterion has little relevance to the protection of Fraser River sockeye because it does not address the risk to migrating sockeye beyond 1 km of the mouth of the Fraser River. Of greater concern to Fraser River sockeye are the narrow passages along the smolt outmigration route, particularly through the Discovery Islands, where the wild smolts are brought into close contact with salmon farms, thereby increasing the potential for disease transfer between farmed and wild fish. In my view, the risk of serious harm that salmon farms pose to Fraser River sockeye along their entire migration route – not just 1 km from the mouth of the river – needs to be considered and reflected in siting criteria.

In testimony, DFO management staff said that the siting criteria could be revised.[63] As these criteria have been in use for several years, they may not reflect the most recent scientific knowledge about the risks posed to wild stocks by salmon farms. They should be updated to reflect the best available science as well as input from First Nations and stakeholders affected by the siting of fish farms.

DFO witnesses told me that, although not mentioned in the siting criteria, sockeye migration routes and the potential for disease and pathogen

transfer along those routes have been considered in the siting of salmon farms.[64] Indeed, in evidence were three screening assessments under the *Canadian Environmental Assessment Act* (CEAA)[65] that considered the introduction of diseases and disease transfers to wild stocks in the siting of salmon farms.* However, other evidence leaves me questioning whether these issues have been considered for all farm sites. DFO was not able to tell me that every salmon farm has received an environmental assessment.[66] Also, past assessments appear to have focused on the impact of salmon farms on the benthos, the bottom of the ocean, rather than on issues more likely to affect migrating sockeye, such as disease or pathogen transfer.[67] A witness from the province told me that, in the past, sites were approved on a case-by-case basis.[68] Further, DFO Science has done little or no research to assess the combined impact on sockeye salmon as they migrate past several different salmon farms along their migratory route.[69] In summary, although proper farm siting holds the potential to minimize the risks of serious harm to Fraser River sockeye, it requires the explicit assessment of the proximity of farm sites to migrating Fraser River sockeye.

The Wild Salmon Policy also lists FHMPs as tools to mitigate the risks of salmon farms. Salmon farmers prepare FHMPs according to a DFO template. They set out measures for broodstock screening and for controlling diseases within the net cages. Specific management practices in the plans (e.g., vaccinations, disease control options such as treatment or culling fish, and biosecurity measures) are intended to reduce the risk of disease transmission from farmed to wild fish by keeping the fish inside the net pens as healthy as possible. (See the discussion in Volume 1, Chapter 9, Fish health management.) Farmed fish are screened for diseases, beginning at the egg stage, through freshwater development, and during their time in marine net pens. Dr. Noakes told me that all the diseases found on fish farms were endemic diseases. He also said that, of the 32 million fish on BC salmon farms, only about 2 percent, or 600,000 per year, are fresh silvers, of which some unknown percentage died of disease. In his view, this is "quite low" compared with the mortality rate of 3 percent per day for juvenile wild salmon.[70] However, I also heard that FHMPs do not eliminate all occurrences of disease and pathogens in net-pen farms.[71]

I accept the evidence that management practices taken within net pens are intended to reduce the risk of disease as much as possible and to keep both farmed and wild fish healthy. However, I cannot determine on the evidence before me whether those measures ensure that the risk of serious harm from disease and pathogen transfer is a minimal one. As described in the section above on the likelihood of harm, too little research has been done on the effects of salmon farms and related diseases and pathogens on Fraser River sockeye for me to reach a conclusion either way. Again, the evidence before me shows plausible mechanisms for harm and many knowledge gaps.

Could further reasonable and cost-effective measures be employed?

Although I cannot assess the extent to which current management practices minimize the risk of serious or irreversible harm to Fraser River sockeye from salmon farms, I can comment and make recommendations about what further reasonable and cost-effective measures could be employed to reduce the risk or reduce scientific uncertainty about that risk.

DFO witnesses told me that, going forward, DFO intends to take an ecosystem-based approach to the management of salmon farms.† Under the new Integrated Management of Aquaculture Plans, DFO intends to evaluate new salmon farm sites on an ecosystem rather than a site-by-site basis.[72] This news is encouraging, but work must proceed quickly to give prominence to the proximity of salmon farms to Fraser River sockeye migration routes.

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* I note that on June 29, 2012, Bill C-38, *An Act to implement certain provisions of the budget tabled in Parliament on March 29, 2012 and other measures*, received royal assent. Part 3, Division 1, enacts the *Canadian Environmental Assessment Act, 2012* (CEAA, 2012). As a result, references in this Report to the CEAA may not reflect the current law respecting environmental assessment in Canada or the applicability of environmental assessments to salmon farms. As discussed in Chapter 3, Legislative amendments, it may be even less likely that salmon farms would be reviewed under the amended Act.

† I note that, on June 29, 2012, Bill C-38, *An Act to implement certain provisions of the budget tabled in Parliament on March 29, 2012 and other measures*, received royal assent. As discussed further in Chapter 3, Legislative amendments, Bill C-38 amends the habitat protection provisions in a way that may have an impact on DFO's use of an ecosystem-based approach.

Given the risk of serious harm posed by salmon farms to Fraser River sockeye, DFO needs to ensure that existing farm sites conform to the most up-to-date knowledge to ensure that risks are minimal. I note that, in about 2005, when DFO established thresholds of compliance for benthic impact from salmon farms, it did not apply that standard retroactively to existing sites.[73] Similarly, the regional director general of DFO's Pacific Region told me that new standards put in place by DFO for site selection under the Pacific Aquaculture Regulatory Program would apply only to new salmon farm sites, not those originally licensed under the provincial regulatory regime.[74] These examples cause me concern. They provide little confidence that the most up-to-date standards and practices are being applied to all salmon farms potentially affecting Fraser River sockeye, irrespective of when the farm site first became operational. If siting measures are to serve as a useful tool to minimize the risk of serious harm to Fraser River sockeye, they must be adaptive to new scientific information. If new information reveals that existing farm locations pose more than a minimal risk of serious harm to Fraser River sockeye, those farms should be removed.

For the "proper farm siting" mentioned in the Wild Salmon Policy to effectively minimize the risk of serious or irreversible harm to Fraser River sockeye, DFO needs to focus on the following measures:

- Protection of Fraser River sockeye from negative impact along their entire migratory route. Special consideration should be given to areas such as the Discovery Islands, where Fraser River sockeye come into proximity to salmon farms.
- Protection of Fraser River sockeye from the potential negative cumulative effects of swimming past multiple farms sited on their entire migration route.
- Frequent and regular revision of siting criteria to account for new scientific information about the risk of fish farms to Fraser River sockeye.
- Retroactive application of revised siting criteria to existing sites, even if it entails removing or relocating salmon farms off the Fraser River sockeye migration route.

In short, siting should be approached with the goal of the Wild Salmon Policy in mind: restoring and maintaining healthy and diverse salmon populations and their habitats for the benefit and enjoyment of the people of Canada in perpetuity. DFO should seek to approve the best sites to avoid negative impact on wild stocks, such as Fraser River sockeye, rather than the best sites to produce farmed salmon.

DFO also needs to take steps to minimize the scientific uncertainty about salmon farms and to re-evaluate its mitigation measures as that uncertainty diminishes. A 2003 Privy Council of Canada document, *A Framework for the Application of Precaution in Science-Based Decision Making about Risk*, makes these useful points about resolving scientific uncertainty in applying precaution:

- To resolve scientific uncertainty, research and scientific monitoring are key parts of the application of precaution.
- The responsibility for producing scientific data may shift among governments, industry, or other proponents.
- Where scientific information is inconclusive, decisions still have to be made to "meet society's expectations about enhancing living standards and addressing the potential for risks."[75]

Data presented during this Inquiry did not show that salmon farms were having a significant negative impact on Fraser River sockeye. However, as noted above, the statistical power of the database (containing fish health data from 2004 to 2010) was too low to rule out significant negative impact.[76] I accept the evidence of Dr. Korman and Dr. Dill that scientists need another 10 years of regulatory data (until at least mid-2020) before they can more confidently identify any relationships that may exist. As well, other than a few studies related to sea lice (mostly in species other than sockeye), DFO has not completed research into the effects of diseases and pathogens from salmon farms on wild Fraser River sockeye. Nor has DFO done any research into the cumulative effects on sockeye of having multiple salmon farms sited on their migration route. In sum, there are insufficient data (almost no data) to evaluate cause and effect relationships, and insufficient data (in terms of a time series of fish health data) to look for correlations between fish farm factors and measures of sockeye health such as productivity. As a result, significant scientific uncertainty remains

around the effect of salmon farms on Fraser River sockeye salmon.

Continuing to collect fish health data from salmon farms into 2020 will eventually allow for a more statistically robust assessment of whether fish farms along the sockeye migration route are affecting Fraser River sockeye. However, mitigation measures should not be delayed in the absence of scientific certainty. Much research may be done around farm–sockeye interactions and cause- and -effect relationships, which is not dependent on extending the time series of the fish health database. Additionally, in light of the uncertainty, and while DFO takes steps to better account for proximity to Fraser River sockeye in farm siting, it is appropriate to take measures to prevent any likelihood of harm from increasing. For that reason, I recommend no increase to salmon farm production in the Discovery Islands until such time as the impact of salmon farming on Fraser River sockeye can be determined, with some degree of certainty, to be minimal.

In summary, I have concluded that net-pen salmon farming in the Discovery Islands poses a risk of serious harm to Fraser River sockeye through the transfer of diseases and pathogens. The full extent and likelihood of that harm cannot be determined because of scientific unknowns. Precautionary measures should focus on filling the knowledge gaps and enabling DFO to adapt mitigation measures to new scientific information. I recognize that DFO may need some time to fulfill my research recommendations. However, as described above, I am also satisfied that British Columbians will not accept more than a minimal risk of serious harm to Fraser River sockeye from salmon farms. Therefore, it is appropriate to set deadlines to ensure that the uncertainty about the extent and likelihood of harm posed by salmon farms does not languish unaddressed. In the recommendations that follow, based on the evidence I heard about the state of research and the strength of regulatory data, I have chosen September 30, 2020, as the date by which DFO should be able to assess, adequately, 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 prohibit all net-pen salmon farms from operating in the Discovery Islands. If, before that date, DFO finds farms to pose more than a minimal risk of serious harm to Fraser River sockeye, those farms should be promptly removed.

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.**

Salmonid enhancement facilities

Salmon enhancement or production facilities include hatcheries, spawning channels, and other improvements designed to produce fish. In British Columbia there are 23 major federal (DFO) enhancement facilities, 21 community hatcheries operated as part of DFO's Community Economic Development Program, and approximately 350 public involvement projects supported by 18 DFO community advisors. In addition, provincial trout hatcheries are operated under the Freshwater Fisheries Society of BC. (See the section on habitat enhancement and restoration in Volume 1, Chapter 6, Habitat management, for a more detailed description of salmonid enhancement facilities.)

Fish health management at salmonid enhancement facilities

Salmonid enhancement facilities are regulated under the federal *Pacific Aquaculture Regulations*. Fish in enhancement facilities carry diseases and pathogens, and the potential exists for enhanced fish to transfer these pathogens to wild salmon stocks. Indeed, I heard evidence that fish with known and suspected infections have been released from enhancement facilities into fish-bearing waters.[77] In some cases, DFO's practice appears to be to release enhanced fish suffering from endemic diseases – in particular, bacterial kidney disease and endemic skin and gill parasites.[78]

The state of regulatory development for salmonid enhancement facilities is in its infancy:

- There are no standards for acceptable levels of disease or pathogens in enhanced fish.[79]
- There are no standard operating procedures across facilities, though DFO has "done a couple of workshops" to encourage community hatcheries to write their own standard operating procedures.[80]
- There are deficiencies in record keeping – use of different formats, lack of consistent record keeping, and, in some cases, only anecdotal information recorded.[81]

- Many facilities have no facility-specific fish health management plans, though they may have access to a template document.[82]
- There are minimal requirements for monitoring and reporting fish health issues under the facilities' conditions of licence.[83]
- There are no testing requirements under the conditions of licence, although in its major facilities, DFO does some screening for diseases where it knows certain diseases, such as bacterial kidney disease, are present in a watershed.[84]
- There is no auditing system or formal system of oversight, and there is a lack of resources to provide proper oversight, such as auditing Fish Health Management Plans and conducting site visits.[85]
- Facilities do not apply standardized pre-release screening for diseases, and some facilities do no pre-release screening at all.[86]

DFO needs to develop a basic regulatory program for salmonid enhancement facilities. Diseases at these facilities pose risks to Fraser River sockeye. Without established fish health standards, standardized procedures, and proper record keeping and monitoring, scientists and regulators cannot properly assess these risks and take informed preventive actions to reduce risks. DFO ought to take a precautionary approach to the management of disease at salmonid enhancement facilities.

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

In addition to the risk of disease and pathogen transmission from enhanced salmon to Fraser River sockeye, there are also risks associated with interactions between enhanced salmon and wild Fraser River sockeye in the marine environment.

According to Dr. Randall Peterman, a professor in the School of Resource and Environmental Management at Simon Fraser University, competition for food can occur between wild and enhanced salmon because their diets overlap and they are thought generally to pass through feeding areas at similar times and places.[87] Also, predation-induced mortality on wild juvenile salmon can be increased because predators are attracted by the high abundance of juvenile salmon resulting from large hatchery releases.[88]

Similarly, when wild and enhanced adult salmon co-migrate through fishing areas, pressure is intense on managers to allow high harvest levels. However, because wild stocks generally have lower productivity than enhanced fish, high-percentage harvest rates targeted on enhanced fish can eventually lead to over-harvesting and depletion of the abundance of wild co-migrating stocks that are subject to those same harvest rates.[89] Finally, after adults leave the ocean, large numbers of hatchery fish straying into spawning areas for wild fish can decrease the biological diversity and fitness of wild stocks.[90]

During the hearings on the marine environment, I heard that the interactions between hatchery and wild salmon is a substantial issue in fishery science and that an extensive literature exists on the potential interactions for pink, chum,

chinook, and coho. Dr. Richard Beamish, retired research scientist, DFO, testified that there is evidence of hatchery–wild interactions among various salmon species, although whether there could be a long-term substantial reduction in production is less clear among the scientific community.[91]

At the hearings on habitat enhancement and restoration, Dr. Peterman provided evidence that the body size of adult sockeye salmon decreases as the abundance of competitors increases, and that the survival rate of sockeye salmon can decrease as the abundance of pink salmon competitors increases.[92] He testified that there is a pressing need for research into the potential interactions between enhanced and wild fish. Additionally, at the hearings on the marine environment, Dr. Stewart McKinnell, lead author of Technical Report 4, Marine Ecology, told me that, when the abundance of fish is high in the North Pacific, the mean size of sockeye tends to be low. According to this report, the sea provides only limited amounts of food for growing sockeye salmon. Thus, Fraser River sockeye are smaller when the total abundance of sockeye in the Gulf of Alaska is greater. Dr. McKinnell said there is some evidence that Fraser River sockeye are significantly smaller in brood years that matured in odd-numbered years (e.g., 2005, 2007, 2009). A reduction in mean size in odd-numbered years may be a consequence of the competition for food with pink salmon during the period of overlap in the Gulf of Alaska.

However, Carol Cross, manager, Strategic Initiatives, Salmonid Enhancement Program, testified that neither the Salmonid Enhancement Program nor DFO Science was, at the time of the hearings, looking into the effects of competition between wild and hatchery salmon in the marine environment.[93] In her view, such studies are complex and large, requiring significant resources, and there is a limited capacity to undertake them.[94] She added that the Salmonid Enhancement Program recently asked DFO Science to consider a study to determine the carrying capacity for salmonids in the Strait of Georgia, in order to aid production planning decisions at hatchery facilities there.[95] At the time of the hearings in May 2011, this study had not yet been designed.

As noted earlier, the precautionary principle addresses situations involving risk and scientific uncertainty. The evidence satisfies me that interactions between Fraser River sockeye salmon and enhanced fish in the marine environment do 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. Further, despite the evidence that salmon enhancement poses a risk to Fraser River sockeye marine survival and that DFO is aware of the nature of this risk, the department does not account for this risk in its management of the fishery.

In contrast to the evidence that salmonid enhancement poses a risk to Fraser River sockeye, throughout the hearings I heard evidence of the benefits to sockeye of habitat enhancement and restoration. I question, therefore, whether the department's prioritizing of salmonid enhancement over habitat enhancement and restoration is consistent with its conservation mandate. It is important that DFO undertake a risk assessment without further delay so a decision can be made on the future of salmonid enhancement facilities, including whether they should be maintained.

In making the above findings about the risk posed by salmonid enhancement, I recognize that there may be a distinction between salmonid enhancement for the purpose of producing fish to sustain commercial and/or recreational harvest and enhancement for conservation purposes. In my view, the Wild Salmon Policy signalled a partial shift in the department's rationale from enhancement for fisheries purposes to enhancement as a means of rebuilding those Conservation Units that have an unacceptable chance of extirpation.[96] The policy provides that the enhancement program will continue to evolve toward a greater emphasis on community stewardship, habitat restoration, and rebuilding of priority Conservation Units. Although hatchery production solely for conservation purposes may not pose the same risk of harm that large numbers of enhanced salmon for fisheries may pose, the risk to Fraser River sockeye of either type of hatchery production was, at the time of the hearings, unknown. Therefore, DFO should assess the risk of salmonid enhancement for both conservation and fisheries purposes.

Finally, I recognize that the management of any risk posed by salmonid enhancement to Fraser River sockeye will likely require international cooperation. For example, in 2008, Canada released 330 million hatchery salmon, but releases of salmon

fry and smolts for Pacific Rim countries (Canada, Japan, South Korea, Russia, and the United States) ranged from 4.7 billion to more than 5 billion annually from 1993 to 2008.[97]

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.

Management of the wild fishery

Integrated Fisheries Management Plan

As I describe in Volume 1, Chapter 5, Sockeye fishery management, as part of Fraser River sockeye salmon pre-season planning, DFO has, since 1999, produced an annual salmon Integrated Fisheries Management Plan (IFMP). The IFMP provides information and guidelines for management of the upcoming fishing season. The process begins with that year's chair of the IFMP process inviting relevant DFO sectors to designate representatives to an IFMP Development Committee. That committee discusses the results of the post-season review from the preceding fishing season and sets timelines for the collection of information. The chair consolidates that information into a draft IFMP. After the Development Committee members review the draft, DFO incorporates their feedback into a second draft IFMP that reflects internal agreement in principle on the main elements, issues, and objectives.

In March and May meetings, DFO invites input on the second draft IFMP from the Integrated Harvest Planning Committee (IHPC) and from the Commercial Salmon Advisory Board, the Sport Fishing Advisory Board, and First Nations. The IHPC, stakeholders, and First Nations are invited to discuss the content of the IFMP, provide additional information, and suggest changes. DFO incorporates some of this feedback into the next draft of the IFMP document.

Internal sector directors also provide input into the draft IFMP. Once a near-final draft is ready, DFO Pacific Region's Salmon Team prepares a briefing note for the minister that includes recommendations regarding sign-off on a final version of the IFMP. The regional director, Fisheries and Aquaculture Management (FAM), and the Pacific Region's regional director general then vet this briefing note locally, followed, at the national level, by vetting by an assistant deputy minister and the director of fisheries resource management.

The IFMP and a briefing note are delivered to the minister in late June or early July. The minister may, before approving the IFMP, make alterations to it. Once approved, the IFMP is posted on DFO's regional and national websites.

As I mention in Volume 1, Chapter 5, Sockeye fishery management, when the IHPC was introduced in 2004, it was understood to be an advisory rather than a decision-making process. It was intended to provide an opportunity for different interests to come together to coordinate fishing plans and resolve potential conflicts. In closing submissions, Canada (on behalf of DFO) described the IHPC as "the key advisory process used by DFO for integrated planning of the Pacific salmon fishery."[98]

During the hearings, some witnesses criticized the IHPC and the IFMP approval processes. For example, Jeffery Young of the David Suzuki Foundation and Marine Conservation Caucus cited a lack of transparency in DFO's decision making, saying that some recommendations made by stakeholders and First Nations during the IHPC process are not incorporated into the final IFMP document, yet no explanation for their absence is provided.[99] As I have described the IFMP approval process above, the draft IFMP document is revised once after the IHPC stage, and the briefing note that DFO then prepares for the minister goes through

four edits, twice regionally and twice in Ottawa. After the minister approves the IFMP, DFO provides no explanation about this decision-making process and the basis for the minister's final decision regarding the IFMP.

I can understand the frustration felt by stakeholders and First Nations, including those involved in the IHPC. They accept that DFO's consultation on the IFMP is only an advisory process, but they often have invested much time and energy into reviewing and commenting on the IFMP. If their suggestions are not acceptable to DFO, they would like to understand why. At the same time, I understand the time constraints DFO is under to receive ministerial approval of the IFMP before the fishing season begins. It would not be realistic to expect DFO to report back to the IHPC, stakeholders, and First Nations at each stage leading up to the minister's final approval.

I do not question either the minister's authority to make final decisions on the Integrated Fisheries Management Plan or the fact that the minister will properly rely on advice from within the department in doing so. However, I think it only fair that DFO be accountable to the stakeholders and First Nations and provide a basis for its decision making.

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

Between 2002 and 2006, DFO developed the Fraser River Sockeye Spawning Initiative (FRSSI), described as a "quantitative modeling tool for assessing harvest rules for Fraser River sockeye salmon given conservation needs and other management objectives."[100]

Escapement strategies in the FRSSI model are defined as a total allowable mortality (TAM) rule that specifies the total allowable mortality rate for Fraser River sockeye at different run sizes. The escapement strategies are designed around three fundamental considerations:

- no fishing at very low run sizes, except for test fishing;
- fixed escapement at low run sizes to protect the stocks and reduce process-related challenges at this critical stage; and
- a fixed total allowable mortality rate at larger run sizes. Currently, TAM is set at 60 percent, which includes the total number of fish that are caught in the fisheries or that die en route to the spawning grounds.

Fisheries are managed according to the Early Stuart, Early Summer, Summer, and Late-run timing groups (based on the historic timing of the migration to their spawning grounds). Any run-timing group may contain a mix of Conservation Units that are relatively weaker or stronger in terms of productivity.* Accordingly, DFO recognizes a need for precaution in setting the maximum mortality rate.[101] DFO includes options for escapement strategies in its draft IFMP, which is presented to and discussed by the IHPC. As described above, the draft IFMP is provided to, and reviewed by, the harvest sectors outside the IHPC process as well.

Al Cass, DFO scientist and one of the creators of the FRSSI model, testified that the model itself does not allocate harvest. Rather, it determines the TAM rules, after which DFO managers allocate harvest (mortality) among the commercial, recreational, and Aboriginal fisheries and account for mortality through other causes.[102]

The FRSSI model has been the subject of criticism. For some, the 60 percent TAM ceiling is too high. For others, it is too low, allowing too many fish to escape to the spawning grounds and resulting in forgone catch. Rob Morley, vice-president of the Canadian Fishing Company and a member of the Fraser River Panel, expressed concern that DFO does not consider economic trade-offs that must be made in setting total allowable mortality / escapement. He suggested that, when presenting the four optional escapement targets in a given year for a given run, DFO should conduct an economic evaluation of the harvest rates before choosing a model.[103] Other

* Productivity is the number of recruits returning per spawner.

criticism of the FRSSI model and process focused on a lack of consideration of the effect of habitat on productivity and the resulting escapement targets.[104]

In 2010, DFO Science evaluated the FRSSI methodology and identified several priority areas for ongoing work. I was told that DFO intended to review the TAM rules, among other things, in 2011.[105] However, at the time of our evidentiary hearings, that review had not taken place. I encourage DFO to complete this process.

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

The Fraser River Panel determines the annual management adjustments that are added to the escapement targets. Management adjustments are a way of estimating the number of fish that will be lost to en route mortality through a variety of factors, including high water temperature, high or low water flow, disease, predation, and illegal catches. They also allow for estimation errors when fish are counted. They are a means to ensure that, in season, enough fish arrive at Mission so that sufficient fish subsequently arrive at the spawning grounds to meet the escapement targets set by Canada for each of the Fraser River sockeye run-timing groups.

The number of sites monitored for water temperature decreased in the 1980s and 1990s, when DFO took over from the predecessor to the Pacific Salmon Commission (PSC), but by 2010 monitoring had returned to the level in place in the 1960s. It is important to maintain the full data set of environmental conditions in the Fraser River to enable the most accurate modelling of management adjustments. Currently, DFO monitors in-river temperature and flow to enable the calculation of management adjustments. Environment Canada has the mandate to monitor water quality, of which water temperature is a main attribute, though I heard evidence that it could be doing more in this area.

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.

In-season management

Test-fishing program

Early in the year, the Pacific Salmon Commission provides to Canada and the United States a test-fishing plan, which includes the proposed budget required from each country to fund test fisheries. The purpose of the test-fishing program is to collect physical, biological, and catch per unit effort information that is used to provide estimates of run size and other stock assessment data for key stock components of Fraser River sockeye salmon runs.

In the case of Canada, once the test-fishing plan is agreed to, Canada transfers funds to the PSC. The PSC issues all the contracts for test fishing in Panel and non–Panel Area waters, although in non–Panel Area Canadian waters, DFO staff direct the test fishers. For the fiscal year ending March 31, 2010, the total cost of the Pacific Salmon Commission's test-fishing program for Panel and non–Panel Area waters was $1.3 million.[106]

The regional director general for DFO Pacific Region told me that the test fishery provides key information that informs the management decisions and is very important to the day-to-day management of the fishery.[107]

Historically, DFO funded its share of the test-fishing program by allowing fishers participating in the program to keep their catch. However, in

the 2006 *Larocque* decision, the Federal Court of Appeal determined that, because fish are a common property resource belonging to all the people of Canada, in the absence of express legislative authority, DFO does not have the power to finance its scientific research activities by selling them.[108] In response, DFO earmarked funds for test fisheries through its "*Larocque* relief funding," a five-year national program ending in 2011. I was told that Canada has repeatedly asked the Pacific Salmon Commission to reduce test fishing because of the cost of the program to DFO, a request the PSC has resisted.[109] At the time of the evidentiary hearings, DFO had not committed to continuing this funding after 2011. However, on June 29, 2012, Bill C-38, *An Act to implement certain provisions of the budget tabled in Parliament on March 29, 2012 and other measures*, received royal assent. Section 411 amends the *Fisheries Act* to authorize the minister to determine "a quantity of fish or fishing gear and equipment that may be allocated for the purpose of financing scientific and fisheries management activities that are described in a joint project agreement entered into with any person or body, or any federal or provincial minister, department or agency." (For further discussion of Bill C-38, see Chapter 3, Legislative amendments.)

I am satisfied that the test-fishing program is critical to the Fraser River sockeye salmon fishery, providing key information on stock composition, run sizes, and run timing used to make prudent harvesting and escapement decisions. It is, in my view, essential that DFO's contribution to the cost of the test-fishing program continue. Without these test-fishing data, and those from the hydroacoustic facilities discussed below, DFO could not manage the Fraser River sockeye fishery.

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

Under the Pacific Salmon Treaty, the Pacific Salmon Commission is responsible for operating the hydroacoustic facility at Mission. PSC staff collect data to reflect daily returning sockeye abundance. These data, coupled with those obtained in the test fisheries, are essential to the determination of in-season run size. Mike Lapointe, chief biologist with the Pacific Salmon Commission, testified that the Mission hydroacoustic facility is the single most important part of the in-season run size estimation. The Mission facility captures data on 10–15 percent of the fish swimming up the Fraser River, whereas fish caught in the test fisheries represent only approximately 0.5–1 percent of the fish.[110]

DFO's Science Branch conducted hydroacoustic monitoring at Qualark (2–3 days farther upstream for migrating salmon) between 1993 and 1998 and reinstituted monitoring there in 2007, using a new sonar system. According to Dr. Brian Riddell, CEO of the Pacific Salmon Foundation, Qualark allows for more accurate abundance data because of the new equipment, coupled with a narrow passage for the fish, and the fact that pink salmon do not migrate this far upstream.[111] Mr. Lapointe testified that Qualark data provide a very good cross-check or confirmation of the Mission data.[112] Indeed, in 2010, in-season adjustments were made to the Mission estimates based on Qualark data.[113]

There is no funding agreement for Qualark, and DFO has not, at the time of the evidentiary hearings, made a commitment to future funding for Qualark. According to Mr. Lapointe's November 2010 report to the PSC's Fraser River Panel, the annual operating cost for Qualark is approximately $300,000.[114]

I am satisfied that the Mission and Qualark hydroacoustic facilities each provide the Pacific Salmon Commission and DFO with the best available information about in-season run size and that the Qualark data are a very good confirmation of the Mission information. In my view, DFO should continue to fund both facilities.

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

Since the mid-1990s, there have been initiatives in Canada and internationally to develop responsible fisheries practices, as I discuss in Volume 1, Chapter 5, Sockeye fishery management. For example, in 1998, Canada's commercial fishing industry developed a *Canadian Code of Conduct for Responsible Fishing Operations* that states, in Principle 6, "To the extent practical, fish harvesters will minimize unintended by-catch and reduce waste and adverse impacts on the freshwater and marine ecosystems and habitats to ensure healthy stocks."[115]

Between 1998 and 2002, DFO funded the Pacific Salmon Selective Fisheries Program, to develop, evaluate, and facilitate implementation of selective fishing techniques in commercial, First Nations, and recreational salmon fisheries. In 2001, DFO released A Policy for Selective Fishing in Canada's Pacific Fisheries (Selective Fishing Policy), which defined selective fishing as "the ability to avoid non-target fish, invertebrates, seabirds, and marine mammals or, if encountered, to release them alive and unharmed."[116]

In its 2001 Integrated Fisheries Management Plan for the South Coast, DFO introduced selective fishing measures that were then translated into commercial fishing licensing conditions, including brailing for 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 were, at the time of the hearings, still in force, but no directed programs addressed selective fishing, and there was no designated DFO lead for the policy. In my view, it is essential that DFO designate an individual to coordinate scientific, educational, and management efforts in relation to selective fishing practices.

Dr. Brent Hargreaves, a DFO research scientist who conducted selective fishing research in the 1990s and 2000s, testified that, as a result of the cessation of the Selective Fisheries Program, there is a gap in the research concerning the long-term survival of released fish. He explained that "the value of those [selective fishing] methods depends entirely on the post-release survival rates and the effectiveness of those fish to get back and spawn successfully."[117] The authors of Technical Report 7, Fisheries Management, Karl English and others, agreed:

> Unfortunately, there is almost no scientifically defensible information on post-release mortality associated with any freshwater gear type and across all three fishing sectors for Pacific salmon … There has been little research to quantify levels of mortality or to understand the mechanism underlying mortality in order to better mitigate or prevent mortality. Without this type of information, especially in an era of warming rivers wherein we expect higher stress-related mortality … it is difficult to ensure sustainability of salmon fisheries and conservation of stocks.[118]

I accept this evidence. I am satisfied that selective fishing practices promote conservation. However, without some effort to coordinate selective fisheries activities, led by a designated individual, the Selective Fishing Policy by itself will not lead to more responsible fisheries practices.

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

Knowing the number of fish that are harvested in the commercial, recreational, and Aboriginal (food, social, and ceremonial [FSC] and economic opportunity) fisheries is important for several reasons. DFO scientists use the previous years' catch estimates in preparing pre-season forecasting models, which fisheries managers then use to plan the fisheries. DFO and the Fraser River Panel rely on estimates of catch from Canada in their decisions regarding in-season fishery openings. DFO scientists rely on catch estimates to support stock assessment research and activities. Also, without accurate catch estimates, it can be difficult to determine what impact a particular fishery may have on individual stocks of concern.

Fisheries-monitoring and catch-reporting programs differ among the commercial, recreational, and Aboriginal sectors and among the gear types and areas in each fishery. Catch estimates may rely on fishers reporting their own catch numbers (fisher dependent), on information collected by monitors independent of the fishers (fisher independent), or on a combination of the two. Where catch reporting is fisher dependent, there is the potential for inaccurate reporting of catch, whether inadvertent or intentional. Independent verification of catch numbers and fishing effort may be used to validate the accuracy of fisher-dependent numbers.

In the commercial fishery, catch estimation is primarily fisher dependent, with varying levels of independent catch validation in some fisheries. DFO requires commercial fishers to complete phone-in reports to DFO, typically by the following morning and no more than 24 hours after fishing. All commercial licence holders must record their catch in a logbook that is returned to DFO at the end of the fishing season. However, DFO also conducts or contracts some fisher-independent on-the-water patrols. Some commercial fisheries are also subject to dockside monitoring, in which a percentage of returning boats have their catch numbers validated by an independent monitor.

In the recreational fishery, catch estimation is primarily by a creel survey, which includes rod counts (estimating the number of people fishing on the river at a given time) and an access survey, in which DFO staff interview recreational fishers as they are leaving their fishing locations and obtain information about how long they were fishing, their target species, and how many fish they caught and released or kept.

In the Aboriginal FSC fishery, catch reporting varies, depending on the area and the method of fishing, and includes a census program, an aerial roving access survey, and hail programs complemented by DFO or Aboriginal fishery officer patrols and final hail counts at the close of the fishery. Some First Nations have a monitoring program where all FSC fish are counted and reported to DFO weekly. Aboriginal economic opportunity fisheries in the Lower Fraser River are monitored using a mandatory landing program, in which 100 percent of fish harvested are counted by a dockside monitor. The mandatory landing programs are run by First Nations fisheries organizations funded through agreement with DFO.

Several witnesses were asked for their understanding of the effectiveness of fisheries monitoring and catch-reporting programs and the accuracy of the catch estimates they produce. Dr. Robert Houtman, catch-monitoring biologist, DFO, told me that his "sense" and the "Department's sense" is that commercial catch estimates for sockeye are "quite a good estimate."[119] When asked to explain what "quite good" meant, he said that it is "difficult to put a number on" it, but he suspects that 95 percent of the commercial catch is accounted for.[120] Matthew Parslow, acting management biologist, DFO, who works with Lower Fraser First Nations, said he thinks that DFO has a "good program" in place that achieves a "fairly good estimate of the catch" in the Aboriginal set net fishery and "quite good" estimates for the Aboriginal drift net fishery.[121] He later stated that probably 90 percent of the catch, if not more, was accounted for.[122] Lester Jantz, area chief, Resource Management, BC Interior, DFO, told me that the major Aboriginal fisheries in that area are monitored with programs that provide a "fairly reliable catch estimate under the current funding levels."[123]

The authors of Technical Report 7, Fisheries Management, also provided a qualitative assessment of the accuracy, precision, and reliability of catch estimates in the commercial, recreational, and Aboriginal fisheries. They report that the accuracy of Aboriginal FSC and economic opportunity fishery catch estimates are "good," whereas the accuracy of the commercial and recreational fishery catch estimates are "fair." The authors consider the reliability of these estimates to range from "medium" to "good."[124]

In contrast, Randy Nelson, regional director of DFO's Conservation and Protection Branch, testified that he believes there are large gaps in the accuracy of catch estimates in all fisheries. He told me that, over the years when his officers provided evidence of illegal harvest to resource managers, they sometimes did not know what to do with it.[125] Mr. Parslow confirmed that DFO does not have any system in place to estimate illegal or unauthorized catch, and that the catch information obtained from the Conservation and Protection Branch is not used in the management of the fishery.[126]

Based on the evidence, I am satisfied that accurate catch estimates are an essential component of DFO's management of the Fraser River sockeye fishery. I accept the testimony of Colin Masson, element lead, Pacific Integrated Commercial Fisheries

Initiative (PICFI), DFO, that there has been a "crisis of confidence" among harvesters and the general public as to the accuracy and reliability of catch estimates,[127] a problem that the Integrated Salmon Dialogue Forum (ISDF) publication, *Charting Our Course*, also raises.[128] The use of qualitative terms such as "good" or "fair," rather than more quantitative and precise measurements, to describe the accuracy of catch estimates is, in my view, unsatisfactory, given the importance of catch monitoring and the public's lack of confidence in DFO's catch estimation. I am also concerned that DFO does not estimate illegal or unauthorized catch to use in its management of the fishery. This information could be helpful to fisheries managers in a variety of ways – for example, in directing enforcement activities, allocating fishing access, and providing post-season accounting of returns.

In developing recommendations in this area, I am cognizant that fisheries monitoring and catch reporting are complex exercises requiring consideration of the unique aspects of each fishery. As described above, catch-estimation methods differ among the commercial, recreational, and Aboriginal fisheries and among the gear types and areas within those fisheries. I accept that there may be valid reasons for the different methods used. The monitoring methods required to achieve conservation objectives in a mixed-stock seine boat fishery may well differ from those required in a small terminal dip net fishery.

Though different monitoring and reporting methods may be applied to each fishery, there is a reasonable expectation that the statistical quality and reliability of the catch estimates produced will be consistent and satisfactory in meeting conservation objectives. In other words, the methods used may differ, but the quality of catch estimation results ought to be comparable.

DFO, First Nations and stakeholders, through consultation and the efforts of the ISDF, have worked toward articulating the quality of catch estimates required. As described in the section on catch monitoring in Volume 1, Chapter 5, Sockeye fishery management, DFO and the ISDF have created tables setting out monitoring standards of "basic," "moderate," and "enhanced," depending on the degree of conservation risk, the type of fishery operations, the catch information required, and the ecosystem or habitat considerations at play. For example, an enhanced level of monitoring applies to fisheries where there is a high conservation risk, a potential for bycatch of sensitive Conservation Units, a high relative fishing capacity, or a high-value species being caught, thereby creating an incentive to under-report the catch. An enhanced level of monitoring also applies if the fishery is managed by defined shares or allocations, the fishery is subject to eco-certification requirements, fisheries managers require accurate and timely records of the operational details of the fishery (e.g., effort, location, gear), or future fishing opportunities (i.e., openings and closings) are dependent on precise and timely catch information.[129] With an enhanced level of monitoring, catch estimates are to achieve a statistical quality of precision within 5 percent, with greater than 20 percent of the catch validated (counted) by an independent party.[130]

I am satisfied that, applying the factors articulated by DFO and the ISDF, the Fraser River sockeye salmon fishery should be monitored at an enhanced level and should achieve catch estimates that fall within 5 percent of actual catch as determined by greater than 20 percent independent validation. In order to achieve this outcome, it is my view that certain aspects of DFO's catch-estimation practices must change.

First, in order to improve the completeness and accuracy of fisher-dependent catch reports, DFO should enforce penalties for non-compliance with catch-reporting requirements. Dr. Houtman described one example in which DFO required commercial fishers to return their harvest logbooks before being issued the subsequent year's annual fishing licence. This requirement led to a dramatic improvement in the percentage of logbooks returned.[131] Where non-compliance with reporting requirements exists, DFO must take persuasive action to address it.

Second, DFO should confirm the role of fishery officers in reporting illegal harvest numbers. Fishery officers on the water lend a valuable set of eyes and ears that should be considered by fishery managers in estimating catch. To be complete and accurate, catch estimates must also consider credible observations of illegal harvest, in addition to reports of legal harvests.

Third, DFO must provide sufficient and stable resources to support an enhanced level of fisheries

monitoring, including funds for independent validation of catch.* I heard that aspects of recreational, commercial, and Aboriginal fisheries monitoring rely on Pacific Integrated Commercial Fisheries Initiative program funding, set to expire in 2012.[132] Mr. Jantz expressed concern that, with the loss of these funds, the quality of catch estimates in the BC Interior area will be compromised.[133] Mr. Parslow expressed similar concerns for the Lower Fraser area, stating that, without PICFI funds, DFO would be limited to core staff with no seasonal technical support for field surveys or boat patrols associated with catch monitoring.[134] As an essential aspect of DFO's fisheries management function, catch estimation programs must be provided with the resources necessary to maintain an enhanced quality of catch estimates and to rebuild public confidence.

Dr. Houtman told me that commercial fishers pay for a portion of the fisheries monitoring and catch reporting in the commercial fishery, in particular for the logbook program.[135] Mr. Masson explained that it is DFO's stated intention to move costs associated with enhanced monitoring onto commercial fishers and that this transfer has already been done in the context of demonstration fisheries using individual transferable quotas.[136] (Individual transferable quotas are described in the section below on share-based management.) However, I also heard from commercial fishing witnesses that they were not content to bear the increased expense of enhanced fisheries monitoring and that doing so may cause significant hardship to them.[137]

In contrast, DFO funds the monitoring of Aboriginal economic opportunity fisheries, and Mr. Masson testified that DFO has no plans to transfer monitoring costs to First Nations at this point, although it might in the future.[138] If DFO decides that those engaged in commercial fisheries should bear some or all of the costs associated with catch monitoring, then in principle mainstream commercial fishers and those engaged in Aboriginal economic opportunity fisheries, where not based on an Aboriginal right to fish for economic purposes, should be treated equally.

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

There are several components to DFO's stock assessment program which, collectively, are important for two main reasons: first, to help understand population dynamics and the production of different stocks; and second to assist in forecasting run sizes, generating escapement targets, and developing post-season estimates of total return.

Escapement enumeration at spawning grounds involves calculating the number of adult salmon returning to their spawning grounds. Enumeration is done using a combination of low- and high-precision assessments, one of which in particular – mark-recapture – is a precise yet costly method. Mark-recapture involves sampling a portion of the returning Fraser River sockeye population downstream

* I note that in the budget tabled in Parliament on March 29, 2012, the government proposes to provide $33.5 million in 2012–13 to extend the Atlantic Integrated Commercial Fisheries Initiative and the Pacific Integrated Commercial Fisheries Initiative.

of spawning areas, marking them, and then releasing them. At the spawning grounds, another portion is captured. After the number of marked individuals within the sample is counted, an estimate of the total population size can be obtained by dividing the number of marked individuals by the proportion of marked individuals in the second sample.

Mark-recapture used to be applied to returning Fraser River sockeye populations anticipated to be larger than 25,000. In 2005, as a result of funding pressures, DFO raised the threshold for the use of mark-recapture to returning populations greater than 75,000. The evidence indicates that this change has not had a detrimental effect on Fraser River sockeye stock assessment. However, Timber Whitehouse, area chief, Fraser River Salmon Stock Assessment, DFO, acknowledged that, because DFO Science has not been able to complete the research on this issue, there is an unresolved issue regarding the appropriate calibration of low-precision enumeration methods now used for spawning populations in the 25,000–75,000 range.[139]

DFO also conducts an assessment of post-incubation fry (juvenile) production in sockeye nursery lakes and some rivers. I was told that DFO's survey work of nursery lakes is not as extensive as it was in the 1980s and 1990s. In Technical Report 10, Production Dynamics, authors Dr. Randall Peterman and Dr. Brigitte Dorner recommend that DFO strategically increase the number of sockeye stocks for which it annually estimates juvenile abundance (i.e., beyond Shuswap and Quesnel lakes). In their view, it is important to have a time series of abundance data on at least one juvenile stage (in addition to spawners and adults) so it will be possible to identify the portion of the total life cycle in which major changes in survival have occurred.I agree with their analysis.

DFO also conducts nursery lake productivity assessments (i.e., the chemical, physical, and biological properties of the lake) to determine the ability of lakes to support juvenile sockeye. Finally, DFO monitors smolt output at Chilko and Cultus lakes.

I was told that the cutbacks to stock assessment of other salmon species such as coho and chinook may have an adverse effect on the sockeye fishery. According to Mr. Whitehouse, if we lose the capacity to be able to inform management about the status of coho or chinook stocks, we may have to constrain sockeye fisheries to deal with the uncertainty around the status of co-migrating species.[140] Not considering other salmon species is also contrary to the Wild Salmon Policy and to ecosystem-based management.

Finally, because escapement enumeration and other stock assessment activities require hands-on participation and occur in the traditional territories of many First Nations that have a historical connection to the Fraser River sockeye salmon fishery, I support the suggestion that DFO encourage the involvement of members of such First Nations in these activities.

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 fishing

Following the Supreme Court of Canada's 1990 decision in *R. v. Sparrow*, it has been DFO's policy

to provide First Nations with priority access (after conservation) to Fraser River sockeye salmon for food, social, and ceremonial purposes. DFO has no specific definition for this term (except that fish harvested for FSC purposes cannot be sold), and, as I discuss in the section on Aboriginal fishing policies and programs in Volume 1, Chapter 5, Sockeye fishery management, there is no common understanding within DFO or among First Nations as to what is encompassed within the term "food, social, and ceremonial."*

Barry Rosenberger, area director, BC Interior, DFO, told me that the department tries to arrive at FSC allocations that reflect the genuine food, social, and ceremonial needs of Aboriginal communities.[141] It attempts to do so through negotiations between its resource managers and representatives from Aboriginal groups.[142] To inform these negotiations, DFO considers a number of factors, including the group's population, recent FSC harvests, harvest preferences, and the availability of fish species in the area. Ms. McGivney testified that a First Nation's preference in a fish species, the breadth of species available, access of other First Nations to the species, and the status of fish resources are further considerations.[143] When negotiations fail to produce an agreement on the quantity of fish to be taken and the conditions under which a group may fish for FSC purposes, DFO's policy is to issue a communal licence to the group in any event, with an FSC allocation as determined by DFO.

Based on the evidence I heard, it will be challenging for DFO and First Nations to reach a common understanding on what is included, and what is not, in "food, social, and ceremonial purposes." However, those who negotiate on DFO's behalf with Aboriginal groups would, in my view, benefit from a clear understanding of how DFO itself interprets these words. That would, I think, lead to greater consistency in how FSC allocations are made and, in the long term, to allocations that are in keeping with Aboriginal FSC needs.

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 cultures, this paucity may put at risk the sustainability of the traditional Aboriginal FSC fishery as well as the Aboriginal cultural connection to that fishery. Conversely, FSC allocations that exceed actual FSC need may negatively affect other First Nations and general commercial access to the fishery, particularly in years of low abundance.

It is, in my view, equally important that First Nations actively assist DFO in reaching appropriate FSC allocations by providing DFO with information on the unique aspects of their culture that are relevant in determining their FSC needs.

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

Traditionally, the Pacific salmon commercial fishery has operated as a "derby" fishery, meaning that, with each commercial fishery opening, licensed fishers catch as much of the target species as they can while the fishery is open. Beginning with the 2005 Pacific Fisheries Reform, DFO has indicated an

* I note that on June 29, 2012, Bill C-38, *An Act to implement certain provisions of the budget tabled in Parliament on March 29, 2012 and other measures*, received royal assent. It amends the *Fisheries Act* to define "Aboriginal" as follows: "'Aboriginal,' in relation to a fishery, means that fish is harvested by an Aboriginal organization or any of its members for the purpose of using the fish as food or for subsistence or for social or ceremonial purposes" (Bill C-38, section 133).

interest in moving the commercial salmon fishery away from derby fisheries and toward share-based management, which assigns catch shares to specific user groups or individuals. Having been told their assigned catch share, users know in advance how many fish they are allowed to catch and retain.

Under the umbrella term "share-based management," there are different management structures or approaches that can be used. When catch shares are assigned to individual licences or vessels, they are often called "individual quotas," or IQs. Share-based management systems can also be designed so that shares or quotas are transferable. When a licence holder is permitted to transfer his or her quota to another licence holder, the quotas are referred to as "individual transferable quotas," or ITQs. A share-based management system may restrict or prohibit transfers of shares within a particular licence area or gear type, or it may allow transfers among gear types or even fishing sectors (e.g., a transfer of total allowable catch from the commercial to the recreational or First Nations sectors).

Not all commercial fishers support share-based management, and for that reason, DFO has elected to rely on demonstration fishing projects with those fleets that are willing to engage in a share-based management model. During the hearings, the First Nations Coalition, the Stó:lō Tribal Council, and the Cheam Indian Band expressed concern about moving to an ITQ system for salmon fisheries because they say the move to ITQ in other fisheries had led to permanent change without adequate consultation or consideration of First Nations' rights and interests. They want to discuss overall allocation policy before DFO makes decisions on share-based management.[144]

I heard evidence of the benefits of share-based management over a derby-style management model. I am satisfied that share-based management serves conservation objectives and that DFO has properly committed to moving to share-based management for this legitimate reason. DFO recognizes that managing the entire commercial salmon fishery as a purely competitive derby model is not responsible or sustainable, and, as such, it has committed to move to share-based management.[145]

However, I accept the evidence of Jeff Grout, salmon resource manager, Salmon Team, DFO, that there are complexities affecting DFO's implementation of share-based management in the salmon fishery – factors such as changing total allowable catch through the season, and the manner in which shares can be transferred among different fleets and sectors.[146] These alternatives to the present system have not yet been thoroughly examined.

Although I support in principle DFO's commitment to moving to share-based management, it is not realistic for the department to do so without first completing its analysis of the socio-economic implications of implementing the various management models, such as IQs and ITQs. It should, without further delay, complete that analysis in a manner that accords with Action Step 4.2 of the Wild Salmon Policy, decide which model of share-based management is preferable, and then implement that model.

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

In 1992, DFO initiated the Pilot Sales Program to provide certain First Nations with commercial salmon fishing allocations in the Lower Fraser River, the Skeena River, and the Alberni Inlet–Somass River areas. The Pilot Sales Program was suspended in 2003 and replaced the following year with communal "economic opportunity fisheries" in marine and Lower Fraser River fishing areas. Since about 2007, DFO has also provided some First Nations with allocations for economic fishing farther upstream on the Fraser River mainstem and at near-terminal and terminal fishing areas (that is, near or at salmon spawning grounds). These in-river economic fisheries are sometimes referred to as "in-river demonstration fisheries."

According to DFO, the economic fishing allocations provided to First Nations for in-river demonstration fisheries are made available through the purchase of equivalent fishing allocations from

the general commercial fishery. These purchases are accomplished using funds from DFO programs such as the Allocation Transfer Program (ATP), the Aboriginal Aquatic Resources and Oceans Management (AAROM) program, and PICFI. Between 2007 and 2011, DFO spent approximately $15 million to acquire salmon licences from the general commercial fishery to support in-river demonstration fisheries. DFO has also funded the acquisition of vessels and gear and the development and capacity building of organizations carrying out in-river demonstration fisheries.

I heard that DFO supports in-river demonstration fisheries for two reasons: to address conservation concerns associated with marine mixed-stock fisheries and to provide economic benefits to First Nations.[147] However, the evidence before me leaves doubt as to whether these two objectives are being met.

During the hearings on harvest management, I heard that the general commercial fishery in marine and Lower Fraser River areas encounters both strong and weak sockeye stocks co-migrating toward their spawning areas in the Fraser River. These stocks eventually separate as they leave the Fraser River mainstem and enter into the various tributaries and streams that make up their respective spawning grounds. Because of this separation, several witnesses suggested that fishing in-river (particularly at near-terminal and terminal areas) provides conservation benefits by allowing fishers to avoid the harvest of weak stocks. By selectively fishing only strong fish stocks, I was told, in-river demonstration fisheries may assist fisheries managers in meeting conservation and escapement targets for weak stocks.[148]

In theory, the potential conservation benefits of in-river demonstration fisheries look promising. However, it is not clear on the evidence that fishing in-river necessarily allows fishers to avoid weak stocks in many situations. Many weak Fraser River sockeye salmon stocks remain "mixed" with other stronger stocks throughout much of their in-river migration. For in-river demonstration fisheries to select only for strong stocks, most of these fisheries would have to be limited to very near-terminal or terminal fishing areas. That has not been the case for all in-river demonstration fisheries, which have also been located along the Fraser River mainstem in areas that still contain mixed stocks.

I was not directed to any detailed analysis of whether in-river demonstration fisheries, particularly those along the Fraser River mainstem, were in fact successful in avoiding weak stocks. Rather, as I describe in Volume 1, Chapter 5, Sockeye fishery management, the evidence before me is clear that the current in-season management of the marine mixed-stock fishery has been conducted in a way that allows DFO to respond to conservation concerns for returning stocks. DFO has been relatively successful in managing commercial harvests in such a way that they largely meet in-season escapement targets set for returning fish stocks.

I also heard that the use and timing of in-river fisheries ought to be carefully considered in light of the potential cumulative effects of water flow and high temperatures on fish as they migrate in-river.[149] Although Karl English, former president, LGL Research Associates Ltd. and lead author of Technical Report 7, Fisheries Management, stated that marine fisheries also stress migrating sockeye, he told me that water temperatures in-river are of particular concern because they are much higher than in the ocean. As a result, he suggested that, in years with extreme water temperatures, different harvest methods may be required.[150] As described in Volume 2, Chapter 4, Decline-related evidence, the temperature of the Fraser River has increased in past decades and is expected to continue to increase. I was not directed to any analysis of whether or how the predicted conservation benefits of in-river demonstration fisheries may be affected by this changing in-river environment.

Based on the foregoing, it is not apparent to me that in-river demonstration fisheries are providing the conservation benefits intended of them. DFO simply has not done the work necessary to assess or quantify any tangible conservation benefits from a shift of commercial harvest to in-river demonstration fisheries, to consider whether changing environmental conditions may counter such benefits, or to evaluate the degree to which any benefit improves on existing mixed-stock management strategies in achieving in-season escapement targets.

Having considered whether in-river demonstration fisheries have been shown to provide a tangible conservation benefit, I now consider whether these fisheries provide economic benefits to First Nations.

I heard that in-river demonstration fisheries provide some First Nations with employment, training, and economic opportunities that may not otherwise be available to them. For example, Chief Fred Sampson of the Siska First Nation told me that in-river demonstration fisheries in his area provide "opportunities to those who are often the poorest of the poor in this province" and that benefits from such fisheries are significant.[151] However, other evidence before me leaves doubt as to whether in-river demonstration fisheries can be economically viable or self-sustainable.

In-river demonstration fisheries experience significant challenges with regard to their economic viability. As fish return to spawning grounds, the quality of their flesh changes. Traits commonly valued in the commercial marketplace, such as the firmness and colour of flesh, may be lost. As a result, some witnesses raised serious concerns about the quality, marketability, and economic value of Fraser River sockeye caught in in-river demonstration fisheries, particularly those in near-terminal and terminal areas.[152] Although efforts are under way to develop markets for in-river and terminally caught sockeye, it appears to me that it will be challenging to achieve this goal in viable quantities, given the limited product range that can be produced from terminally caught Fraser River sockeye salmon.

Many near-terminal and terminal demonstration fisheries also face challenges associated with the cyclical nature of stock returns. As described in Volume 1, Chapter 2, Life cycle, Fraser River sockeye stocks return in varying abundance depending on whether it is a dominant, subdominant, or low-abundance year for that stock. Cyclical fluctuations in abundance affect the profitability of both marine mixed-stock and in-river fisheries. However, whereas a marine mixed-stock fishery may be able to rely on the abundances of multiple stocks, a near-terminal or terminal fishery would rely on the few stocks returning to that terminal area.

There was little evidence before me to suggest that in-river demonstration fisheries are economically viable or self-sustainable or that DFO has done the research and analysis necessary to conclude that they will be in the future. Other than a preliminary study conducted in 1994 on the quality and financial viability of terminal fisheries targeting Late Stuart and Horsefly River sockeye, it does not appear that DFO has conducted systematic research to assess the viability of in-river demonstration fisheries. Rather, the evidence before me indicates that the in-river demonstration sockeye salmon fisheries in the Fraser River have generally not achieved profitability.

Based on the foregoing, valid questions as to the economic viability and sustainability of in-river demonstration fisheries remain to be addressed. It is not clear that DFO has gathered the information or conducted the analysis necessary to show that in-river demonstration fisheries are, or are capable of being, economically viable or sustainable.

In summary, DFO has invested significant funds toward the development of in-river demonstration fisheries. However, there is insufficient evidence for me to conclude that such fisheries offer tangible conservation benefits or that they provide economic benefits to First Nations in a viable or self-sustainable way. Rather, the evidence before me suggests that conservation benefits may not always be achieved through in-river demonstration fisheries and that these fisheries have not been economically viable or sustainable over the several years they have operated. In my view, these issues ought to be carefully researched and analyzed before DFO advances further in acquiring commercial fishing allocations from the marine mixed-stock fishery to expand in-river demonstration fisheries. To clarify, however, this recommendation does not pertain to fishing for food, social, and ceremonial purposes in-river.

Any expansion of in-river demonstration fisheries will also affect a broad array of First Nations and fisheries stakeholders. As discussed in the next section, decisions such as the transfer of fishing allocations between areas and among the various fishing sectors ought to be informed by the strategic planning process set out in Action Step 4.2 of the Wild Salmon Policy.

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

Participants in the Aboriginal, commercial, and recreational fisheries, together with other members of the public, may all be affected by potential changes to the allocation of the commercial Fraser River sockeye salmon fishery. For example, increasing the number of sockeye allocated to in-river demonstration fisheries along the Fraser River may bring opportunities to communities along the river and in the interior, but may reduce economic fishing opportunities in marine and coastal areas.

Reallocation of the commercial Fraser River sockeye salmon fishery among fishing sectors may also affect the size and composition of the fishing fleets. Current DFO practice is to offset increases in First Nations access to the commercial salmon fishery by purchasing voluntarily relinquished salmon licences from individual participants in the general commercial fishery. The effect of this transfer is that the general commercial fishing fleet is made smaller, and fewer opportunities may be available for the public at large to enter into the commercial fishing industry.

As described earlier in this chapter, the Wild Salmon Policy envisions an inclusive planning process where "all parties that are affected by a planning outcome should have the opportunity to provide input to the articulation of objectives, the identification of management options, and the evaluation and selection of management alternatives." The WSP also states that transparency is a key attribute of an effective planning process, whereby "[i]nformation considered in making recommendations should be publicly available and communicated in a timely manner," and that "[r]ecommendations and decisions should be carefully described and the reasons for them clearly explained."[153]

In my view, the reallocation of the commercial Fraser River sockeye salmon fishery, whether geographically or among fishing sectors, is exactly the type of "planning outcome" that is expected to affect multiple parties and that ought to be developed in an inclusive and transparent manner. The evidence before me suggests, however, that DFO has not always developed its policies and practices for the reallocation of the commercial Fraser River sockeye salmon fishery inclusively or transparently.

During the hearings, I was presented with a document known as the Aboriginal Fisheries Framework (AFF), which purportedly articulates the government's target for the overall percentage of the available salmon harvest to be allocated to First Nations for both FSC and economic fisheries.[154] I say "purportedly" because, although the AFF was entered as an exhibit, the portion of this document setting out the percentage of the salmon fishery to be allocated to First Nations was redacted and remains confidential.

In testimony, Ms. McGivney agreed that DFO had not consulted with First Nations or others specifically on the development of the AFF, on the concept of an overall salmon allocation for First Nations, or on the actual salmon allocation itself.[155] When participants to this Inquiry learned that such a target reallocation existed, several of them sought access to this information. After considering applications from participants, I ordered that Canada disclose the overall salmon allocation percentage contained in the AFF. In response, Canada provided me with a letter from the clerk of the privy council certifying the allocation percentage and related information as a cabinet confidence and, on that basis, did not provide me with the ordered information.

The AFF is one example where DFO has not developed its policies and practices for the reallocation of the commercial Fraser River sockeye salmon fishery in an inclusive or transparent manner. DFO has not disclosed the reallocation decision contained in the AFF, nor has it shared with the public how this reallocation was arrived at or what information was considered in doing so.

Although the specific allocation percentage and related information contained in the AFF have been certified as a cabinet confidence, I understand that the approach reflected in the AFF has not been finalized. Rather, I was told that further development of this and related "Coastwide Framework" documents were deferred pending the outcome of this Inquiry.[156] Given the impact that the reallocation of the commercial Fraser River sockeye salmon fishery has on a broad range of groups, I recommend that DFO's continued and future development of its policies and practices in this area, including further revision of the AFF, be conducted in an inclusive and transparent manner.

This objective could be carried out following a strategic and integrated planning process such as Action Step 4.2 of the WSP.

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.

Habitat

As discussed in Volume 2, Chapter 4, Decline-related evidence, I accept the evidence of DFO and expert witnesses that habitat degradation and loss pose risks to Fraser River sockeye and that, if current trends persist, there will be a significant decline in the productive capacity of Fraser River sockeye habitat. This decline could have a negative impact on Fraser River sockeye productivity, affecting the long-term sustainability of the fishery. It is not possible at present to quantify the risk that many habitat stressors (e.g., contaminants, alteration or destruction of habitat) pose to Fraser River sockeye, but I heard evidence about possible negative consequences to these fish and about shortcomings in DFO's management of 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.[157] It recognizes that fish habitat is required to sustain fisheries resources and aims in the long term to achieve net gain in the productive capacity of fish habitat. To support this objective, the policy has three goals:

- active conservation of the existing productive capacity of habitats;
- restoration of damaged habitats; and
- development of new habitats.

The 1986 Habitat Policy and the Wild Salmon Policy are distinct but complementary. Implementation of one policy will advance implementation of the other policy – with their ultimate goal of maintaining and restoring fish populations, including Fraser River sockeye.

Based on the evidence I heard, DFO is not achieving its goal of net gain of productive fish habitat. Nor is it achieving No Net Loss – the guiding principle of the first goal of the 1986 Habitat Policy. Further, DFO measures neither habitat loss nor gain. Measuring requires habitat indicators, such as those contemplated by Strategy 2 of the Wild Salmon Policy, but, as discussed earlier, almost nothing has been done to implement this strategy. Past reports by the Auditor General and the Commissioner of the Environment and Sustainable Development also found that DFO has met neither the net gain objective nor the No Net Loss principle.[158] Similarly, I conclude that the 1986 Habitat Policy has not been fully implemented. Moreover, DFO has not developed a plan to do so. In my view, implementation of Strategy 2 of the Wild Salmon Policy would advance implementation of the 1986 Habitat Policy by providing DFO with a method to assess Fraser River sockeye habitat loss or gain. The habitat inventory information needed to estimate gains and losses in Fraser River sockeye habitat is, in effect, the same information required under Strategy 2 of the Wild Salmon Policy.

Notwithstanding repeated findings that DFO has not met the objectives of its 1986 Habitat Policy, the evidence before me is that the department has not yet undertaken to complete the policy's implementation. Instead, I heard that DFO aims to develop a new habitat policy.[159] Based on the evidence I heard, the 1986 Habitat Policy is a valuable tool for the protection of productive Fraser River sockeye habitat. In my view, DFO does not need a new habitat policy; rather, it needs to complete implementation of the 1986 Habitat Policy. Although the policy may need updating to address changes in case law and legislation, including the changes to the *Fisheries Act* contained in Bill C-38 (see discussion in Chapter 3, Legislative amendments), its goals and No Net Loss principle are sound and should be retained.

The 1986 Habitat Policy recognizes that the cumulative impact of development projects (due to the collective effect of habitat degradation and loss arising from multiple projects in an area) is a serious concern, but DFO considers proposed projects only on a project-by-project basis. On the evidence, I find that cumulative impact is one of the key factors that negatively affect fish habitat. DFO needs to manage this cumulative incremental harm, which, over time, could have a substantial effect on Fraser River sockeye habitat. The habitat management system DFO has in place does not address these harms adequately.

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

Under the regulatory process in place at the time of the hearings, when DFO receives notice of a proposed project, it must assess the project information and, if necessary, visit the site. DFO must decide whether the project is likely to result in a net loss of productive habitat capacity. It may decide to permit the project to proceed as proposed, reject the proposal, or permit the project to proceed with mitigation or compensation conditions aimed at achieving No Net Loss.

In practice, many proposed projects cannot proceed without harming fish habitat. Consequently, since 1986, DFO has authorized many harmful effects on fish habitat on the condition, set out in the permit, that the proponents of the project create or improve other habitat to compensate for loss in habitat productivity. DFO's Habitat Management Program is largely focused on ensuring compliance with the prohibition of harmful alteration, disruption, or destruction of fish habitat in subsection 35(1) of the *Fisheries Act* and other statutory provisions. Developers are not required to seek approval from DFO for their projects, but if they do not and the project results in a harmful alteration, disruption, or destruction of habitat, then they run the risk of prosecution under the *Fisheries Act*.*

Downsizing within DFO and at the provincial level – and the disengagement of British Columbia in many joint habitat management activities with DFO – have resulted in the department placing greater reliance on streamlining processes to manage impact on fish habitat. I heard convincing evidence from several DFO Habitat Management Program staff that these streamlining processes and budget reductions have had a negative impact on DFO's ability to protect Fraser River sockeye freshwater habitat.[160]

* I note that, on June 29, 2012, Bill C-38, *An Act to implement certain provisions of the budget tabled in Parliament on March 29, 2012 and other measures*, received royal assent. As discussed in Chapter 3, Legislative amendments, Bill C-38 amends section 35 of the *Fisheries Act*, changing the prohibition (without authorization) on harmful alteration, disruption, or destruction of fish habitat.

If a proposed project falls within a category of activity to which operational statements or best-management practices apply, then notification to DFO is voluntary. According to David Bevan, associate deputy minister, DFO, because not all proposed projects are reviewed, more monitoring is required to ensure compliance with the *Fisheries Act*.[161] However, at the time of the hearings, if a project proponent did not file a proposed project with DFO, the department was unable to monitor the project because it might not even know that the project exists. This shift away from a project-by-project review and toward a proponent or professional-reliance model demands a strong emphasis on monitoring. Although DFO acknowledges that monitoring for compliance, effectiveness, and fish habitat health are all important for ensuring the sustainability of Fraser River sockeye, at the time of the hearings, DFO was doing only some compliance monitoring, and no monitoring of effectiveness or fish habitat health.[162]

Compliance monitoring involves DFO staff in ensuring two things: (1) that project proponents comply with any conditions of authorizations or orders; and (2) that developments conform to any advice aimed at avoiding negative effects on fish and fish habitat. Identifying areas for improvement in management systems or areas of risk is another part of compliance monitoring. *Effectiveness monitoring* involves verifying that habitat mitigation and compensation measures effectively achieve their intended outcomes. *Fish habitat health monitoring* involves "ecosystem-level" monitoring to measure the effects of development activities on fish habitat in order to establish baseline conditions within a watershed and to determine the cumulative effects of multiple works or undertakings on the productive capacity of fish habitat and the health of the aquatic system. One Habitat Monitoring Unit witness spoke of the need for baseline habitat inventory information in order to conduct fish habitat health monitoring.[163] As far as I can discern on the limited evidence available, this information appears equivalent to what is required by strategies 2 and 3 of the Wild Salmon Policy (see 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.**

Freshwater habitat

Riparian Areas Regulation

Riparian areas are vegetated shorelines of a stream or lake that are critical components of the water body and can affect fish habitat. Loss or degradation of riparian habitats poses risks to Fraser River sockeye sustainability. It is not possible to maintain a healthy fish-bearing stream without a healthy riparian zone. Shortcomings in the current management regime for riparian areas may affect Fraser River sockeye.

In 2006, the Province of British Columbia brought into force the *Riparian Areas Regulation* (RAR), which provided local governments with direction to improve the protection of fish and fish habitat. The regulation applies only to municipalities and regional districts in the Lower Mainland, much of Vancouver Island, the Islands Trust areas, and parts of the southern interior area. It applies only to new residential, commercial, and industrial development on land under local government jurisdiction.

I heard evidence of a regulatory gap between the provincial *Water Act* and the RAR. Lands adjacent to water courses may be privately owned, but in the case of lakes, private ownership applies only above the high-water mark. The provincial *Water*

Act controls works "in and around streams," but I understand that the province interprets this phrase to extend only up to the high-water mark.[164] Thus, works above the high-water mark are not regulated under the *Water Act*, and the landowner is not required to obtain approval for works above that level.

At the same time, the RAR applies only above the one-in-five-year flood elevation, which is higher than the high-water mark. Thus, there is a physical gap between the high-water level (the *Water Act* limit) and the one-in-five-year level (the RAR limit), and works undertaken in this area are subject to no provincial regulatory control. The construction of works on riparian areas may detrimentally affect Fraser River sockeye salmon, and, for that reason, I invite DFO to encourage the Province of British Columbia to resolve this legal anomaly.

Under the RAR, a proponent must have an assessment report completed by a qualified environmental professional (QEP) before development may be approved or allowed by local governments. Proponents must submit completed assessment reports to the provincial Ministry of Environment, which then notifies the appropriate local government of the report. The local government makes the final decision to approve or reject the development project. If the proponent complies with the RAR, DFO accepts that there will be no harmful alteration, disruption, or destruction of fish habitat.

The provincial Ministry of Environment started compliance monitoring for the RAR and is developing an effectiveness monitoring plan. At the time of the hearings in June 2011, the time frame for developing this plan was uncertain. DFO is not engaged formally in RAR monitoring. Provincial compliance monitoring in relation to the RAR is targeted at three different groups: qualified environmental professionals, local governments, and developers. DFO and the ministry agreed on a RAR compliance target of 90 percent, with a 90 percent confidence level.

During the first three years after the Regulation came into force, the ministry assessed the degree of compliance with the regulation-reporting requirements by reviewing every report submitted by QEPs. More recently, the ministry audited every fifth report unless it had particular concerns about a QEP. The initial assessment found that 48 percent of non-compliance with the RAR was attributable to errors by the QEPs.[165] The ministry notified the QEPs of its review and, if errors were serious, the ministry had further discussions with the QEP and with his or her professional association. Also, changes were made to the non-mandatory QEP training course based on the compliance information collected.

Local government and developer compliance with the Regulation is also low. Only 60 percent of local governments were found to be compliant, meaning that 40 percent did not have the appropriate bylaws in place to trigger regulatory action under the RAR. Developer compliance was 38 percent on Vancouver Island and 48 percent in the Lower Mainland.[166]

At the time of the hearings, no compliance reports had been completed since 2009 and no changes to the RAR were made on the basis of compliance reporting results. I heard no evidence that anything other than the compliance assessments and the actions taken by the ministry in relation to QEP reports has been done to ensure achievement of the RAR compliance target of 90 percent with a 90 percent confidence level. Given the high incidence of non-compliance with the RAR, I invite DFO to encourage the Province of British Columbia to continue to monitor compliance with the RAR and work with the province to achieve the RAR compliance target. DFO should also encourage the province to conduct effectiveness monitoring of projects completed under the Regulation.

As well, until recently, if a proponent sought to vary the streamside protection and enhancement area recommended in a QEP's assessment report, the provincial Ministry of Environment would notify DFO, and DFO would be responsible for approving the application for a variance. However, as a result of a decision of the BC Court of Appeal in *Yanke v. Salmon Arm (City)*, developments that require variances to the streamside protection and enhancement area, but do not result in a harmful alteration, disruption, or destruction of fish habitat, do not require approval by DFO or the Ministry of Environment.[167] The court ruled that there is nothing in section 4 of the RAR that allows DFO to veto a development proposal that is before a local government where the qualified environmental professional has given an opinion that the proposed development will not result in harmful alteration, disruption, or destruction of fish habitat.

This decision means that DFO has no proactive input into the development process, even though it is responsible for the protection of fish habitat

and has extensive experience in this issue. It is left with only the reactive, and rather blunt, instrument of section 35 of the *Fisheries Act*. In my view, DFO should encourage the Province of British Columbia to amend the RAR to require provincial approval of such setback variances. The province should also, in my view, consider DFO's input into the impact of these variances on fish and fish habitat.

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

As I discuss in Volume 2, Chapter 4, Decline-related evidence, alterations in water flows and temperatures may have a negative impact on Fraser River sockeye salmon. Surface water use can reduce instream flows that constrain access to spawning habitats or, in extreme cases, remove water from redds. Extraction of groundwater for irrigation can reduce flows into streams, thereby increasing surface water temperatures and affecting sockeye salmon adults and eggs. Although I heard that impact from water withdrawals may be less of a concern for sockeye than for other species of salmon, Jason Hwang, area manager, BC Interior, Oceans, Habitat and Enhancement Branch, DFO, said that water withdrawals could become a concern in the future as demand for water increases.[168] Dr. Michael Bradford, research scientist, DFO, agreed that population growth, particularly in the drier Okanagan and Cariboo areas, could have a future impact on sockeye. He also indicated that groundwater extraction is potentially a concern for Cultus Lake sockeye.[169] Dr. Craig Orr, executive director of the Watershed Watch Salmon Society, said that, to maintain the Early Stuart sockeye stocks, something has to be done to protect groundwater. He also said that groundwater is the "key to resilience of the salmon habitat."[170] The evidence revealed some aspects of water use management that need to be improved in order to ensure sustainability of Fraser River sockeye.

I heard evidence that the *Fisheries Act* is generally not enforced against water users because federal regulatory tools are limited and not particularly well suited to managing water use for the benefit of fish.[171]

The Province of British Columbia holds property and usage rights to surface water and groundwater, except insofar as private rights are granted to other persons. Thus, British Columbia is responsible for the licensing of surface water use and groundwater extraction under the provincial *Water Act*.

In 2010, the BC Auditor General released a report that was critical of the province's management of groundwater resources.[172] I was told that the province is responding to the report primarily through changes contemplated under the *Water Act* modernization process.[173] DFO has been engaged in this renewal process. I was told that the department supports the overall goals and objectives set

out in the 2010 discussion paper produced by the provincial Ministry of Environment. DFO offered a number of specific recommendations relating to protecting fish and fish habitat and to harmonizing the proposed legislation with federal legislation.[174]

I commend the Province of British Columbia for its work on modernizing the *Water Act*. Based on the evidence I heard, I invite DFO to encourage the province to complete that process and to address the three matters specified in the following recommendation.

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

Dr. Peter Tschaplinski, a research scientist with the BC Ministry of Environment, testified about the impact of several potential forestry-related factors on Fraser River sockeye habitat; these include changes to watershed hydrology that can influence stream flow and processes, channel form, and erosional processes, as well as changes to riparian environments that might affect water temperature, nutrient provision, channel structure, and stream microclimates. I accept Dr. Tschaplinski's evidence that forestry practices have improved greatly during the recent 20-year decline in Fraser River sockeye and are thus unlikely to have caused the decrease in productivity. However, he noted the importance of watershed baseline research in ensuring that forestry practices do not harm sockeye habitat.[175] As set out above, I found that habitat degradation and loss are a risk to Fraser River sockeye. I also accept the evidence of Dr. Peter Ross, research scientist, Marine Environmental Quality Section, Institute of Ocean Sciences, Science Branch, and Don MacDonald, lead author of Technical Report 2, Contaminants, that forestry pesticides are of concern with respect to Fraser River sockeye.[176]

Although 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* (FRPA) and the *Forests Act.* FRPA is a results-based model, whereas the earlier *Forest Practices Code* was a prescriptive model. The province's introduction of FRPA in 2004 coincided with DFO's transition toward its national Environmental Process Modernization Plan (EPMP). Under FRPA, the provincial ministry no longer refers the main operational plans it requires from forest licensees to DFO for review.

I heard that DFO's role in forestry issues and fish-forestry interactions has decreased in recent years. Since the early 2000s, DFO has not had a fish-forestry person working out of its regional headquarters, and in about 2006 its Fish-Forestry Technical Working Group (a regional forum to communicate and discuss fish-forestry interaction issues, make recommendations to senior management, and facilitate communication between area Habitat Management Program staff and regional headquarters) fell apart. There is no viable referral system or standard way for DFO to communicate with forest licensees or the province.

According to Peter Delaney, former senior program advisor, Oceans, Habitat and Enhancement Branch, DFO, the department is not doing work on forestry because logging plans are not referred to it and/or they are not a priority for field staff given other demands on their time. DFO has also become less involved on the research and monitoring side of fish-forestry interactions, although some close connections remain between DFO and provincial scientists, and DFO Habitat Management Program staff have done some monitoring of stream crossings. DFO has no active fish-forestry research under way, and DFO research funds in this area have dried up. DFO does not undertake any of its own field assessments on streamside retention zones.[177]

Mr. Delaney said there are several reasons for DFO's disengagement on fish-forestry issues: DFO's move to a results-based professional-reliance model,

the EPMP streamlining processes, reductions in staff, and an increase in development activities.[178]

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 a person with regional responsibility to serve as forestry contact person for the entire Pacific Region. DFO also needs to become involved again in reviewing proposed forestry activities that may harm fish habitat.

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

As I discuss in Volume 2, Chapter 4, Decline-related evidence, the long-term productivity decline in Fraser River sockeye salmon appears to be primarily due to conditions experienced during the time that Fraser River sockeye are in the marine environment. Technical reports 4 (Marine Ecology), 9 (Climate Change), and 12 (Lower Fraser Habitat), as well as four expert reports tendered by the Government of Canada, point to marine conditions and climate change during the coastal migration life-history stage as the most likely causes for the decline.[179] The marine habitat spill-response process is therefore potentially critical to ensuring long-term sustainability of Fraser River sockeye. However, I have some concerns regarding the ability of that process to adequately protect the health of these fish.

The Canadian Coast Guard (within DFO) is the lead federal agency responsible for ship-source and mystery-source pollution incidents in Canadian waters. The role of the Coast Guard is twofold: to oversee a polluter's response to a marine pollution incident or, if the polluter is unknown or unable to respond, to manage the response to the incident. The Coast Guard does not see the evaluation of habitat impact as within its mandate – it relies on Environment Canada and DFO's Oceans, Habitat and Enhancement and Science branches to deal with long-term habitat impact.[180]

On receiving a call about a marine pollution incident, the Coast Guard will do an assessment, and if it determines that further information is required, it calls Environment Canada to activate the Regional Environmental Emergency Team (REET). This team develops post-emergency monitoring plans for habitat issues and conducts long-term monitoring of a particular site. It is a body of experts that provides technical, scientific, and environmental advice to the Coast Guard, and it is co-chaired by Environment Canada and the provincial Ministry of Environment.

The Coast Guard relies on the REET for advice on the impact of various factors on anadromous fish and fish habitat in the marine environment. If a spill is marine in origin, the Environment Canada co-chair of the REET determines what agencies should be brought into the REET to assess any impact.

The REET is only an advisory organization, and the Coast Guard can choose to ignore the REET's advice.[181] I was told that, in deciding whether to follow the advice of the REET, the Coast Guard considers factors such as worker and public safety issues, the nature of the product spilled, weather and forecast conditions, tide information, and cost and reasonableness of the effort or the monitoring. The Coast Guard can prefer the approach to cleanup and monitoring proposed by the polluter or the cleanup company over the REET's recommendations. With respect to cost and reasonableness, I was told that the Coast Guard always tries to recover its costs for marine spill response from the polluter, the

polluter's insurance company, or the Ship Source Oil Pollution Fund. When a claim is submitted to one of these three sources of funds, the Coast Guard must demonstrate reasonableness or it will not recover its monitoring or response costs.[182]

On the evidence, I am satisfied that the Coast Guard has the organizational structure; staffing; response equipment; liaison experience; and vessel, logistical, and air support to make it an appropriate first responder for marine spills. Similarly, the REET is the appropriate body to provide advice on monitoring plans and habitat issues.

However, I have several concerns about post-emergency mitigation and long-term monitoring of the impact of marine spills. In my view, responsibility for these matters should be transferred from the Coast Guard to Environment Canada and assigned to the Environment Canada co-chair of the REET. At the same time, the membership of the REET should always include DFO's Oceans, Habitat and Enhancement and Science staff, who would bring specialized expertise on contaminant, fish, and fish habitat issues.

When the Environment Canada co-chair of the REET decides whether to follow the REET's advice regarding post-emergency mitigation and long-term monitoring, the co-chair should consider a number of the specific matters, as enumerated in my recommendation below. Finally, DFO should identify an individual within DFO who has regional responsibilities to act as a liaison with the Coast Guard, Environment Canada, and the Province of British Columbia on marine habitat spill response.

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

DFO takes the position that it is not responsible for research or monitoring of contaminant fate and transport within the environment, even in relation to anadromous fish such as Fraser River sockeye salmon.[183] It is Environment Canada's view that population-level effects of contaminants, in particular on anadromous fish and the marine environment, is the purview of DFO.[184] In addition, although DFO agrees that the toxicological effects of contaminants on fish are still within its mandate, around 2005, it took away the dedicated funding for such research on contaminants.[185]

In Volume 1, Chapter 6, Habitat management, I found that Environment Canada's water quality monitoring in the Fraser River system does not provide information about most contaminants of concern to Fraser River sockeye (because this kind of reporting is not the purpose of Environment Canada's monitoring program), and that Environment Canada does not do any marine water-quality monitoring in relation to anadromous fish. At the same time, DFO takes no responsibility for water quality monitoring as it relates to sockeye in either the freshwater or the marine environment.

Several witnesses agreed that, with respect to monitoring of contaminants, the respective responsibilities of DFO and Environment Canada should be clarified. They said that both departments

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

should probably be involved, but added that it was not clear which department should take the lead.[186] Ms. Dansereau testified that she and the deputy minister of Environment Canada are working on recommendations to clarify the mandates for their respective departments.[187]

Monitoring of contaminants as it relates to the health of Fraser River sockeye salmon has, for jurisdictional reasons, been neglected by DFO and Environment Canada. It matters little whether Environment Canada considers its jurisdiction to cease at the end of an outfall pipe, or that DFO's decision to cut its Toxic Chemicals Research Program nearly a decade ago and to disband its Pacific Region Water Quality Unit was done without consultation. The effect is that neither department is currently monitoring contaminants that may negatively affect Fraser River sockeye productivity in either the freshwater or the marine habitat.

Technical Report 2, Contaminants, developed an inventory of more than 200 substances that may be released into aquatic ecosystems in the Fraser River basin from the various land uses identified. Of these, the researchers identified 23 chemicals of potential concern measured in surface water, and 11 substances in sediment, at concentrations sufficient to pose potential risks to sockeye salmon eggs, alevins, fry, smolts, or adults. Many of these substances in surface water and sediment occur at concentrations sufficient to cause or substantially contribute to adverse effects on the survival, growth, or reproduction of sockeye salmon in the Fraser River basin. Technical Report 2 dealt only with contaminants in freshwater; much less is known about contaminants in the marine environment, where Fraser River sockeye spend more than half their life.

The findings of Technical Report 2, Contaminants, satisfy me that contaminants, singly or cumulatively, may have a serious negative impact on Fraser River sockeye salmon. It is for that reason that, later in this chapter, I recommend directed science research into contaminants, especially contaminants of emerging concern, endocrine-disrupting chemicals, and complex mixtures. In anticipation of such research, it is important that DFO and Environment Canada co-operate in regularly monitoring fresh and marine water for contaminants affecting Fraser River sockeye salmon.

Given the evidence and my findings about the importance of contaminant research and monitoring to ensure the future sustainability of Fraser River sockeye, 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 still have the ability to fulfill its responsibility for research and monitoring toxicological effects on Fraser River sockeye.

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

The broad application of pesticides to crops, lawns, and forests results in non–point source pollution of Fraser River sockeye habitat, which can have lethal and sublethal effects on these fish. Pesticides can pollute surface waters through overspraying, erosion of contaminated soils, and seepage from contaminated groundwater. Mr. MacDonald testified that the use of pesticides by the forestry sector might be one of the greatest concerns for Fraser River sockeye salmon productivity.[188] Dr. Ross told me that agriculture and forestry pesticides are of concern with respect to Fraser River sockeye health.[189] Technical Report 2, Contaminants, describes a number of water quality concerns associated with agriculture. An Environment Canada study reported that several active ingredients in pesticides in British Columbia were used exclusively in the agriculture sector and accounted for 63 percent of total sales in 2003.[190]

All pesticides imported into, sold, or used in Canada are regulated federally, while the Province of British Columbia regulates the transportation, sale, use, storage, and disposal of pesticides, as well as the certification and licensing of applicators and vendors. Generally speaking, pesticide use on private property by someone who is not acting on a fee-for-service basis does not require a licence.

The Province of British Columbia does not keep comprehensive information on the quantities and types of pesticides used in different areas of the province. Information regarding pesticide application to residential properties and the agricultural sector is not collected, nor is the applicator required to keep it. Although pesticide vendors must keep a record of their sales, I was told that sales data for pesticides are extremely unreliable as information on pesticide use in a region for any given year.[191] I am satisfied that better data on pesticide use are important for understanding the impact of pesticides on the Fraser River watershed.

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

In recent years there have been improvements in effluent discharges from pulp and paper mills along the Fraser River sockeye salmon migratory route. However, Janice Boyd, program scientist, Natural Resources Sector Unit, Environmental Protection Operations, Environment Canada, and Robert Grace, environmental impact assessment biologist, Thompson-Nicola sub-region, Environmental Protection Division, BC Ministry of Environment, told me that current monitoring of pulp and paper and metal mining effluents does not evaluate the impact on the health of Fraser River sockeye.[192] Also, Environment Canada does not assess the cumulative sublethal effects of mining effluent on migratory fish. This risk of harm is not at present being assessed.

Effluents from wastewater treatment plants are known to contain a variety of substances of concern to Fraser River sockeye salmon health, including metals, polychlorinated biphenyls (PCBs), pharmaceuticals, fire retardants, steroids, personal-care products, and disinfectants. Mr. MacDonald testified that the volume of discharges from wastewater treatment plants has increased over the past 20 years. The data to evaluate them are not available, but it is assumed that the concentrations of these contaminants are increasing in the Fraser River watershed and Strait of Georgia.[193]

The authors of Technical Report 2, Contaminants, concluded that, for incubating sockeye eggs, alevins, and rearing sockeye, exposure to wastewater treatment–plant effluent is likely to be negligible for most Conservation Units. Two exceptions may be Harrison River sockeye spawning downstream of the treatment plant located at Harrison Hot Springs and Salmon River sockeye in the Shuswap River area, both of which may be exposed to diluted wastewater treatment–plant effluent during incubation. Also, contaminant research shows that Pacific salmon accumulate persistent and toxic contaminants in their marine life stage and transport these into the spawning and lake environments.[194] At the municipal wastewater treatment hearings, the expert witnesses agreed that municipal wastewater potentially has harmful effects on Fraser River sockeye, in particular sublethal effects, and that it cannot be ruled out as a contributing factor to the long-term decline.[195] According to Dr. Ross, there are 90 wastewater treatment plants in the Fraser River valley. He expressed particular concern about the impact of persistent chemicals that do not break down (e.g., dioxins, PCBs, organic chlorine pesticides, and polybrominated diphenyl ethers [PBDEs]) on Fraser River sockeye throughout their early life and on their return migration.[196]

Federal, provincial, and municipal levels of government share responsibility for managing the collection and treatment of municipal wastewater, administering the performance of wastewater facilities, and controlling the environmental and health impact of municipal effluents. Operators of

wastewater systems must comply with applicable federal legislation and with provincial or territorial legislation, permits, and licences.

In the Pacific Region, DFO is not involved in monitoring or researching the impact of municipal wastewater on Fraser River sockeye or other salmon, nor is anyone from Environment Canada tasked with assessing the impact of municipal wastewater on salmon.

Municipal wastewater is not currently governed by a specific regulation under section 36 of the *Fisheries Act*. However, in March 2010, Environment Canada proposed draft Wastewater Systems Effluent Regulations (WSER) that, if enacted, will apply nationwide.

The WSER specify conditions that must be met by any wastewater system with a capacity to deposit 10 cubic metres or more of effluent daily from its final discharge point into fish-bearing waters. Standards are created for effluent toxicity, effluent monitoring, receiving environment monitoring, record keeping, and reporting. The effluent standards represent a secondary level of wastewater treatment or equivalent, but under transitional provisions, municipal sewage facilities will have different timelines to meet the minimum effluent standard, depending on the level of risk assessed.

Under the WSER, in addition to monitoring to ensure effluent quality standards, some wastewater treatment facilities will be required to undertake environmental effects monitoring to evaluate the effect of the effluent quality standards for protecting fish and fish habitat. Monitoring will include assessing the effects of some emerging chemicals of concern on endocrine function and the effects of nutrient inputs on the benthos and, in some cases, on fish populations.

As noted, the WSER have not yet been enacted. Dr. Ross expressed concern that Environment Canada appears not to have incorporated the issues raised by DFO contaminant scientists and that the WSER do not impose limits or require testing of emerging contaminants of concern such as pharmaceuticals, surfactants, and some persistent organic pollutants and PBDEs.[197] Also, the WSER do not at present address biosolids, which are not broken down by treatment and can be transferred to land – and thereby re-enter Fraser River sockeye salmon habitats.[198]

Although I commend Environment Canada for developing its Wastewater Systems Effluent Regulations, it ought, in my view, also to include in the final version the matters set out below.

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.**

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 and habitat enforcement

Enforcement priorities and funding

In an era of shrinking resources, difficult decisions must be made on how to allocate enforcement funds to achieve the best results.

I heard evidence that the purpose of DFO's 2007 National Compliance Framework is to provide a solid foundation for the activities the department undertakes to achieve and maintain compliance. It articulates three pillars of compliance management:

- Pillar One (Education and shared stewardship) focuses on informal and formal education of the public, co-management, and partnerships.
- Pillar Two (Monitoring, control, and surveillance) focuses on patrols, inspections, third-party monitoring, inter-agency partnerships, and fishery officer responses to non-compliance.
- Pillar Three (Major cases and special investigations) focuses on formal intelligence gathering and analysis, retroactive offence detection and investigation, and the use of specialized skills and technology.[199]

I observe that these three pillars offer an informative categorization of enforcement activities but do not purport to identify which activities should have relative priority.

Two DFO witnesses offered very different perspectives on how to prioritize enforcement expenditures. Mr. Bevan testified that DFO is focusing its compliance and enforcement efforts on Pillar One and Pillar Three, and away from Pillar Two. He said that the department has tried to bring people along to understand the need for conservation and compliance (Pillar One). At the same time, major case investigations (Pillar Three) are required when DFO identifies a systemic problem in a location or in a particular component of fish harvesting and processing.[200] In contrast, Mr. Nelson, regional director of the Conservation and Protection Branch, emphasized the importance of Pillar Two activities, saying that fishery officer field presence is the primary deterrent in any enforcement.[201]

I heard evidence that some Pillar One activities, such as attending community events and organizing once-a-year canoe trips with local Aboriginal youth, help build strong community relationships (and, ultimately, compliance) at relatively low cost. Mr. Nelson persuasively argued that there is no substitute for personnel on the ground and on the water. At the same time, I question whether it is possible to establish, by departmental directive, what priority should be given to Pillar Three activities. If systemic problems are identified, they must be investigated and, in appropriate cases, prosecuted.

When it comes to prioritizing enforcement expenditures, I do not find it helpful to engage in a debate over the relative merits of the three pillars; all three have value. In my view, the overarching principle that should direct allocation of enforcement resources should be to fund the activities that will best support conservation. I accept the evidence of those witnesses who said that conservation is best served by proactively preventing fish from being taken illegally from the water. Preventing the illegal taking of fish will likely involve a combination of community education and stewardship and on-the-ground enforcement activities. Effective catch monitoring of all sectors is an important component of this plan, as is the realistic allocation and identification of FSC fish to Aboriginal groups. I do not want to suggest that after-the-fact investigations are not also important; they are. Indeed, enforcement activities aimed at illegal sales may provide an effective deterrent to taking fish illegally out of the water. In my view, preventing the illegal taking of fish should be the priority consideration when DFO is faced with focusing its resource expenditure within any of the three pillars.

Two previous reports were especially critical of DFO's capacity to enforce compliance: the Honourable John Fraser's *Fraser River Sockeye 1994: Problems and Discrepancies* (Fraser Report) and the Honourable Bryan Williams's *2004 Southern Salmon Fishery Post-Season Review* (Williams Report).[202]

The Williams Report recommended that DFO properly enforce the *Fisheries Act* and Regulations through measures including adequate presence to deter the concealment of overharvesting of fish

by all sectors; enforcement of the laws against the illegal sale of fish; and a system to record illegal nets in the Fraser River accurately through the use of overflights and night patrols, particularly in areas where illegal fishing has been reported.

Following the Williams Report, there was an influx of approximately $1.8 million per year to bolster the work of the Conservation and Protection Directorate (C&P) in the Pacific Region, primarily to address compliance issues with closed-time patrols on the Fraser River. Approximately $1.2 million of this funding was rolled into the Pacific Integrated Commercial Fisheries Initiative program for 2007. According to Mr. Nelson, the new post-Williams funding led to a dramatic increase in C&P's patrol capability. He believes that, at present, C&P has a credible enforcement presence on the Fraser River and that his staff are able to do an adequate job on closed-time fishing activity. He did, however, voice concern that funds for these enforcement activities may be cut back, as occurred before the release of the Fraser and Williams reports.[203]

Mr. Nelson's testimony was clear that it is only due to increased funding following the Williams Report that C&P has recently been capable of providing adequate enforcement services in the Fraser River.[204] In my view, there is no substitute for overflight, on-the-ground, and on-the-water enforcement activity, and the Pacific Region's C&P needs to continue to receive funding that will allow it to provide these services at its post–Williams Report level.

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*

Section 36(3) of the *Fisheries Act* states:

> Subject to subsection (4), no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where the deleterious substance or any other deleterious substance that results from the deposit of the deleterious substance may enter any such water.

As I discuss in Volume 1, Chapter 7, Enforcement, administrative responsibility for section 36 was, in 1978, delegated to Environment Canada, although, ultimately, DFO remains responsible for ensuring that section 36 is enforced. The delegation took place in part because of Environment Canada's responsibility for pollution prevention and its expertise in chemical-based pollutants and spills.*

DFO and Environment Canada witnesses testified that, at the field level, delegation of responsibility for enforcement of section 36 to Environment Canada appears to be working.[205] However, witnesses and public submitters agreed that, in the eyes of the public (and even within government), it can be confusing as to who is responsible in certain circumstances. For example, over the past decade more than half of the convictions pursuant to section 36 arose from prosecutions by DFO. I accept the evidence that there is room for improvement in terms of communication, sharing of information, and joint planning of *Fisheries Act* activities at the national level. Based on the evidence, I am satisfied that DFO and Environment Canada could improve the ability of their on-the-ground staff to co-operate and respond to occurrences by conducting joint training and investigation post-mortems and, where feasible, by sharing resources and expenses in remote locations.

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

* I note that on June 29, 2012, Bill C-38, *An Act to implement certain provisions of the budget tabled in Parliament on March 29, 2012 and other measures*, received royal assent. It amends the *Fisheries Act* to state: "The Governor in Council may, on the recommendation of the Minister and any other federal minister, by order, designate that other minister as the minister responsible for the administration and enforcement of subsections 36(3) to (6) [of the *Fisheries Act*] for the purposes and in relation to the subject-matters set out in the order" (see section 43.2(1)).

Canada's administration of the pollution prevention provisions of the *Fisheries Act*.[206] Ms. Dansereau testified that significant progress has been made to clarify the roles of the two departments, and that they are working at many levels to update the 1985 Memorandum of Understanding, which sets out the agreement between DFO and Environment Canada in relation to section 36.[207]

Several witnesses and participants recommended that DFO should resume administration of section 36 of the *Fisheries Act*. While I conclude that a good case could be made for repatriation to DFO, I am mindful that the focus of our hearings was on the Pacific Region, and I am not aware of the national context and implications that may arise from repatriation.

Although I am not in a position to recommend repatriation, I am satisfied that 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 *Fisheries Act* activities must be improved.

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

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 to avoid the deposition of a deleterious substance. I was told that the removal of inspector powers came about in response to health and safety concerns raised by Habitat Management Program staff as a result of one incident in another region of the country.[208] The result is that Habitat Management Program staff must now call on a C&P fishery officer, who does have inspector powers, to attend the scene and issue a direction for a stop-work order.

Mr. Nelson testified that, in some cases, a fishery officer may be hours away and, in the meantime, the violation could continue. Even if the fishery officer is nearby, the result is that C&P staff wind up performing habitat compliance work that Habitat Management Program staff are supposed to be doing under the Environmental Process Modernization Plan. He also observed that taking inspector powers away does not eliminate the health and safety concern, as Habitat Management Program staff are already on site when the alleged violation arises.[209] If their inspector powers were returned, presumably they would call for assistance from C&P fishery officers when there is a security concern, but in other circumstances would issue the direction themselves. On balance, I am satisfied that inspection powers ought to be returned to Habitat Management Program staff.

Powers of inspection

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

Specialized habitat fishery officer

Over the years there have been changes in how habitat-related work is distributed among C&P's fishery officers. From 1999 to 2003, Pacific Region C&P identified a need for additional specialized habitat officers and had some dedicated habitat fishery officers funded under the now defunct Habitat Conservation and Stewardship Program.

They specialized in the investigation of harmful alteration, disruption, or destruction of fish habitat. Currently, no C&P fishery officers work exclusively on habitat. I accept Mr. Nelson's testimony that specialized habitat fishery officers were very effective.[210] In my view, at least one fishery officer within the Pacific Region ought to be designated as a specialized habitat fishery officer, with the responsibilities set out in the following recommendation.

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

The general rule is that fishers may retain only the species of fish they are licensed to catch and for which there is a fishery opening. If they incidentally catch another species of fish that they are either not licensed to catch or for which there is no opening (unauthorized bycatch), they must return that fish to water, even if it is dead when brought on board. However, some Aboriginal communal fishing licences in the Fraser River include an exception to this rule – the "mortally wounded" clause. This clause provides that certain species of fish that would otherwise be considered unauthorized bycatch may nevertheless be retained if the fish was mortally wounded when caught.

I was told that it is difficult to enforce the "mortally wounded" clause because it is difficult in all circumstances to determine whether a fish is mortally wounded. Two DFO witnesses testified that they had observed Fraser River sockeye being caught during a chinook opening, with no attempt being made to revive or release them.[211] However, Ernie Crey, fisheries and policy advisor for the Stó:lō Tribal Council, testified that retaining and consuming mortally wounded bycatch is consistent with First Nations perspectives and that First Nations are working to determine if a ceiling on such mortalities could be implemented.[212]

In my view, the retention of mortally wounded bycatch 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. I also accept the testimony of DFO witnesses that the "mortally wounded" clause is unenforceable. Requiring bycatch to be returned to the ocean or river is consistent with ecosystem-based management.

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.

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. It is the most studied of all Pacific salmon species, and for many years DFO has invested much time and energy in learning more about this iconic species. I commend DFO and the many individual researchers who have participated in this quest for a better understanding of Fraser River sockeye salmon and the habitat in which they live.

Despite this work, much remains to be done. As Volume 2, Causes of the Decline, documents, 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 metal mining. We still have much to learn about the detrimental impact these stressors actually have on sockeye and their habitat.

This lack of understanding about actual effects not only applies to individual stressors at a single point in time but also extends to cumulative effects (e.g., the combined effect of contaminants, disease, and warmer waters on the health of a fish) and delayed effects (e.g., a contaminant or pathogen picked up during the outmigration, leading to mortality during the return migration).

In Volume 2, Chapter 5, Findings, I summarized the current situation as follows:

> Based on the evidence led during this Commission's hearings, very few (if any) of the potential stressors discussed in this Report can be safely taken off the table with a confident assurance that they have not contributed in some way to the Fraser River sockeye decline. Given the plausible mechanisms that abound, I am satisfied that there is a risk that some of these stressors have a negative impact on sockeye and may have contributed to the long-term decline. However, I accept the testimony of numerous witnesses that a lack of research has resulted in knowledge gaps which have impeded the ability of researchers to move beyond the identification of plausible mechanisms toward the establishment of cause-effect relationships.

Many stressors pose a risk to Fraser River sockeye and, although it is not possible at present to quantify that risk, I did hear evidence that the negative consequences to sockeye may be profound – they may have contributed to a 20-year decline in productivity of Fraser River and other Pacific sockeye salmon stocks. Unless the impact of these stressors is addressed, it is reasonable to conclude that they will have at least as serious a negative impact on these sockeye stocks in the future.

In the following pages I will recommend several focused scientific research projects that should yield much-needed information about the abundance, health, condition, and rates of mortality of Fraser River sockeye salmon during their freshwater and marine life stages and about the impact of contaminants and other stressors on them. I also think it is important that DFO undertake or commission research into the interactive effects of multiple stressors across all stages of sockeye life history and, thinking more broadly, that it work with Oregon, Washington, and Alaska to coordinate the collection and analysis of data on the productivity of their sockeye salmon populations.

Mortality of Fraser River sockeye salmon during downstream migration

During the evidentiary hearings, many witnesses regretted the lack of long-term time-series data sets for crucial milestones in the life history of Fraser River sockeye. Apart from monitoring programs currently under way at Shuswap and Quesnel lakes for fry and at Chilko and Cultus lakes for smolts, there is incomplete information, at a stock or Conservation Unit level, about abundance levels during the juvenile life history stages.

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. One of the important life stages about which there is incomplete information is stage 2, the smolt outmigration. Between the time smolts leave their nursery lakes and enter the ocean, they are exposed to a wide range of stressors, including predators, infectious diseases, freshwater contaminants, municipal wastewater treatment facilities, pathogens from enhancement facilities, physical alteration of habitat, and the effects of agriculture, forestry, and metal mining.

I heard evidence about these various stressors, from which I was able to 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. However, little is known about what impact these stressors actually have on outmigrating smolts and on how many die before reaching the ocean.

I agree with the authors of Technical Report 6, Data Synthesis, 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, and that such research would yield valuable information to identify specific life stages in which dramatic population changes are occurring.[213]

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

Given my conclusion in Volume 2 that the causes of the long-term decline may be found in the nearshore marine areas (such as Queen Charlotte Sound) and deep North Pacific Ocean areas where stocks from the Fraser River and from many other Canadian and US river systems grow and mature, more needs to be learned about these productivity patterns and about the processes that may explain the long-term decline, such as climate change, predators, pathogens, and competition among species.

I am also satisfied that marine conditions in both the Strait of Georgia and Queen Charlotte Sound in 2007 were likely to be the primary factors responsible for the poor returns in 2009. Abnormally high freshwater discharge, warmer-than-usual sea surface temperatures, strong winds, and lower-than-normal salinity may have resulted in abnormally low phytoplankton and nitrate concentrations that could have led to poor zooplankton (food for sockeye) production.

These conditions may also have conspired to increase the growth of harmful algal blooms in the Strait of Georgia, which can potentially cause mortality in salmon through altered ability to uptake oxygen and diminished respiratory function. For example, marine survival of Chilko sockeye average 2.7 percent in years when juvenile sockeye migration through the Strait of Georgia coincides with major blooms, as opposed to 10.9 percent in years with no or minor blooms.

Warmer sea surface temperatures can attract non-resident predators and make sockeye salmon smolts weaker and thus more vulnerable to predators. Concurrently, because of higher metabolic rate, these predators have increased appetite.

A better understanding is needed of Fraser River sockeye salmon migratory and feeding patterns in all these marine areas; the biological, chemical, and physical oceanographic variables that they 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. Earlier in this chapter, I dealt with the specific risks posed by salmon farms.

I heard evidence that increasing fish densities in the North Pacific may have a negative impact on wild stocks, including Fraser River sockeye, yet there are no studies by DFO's Salmonid Enhancement Program or Science Branch looking at the effects of competition between wild and hatchery salmon in the marine environment. Two DFO witnesses acknowledged that, if DFO understood interactions between wild and enhanced salmon, the Salmonid Enhancement Program would be able to improve the way it manages enhancement.[214]

Many of the variables that I recommend be studied are consistent with the marine habitat research that DFO has yet to undertake under strategies 2 and 3 of the Wild Salmon Policy. In addition, it would be logical to broaden the scope of this fundamental research on the marine survival of sockeye salmon to include other salmon stocks, both Canadian and US, and to share responsibility for the research between our countries.

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

Surprisingly little research on population health has been conducted on Fraser River sockeye. I heard evidence about why there has been this gap in research:

- Salmon are difficult to track in the ocean.[215]
- When a wild fish dies, it disappears. It drops to the bottom of the ocean, never to be seen again. Diseased wild fish may not be detected.[216]
- Most laboratory studies focus on single pathogens, whereas most wild fish carry multiple pathogens.[217]
- Sockeye are very difficult to keep in a laboratory.[218]
- The focus of fish health research has been on cultured fish.[219]

Dr. Kent, author of Technical Report 1, Infectious Diseases, ably described the state of science about diseases in wild populations in his report to this Inquiry:

> [T]here are various well-accepted approaches that have been used to evaluate impacts of diseases in wild animal populations, including fishes. These approaches require evaluation of both prevalence and severity of infection in large numbers of samples. In recent years, this type of research has not been well supported as it is considered by some funding agencies to be merely survey work and not hypothesis driven. These types of investigations have not been applied to Fraser River sockeye salmon, but there are a few scientific reports that have documented outbreaks of infectious disease in sockeye salmon in British Columbia.[220]

With so little known about the health of Fraser River sockeye, it is difficult to assess the impact of some activities, such as salmon farms or salmon enhancement facilities, on these wild stocks. Researchers hired by this Inquiry were unanimous in their views that more research into the health of wild fish stocks is critical in order to make these sorts of assessments.[221] I heard evidence that, in 2010, in response to the poor 2009 returns, DFO began a three-year survey of sockeye salmon health in the Strait of Georgia.[222] Because of the short-term nature of this survey, it will provide a snapshot of sockeye health in one area of the sockeye's migratory range; it will not provide trend data.

A large component of the sockeye health survey in the Strait of Georgia is assessing sockeye for sea lice infection.[223] The sources of sea lice infecting migrating Fraser River sockeye juveniles include both wild fish (herring, stickleback) and farmed salmon.[224] I accept the evidence I heard that Atlantic salmon farms may be a significant source of *Lepeophtheirus salmonis* (*Leps*) infection for outmigrating smolts. The evidence is less clear for *Caligus clemensi* (*Caligus*). I accept the evidence of Michael Price, biologist, Raincoast Conservation Foundation, one of the expert witnesses testifying about sea lice, that Fraser River sockeye juveniles

downstream of salmon farms have a greater *Caligus* lice load than upstream;[225] however, the whole of the evidence before me presents different explanations for why that is so (e.g., increased time spent in sea water, exposure to salmon farms, or exposure to other natural sources of *Caligus* infection).[226] I accept the evidence that salmon farms are one of many sources of *Caligus* infection.

The evidence led during the hearings indicated that there is little scientific information about the effect of *Caligus* infection on sockeye. There was a consensus among the scientists who testified that *Caligus* infection presumably has some negative effect on sockeye hosts, but that effect is likely to be of lesser magnitude than *Leps* infection.[227] I accept the evidence of Dr. Simon Jones, research scientist, DFO, and Dr. Orr, both expert witnesses on sea lice, that more work is needed into the thresholds of sea lice infection and resilience in sockeye generally, and into the patterns of sea lice (especially *Caligus*) distribution and infection on juvenile sockeye.[228]

Senior DFO Science staff testified that there is a gap in research on wild fish health and that, although DFO is attempting to address it, research priorities are "very much weighted" by the need for DFO Science to provide advice to its "clients," such as the Canadian Food Inspection Agency (CFIA) or to the Fisheries and Aquaculture Management Branch.[229] Also, as described above in the section on salmon farm management, DFO has conducted little research into the effects of pathogens from salmon farms on Fraser River sockeye.

I see a difficulty in having DFO Science's research priorities for fish health directed by "clients," such as CFIA, whose mandate is not the conservation of wild fish but trade and economic concerns, or by aquaculture management, whose focus is sustainability of the aquaculture industry. When DFO's research is set by other agencies, there is the risk that the department does not give the priority it should to the conservation and protection of wild salmon. DFO Science should not be a follower on issues of wild fish health; it should be the leader. And it should be an advocate for research and innovation on wild fish health.

Evidence I heard in December 2011 concerning the possibility of infectious salmon anemia virus (ISAv) in BC waters heightened my concern about DFO's approach to wild fish health. DFO as an organization has not taken a proactive approach to researching whether ISAv exists in wild salmon. Instead, it has worked – under CFIA's direction – in a reactive manner, assisting in the investigation into whether presumptive positive tests for ISAv found by non-government labs were false positives. DFO discouraged one of its own leading scientists from conducting research outside the CFIA-led regulatory program. And it followed communication practices that left the impression that all was well, when at a minimum there was a strong case for further research. (See the case study on ISAv in Volume 1, Chapter 9, Fish health management.)

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

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. Compared with other Fraser River sockeye, these salmon exhibit unique freshwater and marine life history patterns, and they may follow migration routes that are distinct from most other Fraser River sockeye populations.

In several respects the Harrison sockeye present a confounding picture. For example, there is concern that other sockeye stocks, which spend only a few days in the contaminated Lower Fraser River, may be adversely affected by contaminants. Yet Harrison River sockeye, which migrate downstream almost immediately after emerging from the gravel and spend several months as fry in river sloughs and estuaries where they would have much greater exposure to contaminants and compromised habitat, are increasing in productivity. Similarly, although there is concern that most other Fraser River sockeye smolts are exposed to numerous stressors during their brief migration through the Strait of Georgia, it appears that the Harrison River population has, at least in recent years, suffered no ill effects, even though it is believed that they spend most of their ocean-entry year in the Strait of Georgia.

Although 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, this population would be a fruitful area of research because it may provide important insights into Fraser River sockeye production processes.

There is also uncertainty about the migratory route the Harrison River population takes after it leaves the Strait of Georgia. It is hypothesized that some or all migrate through Juan de Fuca Strait to the west coast of Vancouver Island, but the evidence is incomplete. Neither is it known how far north the fish migrate and where they reside during their marine life history. Improving our understanding of these migratory patterns may provide additional insight into Fraser River sockeye production processes.

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

The findings of Dr. Peterman and Dr. Dorner in Technical Report 10, Production Dynamics, show that recent sockeye salmon declines have occurred over a much larger geographical area than just the Fraser River system and are not unique to it. This conclusion suggests that there may be a shared causal mechanism at play that is operating on a larger regional spatial scale, most likely in the marine environment shared by these stocks. This important new research finding has potential application to fisheries management in Oregon, Washington, and Alaska, as well as British Columbia.

However, Dr. Peterman and Dr. Dorner describe only the extent to which time-series trends in productivity are similar across sockeye salmon stocks. The causes of that similarity are not investigated, although they hypothesize that "large-scale phenomena such as climate-driven oceanographic changes, or widespread predation or pathogen-induced mortality, might be major drivers of the observed decreases in productivity throughout the region through effects on freshwater and/or marine conditions."[230] They report that the current limited informal contacts among scientists and managers through conferences or other meetings reduce opportunities for sharing research – information that is needed to learn about large-scale processes that cut across jurisdictional boundaries. They recommend that a formal working group could coordinate data collection and sharing of methods of analysis, and facilitate the communication of results in a timely manner. This kind of collaboration, they state, will help to increase the rate of learning about the causes of these widespread trends and to identify what might be done about them.

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

Throughout the hearings, I heard that Fraser River sockeye salmon experience multiple stressors that may affect their health and their habitats. Several witnesses emphasized the importance of considering the cumulative effects of these stressors, rather than considering stressors in isolation. Cumulative effects can arise from multiple exposures to an individual stressor within an area or life 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.

The impact of an individual stressor may increase where that stressor appears multiple times within an area. For example, Dr. Orr told me that the accumulation of wells near sensitive streams may result in water flow problems;[231] Dr. Ross told me that having multiple point sources of chemical discharge in the Fraser River estuary increases the potential for harm from chemical exposure;[232] and Michael Crowe, head, Habitat Management Program, Oceans, Habitat and Enhancement Branch, BC Interior, spoke of the cumulative impact of many small developments leading to an incremental loss of riparian function in a given area.[233]

Where Fraser River sockeye experience a stressor over the course of their lives, the negative impact of the stressor may have a cumulative effect. For example, Dr. John Ford, program head, Cetacean Research Program, Pacific Biological Station, DFO, spoke of the cumulative predator effects caused by "multiple potential different predatory species" encountered by Fraser River sockeye at various stages in their life cycle.[234] Don MacDonald, aquatic biologist, MacDonald Environmental Sciences Ltd., and lead author of Technical Report 2, Contaminants, and Dr. Mark Johannes, senior environmental specialist, Golder Associates Ltd., and lead author of Technical Report 12, Lower Fraser Habitat, told me about the potential risks associated with contaminants accumulating in the tissues of Fraser River sockeye across all stages in their life history.[235]

When Fraser River sockeye are exposed to multiple types of stressors during their lives, this contact can also affect their productivity. For example, Dr. Jack Rensel, consultant, Rensel Associates Aquatic Science Consultants, told me that harmful algae and pathogens could act cumulatively to impair fish;[236] Dr. Scott Hinch, professor, Department of Forest Sciences and Institute for Resources, Environment and Sustainability, University of British Columbia, and lead author of Technical Report 9, Climate Change, told me that climate change may interact with other stressors, causing harm to Fraser River sockeye;[237] and David Patterson, habitat research biologist, DFO, told me that migration mortality may be influenced by water temperatures, flows, sediment, general water quality, predation, disease, and other environmental factors.[238] With regard to the low returns of Fraser River sockeye in 2009, I heard from Dr. Jim Irvine, research scientist, Pacific Biological Station, DFO, that cumulative, multiple stressors may have played a role;[239] Mr. Marmorek went further, telling me that cumulative stressors in the marine environment may have been a primary cause for low returns that year.[240]

Dr. Siddika Mithani, assistant deputy minister, Oceans and Science, DFO, testified that the department considers "ecosystem science" and the investigation of cumulative effects as a priority for the Science Branch. She said it is "absolutely something that we need to do."[241] However, DFO witnesses told me that the department does not have a defined approach to considering or researching cumulative effects generally.[242]

Although I heard that DFO and other organizations have conducted some research on cumulative effects in specific contexts, the cumulative effects of many other stressors have not been considered.[243] For example, Mr. Bevan told me that in DFO's management of the "impacts on habitat … the cumulative impact is not being looked at."[244] Dr. Laura Richards, regional director, Science, Pacific Region, testified that she was not aware of

any work DFO was doing to assess the cumulative impact of the number of salmon farms on the Fraser River sockeye migration route.[245] Dr. Robie Macdonald, section head, Marine Environmental Quality, DFO, said that the department's toxicology work does not address the effect of multiple contaminants on fish at one life stage or the effect of contaminants on fish over various stages of the life cycle.[246] As a further example, Ms. Boyd of Environment Canada testified that federal environmental effects monitoring does not address the cumulative effects of the introduction of mining and pulp effluents into freshwater systems.[247]

I accept that research into cumulative effects is difficult. Robin Brown, head, Ocean Sciences Division, Institute of Ocean Sciences, Science Branch, told me that there has been a "very modest movement" in the assessment of cumulative impact in the marine area, but that it is very difficult research to carry out.[248] With respect to the cumulative effects of habitat loss, Patrice LeBlanc, director, Habitat Management Policy Branch, Program Policy sector, DFO, said that researchers "lack approaches and methodologies for assessing accumulative impacts" and that no such methodologies are currently available.[249] With respect to stress on fish health, Mr. Marmorek expressed the challenge this way: "[I]t gets tricky, because we don't have a cumulative stress meter that we can stick into sockeye and determine how overall stress is going up, or what the contributors are to that overall stress."[250]

However, I also heard from many witnesses that more cumulative effects research could and should be done. Dr. Ross told me that an improved understanding of the cumulative effects of endocrine-disrupting pollutants could be achieved by expanding research beyond laboratory settings and into the real world.[251] Ms. Boyd told me that, although researchers might have "shied away" from cumulative effects research in the past, "we've got to move in that direction," and she proposed bringing different groups together to formulate a cumulative effects monitoring strategy.[252] Dr. Villy Christensen, one of the authors of Technical Report 8, Predation, told me that an ecosystem model to assess the cumulative role of predation on sockeye could be built "certainly within a year."[253]

Several technical reports also recommended that cumulative effects research be done:

- *Technical Report 2, Contaminants:* Studies should be conducted to evaluate the interactive effects of contaminants (such as endocrine-disrupting compounds), disease agents, and/or water temperatures on sockeye salmon during outmigration of smolts and upstream migration of adults. Such studies should be conducted under a regional cumulative effects assessment program that is explicitly designed to evaluate the impact of multiple disturbance activities within the river basin.
- *Technical Report 8, Predators:* A conceptual ecosystem model should be built to assess the cumulative role that predators and other factors (e.g., food limitation) have on sockeye salmon as they leave the rivers and migrate to the North Pacific.
- *Technical Report 9, Climate Change:* Research is needed that examines cumulative impact across multiple stressors, such as the warming potential of multiple effluents (e.g., wastewater treatment plant discharges, industrial water discharges) to determine if they could have a cumulative effect on water temperature of the Fraser River; the impact of multiple environmental stressors (e.g., temperature, flow, water quality, and water chemistry); and the impact of fishery interactions.

Mr. English told me that research into cumulative effects will not only help scientists understand what is happening to Fraser River sockeye but may also inform fisheries managers about the way fisheries could be adjusted accordingly. Although little may be done about certain stressors, such as annual water temperatures, he said that "it is possible to minimize cumulative environmental effects and fishery related factors by disassociating the timing and location of in-river fisheries from these other stressors" – meaning that there may be years when, with extreme temperature, different harvesting methods should be considered.[254] I take this suggestion as an example of the importance of understanding cumulative effects, not only to fulfill scientific curiosity but also to inform the proper management of Fraser River sockeye salmon and their habitats.

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

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 used incompatible databases.

The scientific research proposed in the preceding recommendations will generate a wealth of information about Fraser River sockeye salmon and related species as well as salmon habitat and the various stressors that threaten sockeye and their habitat. These data will add to the data already collected within DFO. It is essential that DFO develop and maintain an accessible inventory of all its research – a central repository 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, I repeat what I said when discussing fish health data from salmon farms: DFO needs to be transparent and to allow non-government scientific researchers access to the proposed Fraser River sockeye salmon data for the purpose of original research. The information will be collected to assist in the assessment of risks posed to wild stocks. Although DFO has a mandate to analyze these data, it does not hold an exclusive mandate to do so, and the information in the database should not be treated as proprietary. Making the fruits of this research available to non-DFO scientific researchers is consistent with Principle 4.5 of the 2003 document prepared by the Privy Council of Canada, *A Framework for the Application of Precaution in Science-Based Decision Making about Risk*, which states that a "high degree of transparency, clear accountability and meaningful public involvement are appropriate."[255]

DFO's conservation mandate may be advanced by the provision of existing and new research to non-government scientific researchers. These researchers may apply fresh perspectives and ideas to this information and, by doing so, prompt DFO to ask new questions that further scientific understanding. Ultimately, this understanding could, in turn, lead to regulatory advances to protect wild stocks.

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 warming waters

In this volume, I have called for scientific research on a wide range of issues. Some of that research is for the purpose of improving our understanding of Fraser River sockeye salmon and how they behave. Other research is intended to provide a knowledge base about how particular stressors have a negative impact on these salmon stocks and how serious this impact can be. That understanding in turn will allow decisions to be made aimed at lessening or eliminating the impact of those stressors on Fraser River sockeye. For example, research on pathogens, contaminants, and

interactions with enhanced salmon could lead to changes in fisheries and habitat management. In these cases, there may be specific remedial actions that DFO can take to improve the sustainability of Fraser River sockeye salmon.

Other stressors will be a much greater challenge. Foremost among them is climate change. I ended Volume 2, Causes of the Decline, with a disquieting focus on the future – the prospect of warming salt- and freshwaters, increased precipitation in the form of rain, and earlier melting of the snowpack. These factors will likely have a negative impact on Fraser River sockeye salmon during all their life stages. Indeed, DFO has recognized the likely negative impact that climate change poses to fisheries.[256] Climate change also makes it more difficult to predict what will happen in the future. We are into a new paradigm, with increased unpredictability leading the way.

The signs of climate change that we see, such as warming of the Fraser River, are felt locally but caused by forces operating on a much larger scale. British Columbians and other Canadians all contribute to global warming, but we cannot, by ourselves, reverse its effect on us. We can all do our part, but even our best efforts will not lead to a cooling of the Fraser River. Solutions will only be found at a national and international level.

It was well beyond the scope of this Commission of Inquiry to examine the underlying causes of climate change and how society can tackle it. However, I heard enough evidence about warming waters and their impact on Fraser River sockeye salmon to reach the uncomfortable conclusion that reducing deposits of contaminants and municipal wastewater into the Fraser River, or increasing productive sockeye habitat, will not make a big difference if climate change increases the temperature of those same waters to a level that is lethal to Fraser River sockeye. Although we must address the impact of contaminants and habitat loss, we cannot stop there. Warming waters is the elephant in the room that we cannot ignore.

I did not hear evidence on and do not profess to know what specific steps should be taken to address the causes of warming waters and climate change. If solutions are to be found, they will likely be at the national and international level. Canadians must look to the Government of Canada as a whole, not DFO, for domestic action and for Canadian support for international initiatives that will reduce the impact of warming waters and climate change on Fraser River sockeye salmon.

Improving future sustainability by addressing the causes of warming waters

74 To improve future sustainability of 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

In my October 2010 Interim Report, I summarized the many previous examinations, investigations, and reports that I considered relevant to my mandate, along with the more than 700 recommendations made in them regarding the Pacific salmon fishery. Most of those recommendations were directed at DFO, focusing on its management of the fishery and its legislative powers respecting harvesting, protection of habitat, protection of wild salmon stocks, and aquaculture.

Where the Government of Canada, DFO, or the minister of fisheries and oceans formally responded to those recommendations, I summarized those responses. In doing so, I relied primarily on a 289-page document prepared for the Commission by Canada entitled "Recommendations Related to Fraser River Sockeye Salmon and Responses by the Government of Canada, 1982–2010," which is included in the DVD accompanying this Report.[257]

A review of these materials reveals that, when the Government of Canada or DFO chose not to implement a recommendation, there was, in most cases, no follow-up by the recommending body, and there was no independent scrutiny of the merit or adequacy of the government response. The government entities under review (DFO and Environment Canada) decided what their response to the recommendations would be, and that was the end of it.

In my view, there should be a degree of accountability 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. I do not suggest that government is obligated to adopt and implement all of a commission's recommendations, but I think that the public would be better served if there were a form of independent oversight of the government's response.

More specifically, I conclude that 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. That would bring a needed measure of transparency to the government's response to the commission's work, while at the same time preserving the Executive Branch's independence of action.

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 and would, in my view, be an appropriate body to undertake this type of review – if willing and able to do so. Given the ongoing interest of the Standing Committee on Fisheries and Oceans on the matters 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.

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.**

Notes

Policy and practice reports were prepared by Commission counsel and entered into evidence to provide a contextual background to inform the hearings on the various topics, including:

- PPR 5, Harvest Management;
- PPR 8, Habitat Management;
- PPR 12, Catch Monitoring; and
- PPR 19, Marine Environment.

1 Exhibit 77, p. 66.
2 Exhibit 77, pp. 45, 66.
3 Exhibit 604, p. 33.
4 Exhibit 606, p. 47.
5 *R. v. Nikal*, [1996] 1 SCR 1013, para 102.
6 Al Cass, Rob Morley, and Ken Wilson, Transcript, February 7, 2011, pp. 77–81.
7 See, e.g., Western Central Coast Salish First Nation's written submissions, pp. 57–59; First Nations Coalition's written submissions, pp. 251, 255,
8 *R. v. Marshall,* [1999] 3 SCR 533 *(Marshall II)*, para 40.
9 *Comeau's Sea Foods Ltd. v. Canada (Minister of Fisheries and Oceans)*, [1997] 1 SCR 12, para 37.
10 Transcript, August 19, 2011, p. 45.
11 Canada's final submission, pp. 110, 149; Transcript, August 19, 2011, p. 45; Transcript, September 2, 2011, p. 75; Exhibit 1426.
12 Exhibit 8, p. 2.
13 Exhibit 480, pp. 11, 14.
14 Exhibit 1187, p. 13.
15 Exhibit 1187, p. 20.
16 *R. v. Marshall*, [1999] 3 SCR 533 *(Marshall II)*, para. 40.
17 Stewart Johnstone, Transcript, August 22, 2011, pp. 36, 69–70; Sylvain Paradis, Transcript, June 7, 2011, pp. 29, 48, 51–52; Exhibit 981, p. 9.
18 Robie Macdonald, Transcript, June 6, 2011, pp. 5–8; Sylvian Paradis, Transcript, June 7, 2011, pp. 29, 48, 51–52; Exhibit 981, p. 9.
19 Transcript, September 23, 2011, p. 3.
20 Exhibit 216, pp. 20–30.
21 Exhibit 1728, pp. 1–2.
22 Exhibit 102, p. 1.
23 Transcript, September 22, 2011, p. 44.
24 Susan Farlinger, Transcript, September 23, 2011, p. 55; David Bevan, Transcript, September 23, 2011, p. 65.
25 Exhibit 8, p. 8.
26 Exhibit 8, p. 35.
27 Susan Farlinger, Transcript, September 27, 2011, pp. 21–22.
28 Exhibit 244, p. 2; Transcript, December 9, 2010, pp. 40–41.
29 Claire Danserau, Transcript, September 22, 2011, pp. 45, 58–60. Susan Farlinger, Transcript, September 22, 2011, pp. 51–52; David Bevan, Transcript, September 23, 2011, p. 83.
30 Exhibit 8, p. 35.
31 Transcript, November 30, 2010, pp. 96–97; Exhibit 102.

32 Exhibit 238, p. 8; Exhibit 240, pp. 6, 8.
33 Transcript, November 29, 2010, pp. 72–73.
34 Pat Chamut, Transcript, November 29, 2010, pp. 72–73; Transcript, November 30, pp. 82–83; Jim Irvine, Transcript, December 8, 2010, pp. 58–59.
35 Kathy Scarfo, Transcript, March 1, 2011, p. 30; Rob Morley, Transcript, February 7, 2011, p. 83.
36 PPR 20, pp. 14–15.
37 Exhibit 1615.
38 Andrew Thomson, Transcript, September 1, 2011, pp. 7–8.
39 Gary Marty, Transcript, August 31, 2011, pp. 21–22.
40 Andrew Thomson, Transcript, August 30, 2011, pp. 16–18.
41 Andrew Thomson, Transcript, August 30, 2011, p. 25.
42 Exhibit 1615, p. 6.
43 Josh Korman, Transcript, August 25, 2011, pp. 82–83; Exhibit 1536, p. 34; Craig Stephen, Transcript, August 22, 2011, p. 93.
44 Josh Korman, Transcript, August 25, 2011, pp. 86–87; Exhibit 1543, p. 11; Larry Dill, Transcript, August 26, 2011, p. 79.
45 Craig Orr, Transcript, September 6, 2011, p. 22.
46 Clare Backman, Transcript, September 7, 2011, p. 89.
47 Trevor Swerdfager, Transcript, August 30, 2011, pp. 22–23.
48 Kristina Miller, Transcript, December 15, 2011, pp. 53, 102–3; Exhibit 2084.
49 Exhibit 51, p. 3.
50 Mia Parker, Transcript, September 7, 2011, p. 26.
51 Michael Kent, Transcript, August 22, 2011, pp. 11–12; Craig Stephen, Transcript, August 22, 2011, p. 15.
52 David Marmorek, Transcript, September 19, 2011, p. 76.
53 Exhibit 1540, p. 9.
54 Exhibit 1540, p. 9.
55 See, e.g., Aquaculture Coalition's written submissions, p. 1; Conservation Coalition's written submissions, pp. 14–17; written submissions of Area D Salmon Gillnet Association and Area B Harvest Committee (Seiners), pp. 64–65.
56 Catherine Stewart, Transcript, September 8, 2011, p. 5; Exhibit 1563.
57 For example, see Exhibit 1543.
58 Transcript, August 23, 2011, p. 42.
59 Exhibit 1540, p. 24; Lawrence Dill, Transcript, August 29, 2011, pp. 104–5.
60 Transcript, August 22, 2011, pp. 37–38.
61 Exhibit 8, p. 31.
62 Exhibit 1632, p. 1.
63 Andrew Thomson, Transcript, August 30, 2011, p. 18.
64 Susan Farlinger, Transcript, September 22, 2011, pp. 82–83; Trevor Swerdfager, Transcript, August 30, 2011, pp. 71–72.
65 Exhibits 1625, 1629, 1630.
66 Andrew Thomson, Transcript, September 1, 2011, pp. 87–88.
67 Rebecca Reid, Transcript, April 5, 2011, pp. 28–31; Exhibit 663.
68 Gavin Last, Transcript, August 30, 2011, p. 71.
69 Laura Richards, Transcript, September 22, 2011, p. 79.
70 Exhibit 1536, p. 25; Donald Noakes, Transcript, August 29, 2011, p. 23.
71 Susan Farlinger, Transcript, September 26, 2011, p. 74–75.
72 Andrew Thomson, Transcript, August 30, 2011, pp. 74, 108.
73 Kerra Hoyseth, Transcript, September 1, 2011, pp. 57–58.
74 Susan Farlinger, Transcript, September 22, 2011, p. 80.
75 Exhibit 51, pp. 4–5.
76 Josh Korman, Transcript, August 25, 2011, pp. 86–87; Exhibit 1543, p. 11.
77 Exhibit 1454, p. 3; Christine MacWilliams, Transcript, August 22, 2011, p. 48.
78 Christine MacWilliams, Transcript, August 22, 2011, p. 48.
79 Exhibit 1454, p. 2.
80 Christine MacWilliams, Transcript, August 22, 2011, pp. 77–78.
81 Craig Stephen, Transcript, August 23, 2011, pp. 77–80; Exhibit 1454, p. 105.
82 Exhibit 1454, pp. 3–4.
83 Exhibit 1593, pp. 4–6.
84 Christine MacWilliams, Transcript, August 22, 2011, pp. 47–48.
85 Exhibit 1454, pp. 3–4.
86 Exhibit 1454, pp. 87–88.
87 Transcript, May 2, 2011, p. 67; Exhibit 759A, p. 3.
88 Exhibit 759A, p. 3.
89 Randall Peterman, Transcript, May 2, 2011, pp. 37, 66–67; Exhibit 759A, p. 3.
90 Randall Peterman, Transcript, May 2, 2011, pp. 59–61; Exhibit 759A, p. 3.
91 Transcript, July 7, 2011, p. 83.
92 Transcript, May 2, 2011, pp. 86, 99.
93 Transcript, May 2, 2011, p. 46; Exhibit 757, p. 3 (Exhibit A, Question 8.c); Exhibit 758, p. 9 (Exhibit A, Question 19.c).
94 Exhibit 757, p. 3 (Exhibit A, Question 9).
95 Exhibit 757, p. 3 (Exhibit A, Question 10); Exhibit 758, p. 10 (Exhibit A, Question 21); Exhibit 766.
96 Exhibit 8, pp. 30, 36.
97 Annual Statistics 2008, online: NPAFC Statistical Yearbook www.npafc.org/new/publications/Statistical%20Yearbook/Data/2008/2008page.htm.
98 Canada's final submissions, p. 202.
99 Transcript, February 11, 2011, pp. 45–46, 66.
100 Exhibit 396, p. 1.
101 Al Cass, Transcript, February 7, 2011, pp. 15–17.
102 Transcript, February 8, 2011, p. 121; see also PPR 5, pp. 43–45.
103 Transcript, February 7, 2011, p. 70.
104 Rob Morley, Transcript, February 7, p. 83.
105 Paul Ryall, Transcript, March 16, 2011, p. 5.
106 Exhibit 371, p. 1.
107 Susan Farlinger, Transcript, September 23, 2011, p. 7.
108 *Larocque v. Canada (Minister of Fisheries and Oceans)*, (*Larocque*), 2006 FCA 237, FCA 237 270 DLR (4th) 552.
109 Exhibit 372; Exhibit 373; Jim Cave, Transcript, January 31, 2011, pp. 58–59.
110 Transcript, January 26, 2011, pp. 86–87.
111 Transcript, January 27, 2011, pp. 19–20.
112 Transcript, January 27, 2011, p. 23.
113 Mike Lapointe, Transcript, January 26, 2011, p. 83.
114 Exhibit 356, p. 3.
115 Exhibit 443, p. 2.
116 Exhibit 266, p. 7.
117 Transcript, February 21, 2011, p. 36.
118 Exhibit 718, p. 57 (Authority cited by authors of TR7 omitted).
119 Transcript, May 11, 2011, p. 13.
120 Transcript, May 11, 2011, p. 51.
121 Transcript, May 11, 2011, pp. 16–17.
122 Transcript, May 11, 2011, p. 52.
123 Transcript, May 11, 2011, pp. 15–16.
124 Exhibit 718, p. 21.
125 Transcript, May 17, 2011, p. 11. See also Transcript, May 18, pp. 1–2.
126 Transcript, May 11, 2011, p. 21.
127 Transcript, May 12, 2011, p. 12.
128 Exhibit 855, foreword.
129 Exhibit 855, p. 10; Exhibit 860, pp. 23–24.
130 PPR 12, p. 44; Exhibit 855, p. 10.
131 Transcripts, May 11, 2011, p. 6; Exhibit 840, p. 3.
132 Joe Tadey, Transcript, March 3, 2011, p. 15; Exhibit 270, p. 10; Lester Jantz, Transcript, May 11, 2011, pp. 20–21.
133 Transcript, May 11, 2011, p. 18.
134 Transcript, May 11, 2011, p. 19.

135 Transcript, May 11, 2011, p. 12.
136 Transcript, May 12, 2011, p. 19.
137 Peter Sakich, Transcript, May 12, 2011, p. 20; Kathy Scarfo, Transcript, March 1, 2011, pp. 51, 56.
138 Colin Masson, Transcript, May 12, 2011, p. 21; Julie Stewart, Transcript, August 19, 2011, p. 18.
139 Timber Whitehouse, Transcript, February 2, 2011, pp. 33–36; Transcript, February 3, 2011, pp. 24–25; Exhibit 380.
140 Timber Whitehouse, Transcript, February 2, 2011, pp. 61–62; Brian Riddell, Transcript, February 2, 2011, pp. 42, 59, 62–63.
141 Transcript, July 4, 2011, pp. 28–29.
142 Barry Huber, Transcript, June 30, 2011, pp. 36–37; Kaarina McGivney, Transcript, August 19, 2011, p. 3; Exhibit 1279, p. 5.
143 Transcript, August 19, 2011, p. 4.
144 First Nations Coalition's written submissions, p. 309; Stó:lō Tribal Council and Cheam Indian Band's written submissions, pp. 61–62, 101.
145 Susan Farlinger, Transcript, September 22, 2011, pp. 69–70; Jeff Grout, Transcript, February 23, 2011, pp. 18, 23, 29, 45, 88–89, 92.
146 Transcript, February 23, 2011, p. 50.
147 Canada's written submissions, p. 164, available at www.cohencommission.ca; Susan Farlinger, Transcripts, September 22, 2011, p. 63
148 Paul Sprout, December 16, 2010, p. 11.
149 Karl English, Transcript, April 14, pp. 21–22; Transcript, April 15, pp. 75–76.
150 Transcript, April 15, 2011, pp. 75–77.
151 Exhibit 291, pp. 1, 5.
152 Bill Duncan, Transcript, March 1, 2011, p. 42; Gordon Curry, Transcript, February 21, 2011, pp. 65–66; Rob Morley, Transcript, March 1, 2011, p. 43.
153 Wild Salmon Policy, Exhibit 8, p. 28.
154 Exhibit 1426.
155 Transcript, August 19, 2011, p. 31; Transcript, September 2, 2011, p. 97.
156 Exhibit 1279, p. 1; see also Ruling Re: Heiltsuk Tribal Council's Application for Production of FSC "Mandate Documents"; Coastwide Framework Documents, September 20, 2011, p. 15.
157 Exhibit 260.
158 Exhibit 730, pp. 20–29; Exhibit 88, p. 12; see also PPR 8, pp. 20–21.
159 Patrice LeBlanc, Transcript, April 4, 2011, p. 8; Transcript, April 5, 2011, p. 57; David Bevan, Transcript, November 2, 2010, pp. 36–37; Claire Dansereau, Transcript, September 22, 2011, pp. 29–30; Exhibit 665.
160 Exhibit 662; Jason Hwang, Transcript, April 4, 2011, p. 32; Jason Hwang, Transcript, April 5, 2011, p. 19; Michael Crowe, Transcript, June 8, 2011, pp. 5–7, 14, 16–18, 21–22, 25–27; Corino Salomi, Transcript, June 8, 2011, pp. 14–15, 21–22; Exhibit 1003.
161 Transcript, September 22, 2011, pp. 33–34.
162 David Carter, Transcript, April 6, 2011, pp. 3, 6, 9, 11, 20, 37; Exhibit 260, p. 21; Exhibit 678.
163 Dave Carter, Transcript, April 6, 2011, pp. 16–17.
164 Michael Crowe, Transcript, June 8, 2011, pp. 8–9; see also Exhibit 1018.
165 Exhibit 1010, pp. 13–15.
166 Stacey Wilkerson, Transcript, June 8, 2011, p. 44; Exhibit 1010, p. 15.
167 *Yanke v. Salmon Arm (City)*, 2011 BCCA 309.
168 Transcript, September 16, 2011, p. 8.
169 Transcript, September 15, 2011, p. 6.
170 Transcript, September 15, 2011, pp. 2–3, 9, 57; see also Exhibit 1760.
171 Jason Hwang, Transcript, September 16, 2011, pp. 9–11.
172 Exhibit 1871, p. 2.
173 Glen Davidson, Transcript, September 16, 2011, p. 13.
174 Jason Hwang, Transcript, September 16, 2011, p. 16; Exhibit 1874, pp. 4–32.
175 Transcript, June 17, 2011, pp. 6, 48–51, 57–58, 76.
176 Don MacDonald, Transcript, May 9, 2011, pp. 91–92; Exhibit 826, pp. 34–36; Peter Ross, Transcript, June 14, 2011, p. 30.
177 Transcript, June 17, 2011, pp. 19–20, 53–53, 57, 59, 72, 77.
178 Transcript, June 17, 2011, pp. 19, 52.
179 For Canada's reports, see Exhibits 1303, 1305, 1307 and 1309.
180 PPR 19, p. 29.
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256 Exhibit 1400, pp. 2–4, 32; PPR 19, pp. 78–80.
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Chapter 3 • Legislative amendments

On March 29, 2012, the Government of Canada tabled its budget in Parliament. Four weeks later, on April 26, 2012, the government introduced Bill C-38, entitled *An Act to implement certain provisions of the budget tabled in Parliament on March 29, 2012 and other measures* (short title: *Jobs, Growth and Long-Term Prosperity Act*). Bill C-38 received royal assent on June 29, 2012.

Bill C-38 includes at least two sets of provisions relevant to the work of this Commission:

- It repeals the *Canadian Environmental Assessment Act* (CEAA) that was in force at the time of this Commission's hearings and replaces it with the new *Canadian Environmental Assessment Act, 2012* (CEAA, 2012).
- It amends the *Fisheries Act*, most notably some of the habitat protection provisions, but also enforcement and fisheries management provisions.

Bill C-38 was introduced five months after completion of the evidentiary hearings and when my Final Report was in the late stages of drafting. My review of the amendments satisfied me that many of them would have a significant impact on some of the policies and procedures of the Fraser River sockeye salmon fisheries examined by this Commission and on important habitat protection measures in place at the time of the evidentiary hearings.

In response to these recent developments, I decided to take the following actions:

- To invite all participants to make supplementary written submissions regarding how, if at all, their previous submissions would be affected by Bill C-38's changes to legislation.
- In this Report, to insert references to Bill C-38 when discussing issues that may be affected by these new amendments.
- In this chapter, to summarize the changes to Canada's environmental assessment process and to the federal *Fisheries Act*, insofar as they may have an impact on Fraser River sockeye salmon, their habitat, and the sockeye fishery.

I extend my appreciation to those participants who, on short notice, prepared detailed and thoughtful responses to these legislative changes. I make reference to them in the discussion that follows. The full text of all participants' supplementary submissions is included in the DVD accompanying this Report.

I note that 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. Such processes include Pacific Salmon Treaty negotiations with the United States, treaty negotiations with First Nations, the Coastwide Framework initiative of the Department of Fisheries and Oceans (DFO) (related to post-treaty allocations of fish), and decisions about new salmon aquaculture licences. It is regrettable that the legislative amendments discussed in this chapter, especially those related to the *Fisheries Act*, could not also have waited until the Government of Canada had the opportunity to consider this Report.

Because these amendments were 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 programs and activities. As a result, I decided to invite supplementary written submissions from participants. I received those submissions on May 14, 2012.

As I finished my drafting of this Final Report, the amendments presented challenges:

- Some of the amendments are enabling only, granting to cabinet or to a minister the authority to make regulations. It is only when these regulations are drafted and published that interested parties will be able to assess the true import of the amendments.
- The statutory language used in some amendments has not yet been interpreted by officials and may be tested in court.

For all these reasons, I approached the drafting of this chapter with caution. I am, however, able to summarize Bill C-38's provisions that relate most directly to the work of this Inquiry and, where appropriate, will include the positions taken by the various participants who filed supplementary written submissions.

I have not considered any further legislative amendments beyond June 30, 2012, when the drafting of this Report was essentially complete.

Summary of legislative changes in Bill C-38 relevant to this Report

In this section, I briefly summarize Bill C-38's changes to the environmental assessment process and the *Fisheries Act* that are relevant to this Inquiry. In the next major section, I address the possible implications of these enactments in light of the evidence I heard and my findings and recommendations.

Changes to the environmental assessment process: CEAA, 2012

Bill C-38 repeals the *Canadian Environmental Assessment Act* in force at the time of the Commission's hearings and enacts the *Canadian Environmental Assessment Act, 2012* (CEAA, 2012) – which establishes a new federal environmental assessment process.[1] Under the CEAA, 2012, assessments are conducted in relation to projects designated by regulations or by the minister of the environment – the "designated projects." However, not all designated projects will require an environmental assessment. Proponents of designated projects must provide the Canadian Environmental Assessment Agency (CEA Agency) with a description of the designated project.[2] The CEA Agency then conducts a "screening," which includes a consideration of the description of the designated project; the possibility that the carrying out of the designated project may cause adverse environmental effects; any comments received from the public within 20 days of posting the notice of the proposed project; and the results of any relevant study conducted by a committee established under sections 73 and 74 of the CEAA, 2012 (the minister may establish a committee to conduct a study of the effects of existing or future physical activities

in a region entirely on federal lands or may jointly establish such a committee if the region is partly on or entirely outside federal lands).[3] On completion of this screening, the CEA Agency must decide if an environmental assessment of the designated project is required.[4]

If an environmental assessment is required, the assessment determines whether a designated project is likely to cause significant adverse environmental effects that (1) fall within the legislative authority of Parliament or (2) are directly linked or necessarily incidental to a federal authority's exercise of a power or performance of a duty or function required to carry out the project.[5] The CEA Agency, the Canadian Nuclear Safety Commission, the National Energy Board, or a review panel established by the minister (at his or her discretion) conducts the assessments.[6] However, cabinet is the final decision maker with respect to project approval.

After an assessment, if the decision maker decides that the designated project is not likely to cause significant adverse environmental effects or if cabinet decides that these effects are justified in the circumstances, then a decision statement, with conditions, is issued to the project proponent.[7]

A designated project means one or more physical activities that are

- carried out in Canada or on federal lands;
- designated by regulations or in an order made by the minister; and
- linked to the same federal authority as specified in the regulations or order.

It also includes any physical activity that is incidental to those physical activities.[8] At the time of writing this Report, there are no proposed regulations under the CEAA, 2012, prescribing designated projects.

The CEAA, 2012, allows the federal government to delegate an environmental assessment, substitute the process of another jurisdiction for an environmental assessment under the Act, and exclude a project from application of the Act when there is an equivalent assessment by another jurisdiction.[9] The new Act provides opportunities for public participation during both the screening process and an environmental assessment.[10] It also requires participant funding programs,[11] establishment of a public registry,[12] and follow-up programs in relation to all environmental assessments.[13]

The CEAA, 2012, specifies that federal authorities (with exceptions for national security, national emergencies, and other matters) must determine that the projects are not likely to cause significant adverse environmental effects before they take steps to carry out projects or enable projects on federal lands (defined in the Act), or outside Canada. If, however, the authority determines that a project is likely to cause significant adverse environmental effects, it may refer the matter to cabinet – to decide whether the effects are justified in the circumstances.[14]

Changes to management of Fraser River sockeye and sockeye habitat

Bill C-38 amends the *Fisheries Act* "to focus that Act on the protection of fish that support commercial, recreational or Aboriginal fisheries and to more effectively manage those activities that pose the greatest threats to these fisheries."[15] In this section I focus on the amendments that, in my view, have the potential to significantly affect DFO's and Environment Canada's management of Fraser River sockeye and sockeye habitat.

Management of Fraser River sockeye

Part 3, Division 5, of Bill C-38 contains a new section of the *Fisheries Act* (section 4.1) that allows the minister of fisheries and oceans to enter into agreements with the provinces to further the purposes of the Act. If an agreement provides that there are provincial laws which are "equivalent in effect" (not defined in the Act) to a provision in the regulations, then cabinet can declare, by order, that provisions of the Act or its regulations do not apply in that province (section 4.2). The amendments also allow the minister to enter into agreements, arrangements, or transactions with any person or body, or any federal or provincial minister, department, or agency, to implement programs and projects for the purposes of the Act (section 4.4).

Bill C-38 defines commercial, recreational, and Aboriginal fisheries for the purposes of the *Fisheries Act* (in subsection 2(1)). A "commercial fishery" is defined as fish harvested under the authority of a licence for the purpose of sale, trade, or barter. A "recreational fishery" is defined as fish harvested under the authority of a licence for personal use

of the fish or for sport. An "Aboriginal fishery" is defined as fish harvested by an Aboriginal organization or any of its members for the purpose of using the fish as food or for subsistence or for social or ceremonial purposes.

Part 3, Division 5, also creates a new section 43.2. It permits cabinet to designate another minister as the minister responsible for the administration and enforcement of subsections 36(3) through (6) of the *Fisheries Act* for the purposes of, and in relation to, subject matters set out by order. As discussed in Volume 1, Chapter 7, Enforcement, and Chapter 2, Recommendations, of this volume, section 43.2 means that Environment Canada could assume legislative as well as administrative responsibility for these subsections. At the time of the hearings and report writing, DFO is ultimately responsible for enforcement of section 36, although Environment Canada has administrative responsibility.

Part 4, Division 18, of Bill C-38 creates a new provision (section 10) that authorizes the minister of fisheries and oceans to allocate fish for the purpose of financing scientific and fisheries management activities in the context of joint project agreements. Section 10 appears to be a response to the *Larocque v. Canada* decision.[16] In *Larocque*, a case involving the snow crab fishery in the Gulf of St. Lawrence, the Federal Court of Appeal held that the minister of fisheries and oceans does not have the authority to finance DFO's scientific research activities by selling fish, "a common property resource belonging to all the people of Canada" – a resource managed by DFO.[17] After *Larocque*, DFO ceased funding Fraser River sockeye test-fishing programs through the allocation of fish to test fishers.

Management of Fraser River sockeye habitat

The amendments to section 35 (at the time of the hearings, the harmful alteration, disruption, or destruction [HADD] provision) in Part 3, Division 5, of Bill C-38 are relevant to the evidence, findings, and recommendations in this Report regarding management of Fraser River sockeye habitat. At the time of the hearings, subsection 35(1) provided that "[n]o person shall carry on any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat." The new subsection 35(1) states that "no person shall carry on any work, undertaking or activity that results in serious harm* to fish that are a part of a commercial, recreational or Aboriginal fishery, or to fish that support such a fishery." The amendments also broaden the exceptions to the prohibition in subsection 35(1) under a revised subsection 35(2). In addition to the authorizations for HADDs at the time of the hearings (for any person following the conditions required by the minister or regulations made by cabinet), the following categories of exceptions are authorized:

- Paragraph 35(2)(*a*): If the work, undertaking, or activity is a prescribed work, undertaking, or activity and is carried on in accordance with prescribed conditions.
- Paragraph 35(2)(*c*): If the carrying on of the work, undertaking, or activity is authorized by a prescribed person or entity and the work, undertaking, or activity is carried on in accordance with the prescribed conditions.
- Paragraph 35(2)(*d*): If the serious harm is produced as a result of doing anything that is authorized, otherwise permitted, or required under the Act.

Bill C-38 also creates a new subsection 35(3). It allows the minister (instead of cabinet as required by the Act at time of report writing) to make regulations for the purposes of paragraph 35(2)(*a*). Changes to section 36 also allow the minister (instead of cabinet) to make regulations to except the application of subsection 36(3). (That subsection prohibits the deposit of deleterious substances into fish habitat.)

In addition, Bill C-38 creates a new section 6, which requires the minister of fisheries and oceans to consider certain factors before he or she recommends to cabinet that a regulation be made in relation to section 35 (and some other specific circumstances). The following factors must be considered:

- the contribution of the relevant fish to the ongoing productivity of commercial, recreational, or Aboriginal fisheries;
- fisheries management objectives;

* "Serious harm" is defined as the death of fish or any permanent alteration to, or destruction of, fish habitat (ss. 2(2)).

- whether there are measures and standards to avoid, mitigate, or offset serious harm to fish that are part of a commercial, recreational, or Aboriginal fishery, or that support such a fishery; and
- the public interest.

The minister also has to consider these factors before exercising powers in certain circumstances, including those set out in paragraph 35(2)(*b*) (exception to the prohibition in subsection 35(1), where the minister authorizes a work, undertaking, or activity and the minister's conditions are followed); paragraph 35(2)(*c*) (exception to the prohibition in subsection 35(1) if a prescribed person or entity authorizes a work, undertaking, or activity and the prescribed conditions are followed), and subsection 35(3) (the minister may make regulations prescribing a work, undertaking, or activity that can be carried out without violating subsection 35(1)).

Also relevant to the management of Fraser River sockeye habitat is the amendment to section 32. Section 32 prohibits the killing of fish by means other than fishing. The revised provision expands exceptions to the prohibition. Paragraph 32(2)(*d*), in conjunction with paragraph 43(1)(*i.3*) (see below), enables government to allow other regulators, such as a province or a federal agency, to issue authorizations under the *Fisheries Act*. Bill C-38 also provides that cabinet can, by order, repeal section 32 at any time.

Prior to the amendments, section 37 of the *Fisheries Act* provided that

- the minister may request plans and specifications for works or undertakings that might affect fish or fish habitat; and
- the minister may, by regulations or with cabinet approval, make orders to restrict or close works or undertakings that may harmfully alter fish habitat or lead to the deposit of deleterious substances.

The amendments to section 37 require, but only on request of the minister or in accordance with any regulation requiring the provision of specific material, any person proposing to carry on a work, undertaking, or activity in "any ecologically significant area" (not defined in the Act or amendments), to provide the minister with prescribed material and other information.

The Bill C-38 amendments also add new categories of regulations (in section 43) that cabinet may make to carry out the purposes and provisions of the *Fisheries Act*. These categories include regulations providing for the control and management of aquatic invasive species.

In addition, a new subsection 43(5) provides that cabinet may make regulations exempting any Canadian fisheries waters from the application of section 35.

As noted above, paragraph 43(1)(*i.3*), in conjunction with paragraphs 32(2)(*d*) or 35(2)(*c*), enables government to allow regulators other than the minister of fisheries and oceans, such as a province or a federal agency, to issue authorizations under the *Fisheries Act*.

Discussion of legislative changes

In this section I discuss the impact that the legislative amendments have on this Commission's findings and recommendations. I also summarize concerns identified by participants in this Inquiry.

New environmental assessment process: CEAA, 2012

At the time of report writing, no regulations were yet proposed regarding what type of projects will be considered designated projects and potentially subject to environmental assessment. It is difficult to fully assess the impact of the CEAA, 2012, on the environmental assessment process without knowing the regulations. However, on the face of the enactment, the environmental assessment process as described in this Report will be fundamentally changed once the new Act comes into force and the CEAA is repealed. Below, I discuss several of the changes that I see as particularly relevant to this Commission's findings and recommendations on management of Fraser River sockeye and sockeye habitat.

First, under the CEAA, 2012, the trigger for environmental assessment is no longer

government action. Rather, it is the type of project. For Fraser River sockeye, this change means that projects requiring HADD authorizations will not necessarily be subject to an environmental assessment. Furthermore, even designated projects may not be subject to environmental assessments because the CEA Agency has complete discretion to decide if an environmental assessment is required. The participant Conservation Coalition submits that, given this new regulatory structure, the new Act is likely to result in fewer environmental assessments than under the CEAA. In this participant's view, the CEAA, 2012, is intended to eliminate federal government responsibility for environmental protection.[18] The participant Western Central Coast Salish First Nations (WCCSFN) told me that the CEAA, 2012, reduces federal oversight of environmental assessments, including projects that may have an impact on fish habitat, and that this change will have long-term effects on the sustainable management of Fraser River sockeye.[19]

Second, the CEAA, 2012, limits responsible authorities to three regulatory agencies. Therefore, DFO will no longer be a responsible authority for environmental assessment. Also, the CEA Agency is the sole decision maker of whether an environmental assessment will be required for designated projects. The combined effect of these changes to the CEAA regime means that it is likely DFO will be less involved in assessing the impact of projects on Fraser River sockeye and sockeye habitat.

Third, the CEAA, 2012, allows a provincial environmental assessment to proceed instead of the federal assessment process. The Conservation Coalition was concerned with this change because, in its view, federal environmental assessments are an important opportunity for "sober second thought."[20] In addition, British Columbia's environmental assessment process does not require a complete analysis of the significance of a project's environmental impact.

Fourth, the CEAA, 2012, increases cabinet's role as a decision maker in project approval. Cabinet may decide that significant environmental effects are justified in the circumstances and approve a project. The participant First Nations Coalition (FNC)* was concerned about increased cabinet (and ministerial) discretion. The FNC stated that this change to the CEAA ignores "well documented international experience and concerns raised repeatedly by First Nations."[21]

Participants also expressed the following concerns about the CEAA, 2012:

- restricted scope of environmental assessments compared with the CEAA;[22]
- short timelines for the initial screening decision and environmental assessments;[23]
- reduced public participation in environmental assessments;[24]
- reduced opportunities for First Nations participation in environmental assessments;[25]
- reduced generation and dissemination of Aboriginal traditional knowledge;[26]
- reduced generation and dissemination of science and diverse perspectives;[27]
- the possibility that proposed fish farms will not be subject to environmental assessments[28] (the participant Aquaculture Coalition also told me that, even if environmental assessments were required for fish farms, the risk of disease would not be evaluated);[29]
- a weakened environmental assessment process and "moving projects, major and important economic projects, rapidly through the approval process";[30]
- the inability of Canada to meet its duty to consult with First Nations;[31] and
- reduced transparency of decision making by cabinet with respect to project approval.[32]

Revised *Fisheries Act*

Management of Fraser River sockeye

As set out above, section 4.1 allows the minister of fisheries and oceans to enter into agreements with the provinces to further the purposes of the Act. If an agreement provides that there are provincial laws that are "equivalent in effect" to a provision in the regulations, then cabinet can declare, by order, that provisions of the Act or its regulations do not apply in that province (section 4.2). Section 4.4 also allows the minister to enter into agreements,

* The participant Musgamagw Tsawataineuk Tribal Council supported the FNC's submission in its entirety.

arrangements, or transactions with any person or body, or any federal or provincial minister, department, or agency, to implement programs and projects for the purposes of the Act.

The FNC noted that Bill C-38 provides no guidance on when a provincial law will be considered "equivalent in effect"[33] and told me the following:

> The lack of engagement and leadership by the Province on issues central to the sustainability of FRSS [Fraser River sockeye salmon] suggests that even if an agreement to cooperate is reached under the proposed s. 4.1 of the [*Fisheries Act*], it is unlikely that it will lead to greater protections for FRSS, unless it was nested within tripartite agreements with First Nations which included provisions for transparent decision making processes and accountability for the long term sustainability of FRSSI …
>
> This amendment may lead to further down grading of oversight and protections with respect to fish habitat given the Province's increasing reliance on industry and qualified environmental professionals to ensure that activities such as logging and developmental projects do not adversely affect FRSS and their habitat
>
> …
>
> The FNC submits that while increased collaborative governance amongst DFO, the Province and First Nations is required, it would be dangerous to FRSS and their long term sustainability for Canada to delegate certain DFO responsibilities regarding FRSS to the Province.[34]

The FNC and WCCSFN both expressed concern that sections 4.1 and 4.2 do not also make provision for equivalent agreements between First Nations and DFO.[35]

There is ambiguity in the scope of the agreements contemplated, and it is not clear to me how the government intends to use them. However, evidence from the Commission's hearings reveals that, since the 2000s, the province has withdrawn from actively reviewing individual proposed projects and moved to a "results-based approach," which provides standards and guidance documents (see Volume 1, Chapter 6, Habitat management). I note also that, in 2009, the Commissioner of the Environment and Sustainable Development reported that accountability in agreements between DFO and the provinces is weak.[36] In my findings, I conclude that, although there are some broad, overarching federal-provincial agreements on the management of fish habitat, DFO's regional headquarters has not provided guidance on how the department's Habitat Management Program staff and the province are to coordinate their habitat work.

The Conservation Coalition told me that sections 4.1 and 4.2 allow devolution of fisheries management to the provinces and territories.[37] I also note that the amended paragraph 35(2)(*c*), in conjunction with paragraph 43(1)(*i.3*), would enable government to allow other regulators, such as a province or a federal agency, to issue section 35 authorizations under the Act. In Chapter 2, Recommendations, I set out my conclusions regarding the minister's ultimate authority for decision making. At the time of report writing, it is too early to say what impact sections 4.1–4.4 may have on my recommendation in this regard, but the potential impact cannot be ignored. Indeed, at the hearings, Kaarina McGivney, former regional director, Treaty and Aboriginal Policy, DFO, was asked about the ultimate authority of the minister (in the context of barriers to co-management). Ms. McGivney said that the *Fisheries Act* provides the minister with ultimate authority and that proposals had been put forward to revisit the Act to address this barrier to co-management.[38] Some of the previous proposed amendments to the *Fisheries Act* included provisions allowing new "agreements." Claire Dansereau, deputy minister, told me that "there is potential for modernizing the *Fisheries Act* in some parts to ensure that there is more room outside of the Minister constantly being the final decision point."[39]

As noted above, Bill C-38 creates definitions for commercial, recreational, and Aboriginal fisheries. The WCCSFN told me that adding these definitions provides DFO with a way of "further separating Aboriginal fisheries from commercial fisheries," suggests a misleading hierarchy of priority, and suggests that First Nations are "mere stakeholders as opposed to rights holders to Fraser River sockeye."[40] The FNC, the Stó:lō Tribal Council, and the Cheam Indian Band also were concerned that the definitions separate Aboriginal and commercial fisheries.[41]

In addition, the FNC argued that the definitions could result in an adverse impact on the "ongoing protection and exercise of [constitutionally protected] fishing rights, including rights and responsibilities to [Fraser River sockeye]."[42] The FNC warned that the definition attempts to reduce an Aboriginal fishery to a right to harvest. In its view, the "choice to hold off harvest in order to meet conservation and stewardship objectives should not affect whether those fisheries are an 'Aboriginal fishery,'" and it is "not for the legislature to predetermine what constitutes an Aboriginal fishery and freeze that right in time."[43]

I cannot assess what effect these definitions will have on the long-term sustainability of the Fraser River sockeye fishery. I note, however, that DFO's 1993 Policy for the Management of Aboriginal Fishing contains a definition of "Aboriginal fishing." At the time of the hearings, this policy was still in effect. It is not clear if the amendment would change the definition, stated in the policy as follows:

- In this policy, Aboriginal fishing means fishing under the authority of a Communal Licence issued pursuant to the Aboriginal Communal Fishing Licences Regulations under the Fisheries Act.
- Aboriginal fishing under a Communal Licence includes fishing for food, social and ceremonial purposes. In a limited number of cases, it may also include fishing for sale under test sale projects negotiated as part of an Aboriginal Fishing Agreement. The terms of the Communal Licence will set out the extent of the authority of the Aboriginal group to fish.
- In the absence of an Aboriginal Fishing Agreement, all Aboriginal fishing under a Communal Licence will be limited to fishing for food, social and ceremonial purposes.[44]

Management of Fraser River sockeye habitat

The revisions to the *Fisheries Act*, in particular sections 2(1), 6, 32, 35, 36, and 43, appear to substantively change DFO's habitat management framework. Habitat management was a significant topic explored during the Commission's hearings, and one on which I have made findings and recommendations (see Volume 1, Chapter 6, Habitat management; and Chapter 2, Recommendations, of this volume). The changes to the Act leave me with a number of concerns in relation to this Inquiry and my recommendations for the future sustainability of Fraser River sockeye salmon.

The amendments collectively appear to narrow the focus of the Act from protecting fish habitat to protecting fisheries. Based on the evidence I heard, this shift could harm the long-term sustainability of Fraser River sockeye. Although, as discussed in Volume 2 of this Report, the evidence does not allow me to conclude that one stressor in particular is the sole cause of the long-term decline in Fraser River sockeye productivity, there is a risk that some of these stressors have a negative impact on sockeye and may have contributed to the long-term decline. My reference to "stressors" is to conditions present in Fraser River sockeye habitat. The importance of habitat to healthy fish stocks was emphasized throughout the hearings. In Chapter 2, Recommendations, of this volume, I accepted the evidence of DFO and expert witnesses that habitat degradation and loss pose risks to Fraser River sockeye and that, if current trends persist, there will be a significant decline in the productive capacity of Fraser River sockeye habitat. This decline could have a negative impact on Fraser River sockeye productivity, affecting the long-term sustainability of the fishery.

For this reason, I highlight the following specific changes that flow from the amendments in Bill C-38 as potentially problematic:

- expanding the circumstances in which harm to fish habitat may be authorized;
- providing greater discretion to the minister to authorize exceptions to the prohibitions (by regulation) in sections 35 and 36;
- allowing damage to fish habitat where there is no permanent alteration or destruction of habitat or death of fish;
- enabling the government to allow other regulators, such as a province or federal agency, to issue section 35 authorizations under the Act;
- requiring a revised 1986 Habitat Policy, including a review of the No Net Loss principle "to ensure consistency with our focus on managing threats

to recreational, commercial or Aboriginal fisheries";[45] and
- codifying the Environmental Process Modernization Plan (EPMP) streamlining processes, such as operational statements and best management practices.

Because habitat is so important to Fraser River sockeye productivity, expanding the circumstances in which harm to fish habitat may be authorized (including giving the minister more discretion to authorize these exceptions) concerns me. Also, allowing damage to Fraser River sockeye habitat, where there is no permanent negative impact on habitat or death of fish, appears to lower the threshold of protection for these stocks. It presupposes that one can assess whether damage is permanent – if one cannot, then the prohibition will not apply. It also presupposes that the only way fish can be negatively affected by stressors in their habitat is if these stressors have a direct, lethal effect. This assumption is contrary to the evidence I heard from many science witnesses, as well as to my finding that sublethal, delayed, and cumulative effects can all act to reduce Fraser River sockeye productivity. (For a summary of this evidence, see the discussion of cumulative effects in the section on science research in Chapter 2, Recommendations.)

I note that DFO has worked hard over the years to amass expertise on fish habitat which other agencies do not have. The amendments enabling the government to allow other regulators to issue section 35 authorizations introduce the possibility that DFO's expertise on fish and fish habitat will not inform these decisions.

In Chapter 2, I made a number of recommendations about habitat management based on the regulatory framework in place at the time of the hearings. The amendments significantly change this framework. According to the federal government, the amendments to the *Fisheries Act* in Bill C-38 will require review of the 1986 Habitat Policy, including a review of the No Net Loss principle "to ensure consistency with our focus on managing threats to recreational, commercial or Aboriginal fisheries." In Chapter 2, I stated that the policy is a valuable tool for the protection of productive Fraser River sockeye habitat. I also stated that DFO needs to complete implementation of the 1986 Habitat Policy and that, if the policy is revised, its goals and No Net Loss principle should be retained. Given Bill C-38, I reiterate these findings. I also repeat my recommendation that DFO should complete implementation of the 1986 Habitat Policy.

Operationally, how the revised Act will change the management of Fraser River sockeye is unknown. For example, will the changes require a new Habitat Management Program project review process, and, if so, what resources will be required to overhaul the regulatory system described in this Report? If EPMP streamlining processes are codified, will oversight of projects (including the cumulative negative impact on habitat) by habitat staff be reduced? The revised Act appears to signal a move toward further reduction of DFO oversight of projects. On the evidence, I found that cumulative impact is one of the key things that negatively affect fish habitat. DFO needs to manage this cumulative incremental harm that, over time, could have a substantial effect on Fraser River sockeye habitat. Less oversight of development is not likely to aid DFO in this regard.

I heard no evidence that the regulatory framework and sections 35 and 36 were inadequate to protect Fraser River sockeye habitat. Rather, witnesses and exhibits pointed to the lack of resourcing, resulting in less oversight and more reliance on streamlining processes, as having a negative impact on DFO's ability to protect Fraser River sockeye habitat. According to David Bevan, associate deputy minister, DFO, because not all proposed projects are reviewed, more monitoring is required to ensure compliance with the *Fisheries Act*. In my findings and recommendations, I agree with Mr. Bevan. The shift away from project-by-project review and toward a proponent or professional-reliance model demands a strong emphasis on monitoring. The evidence indicated that this emphasis was still lacking, and I recommended that DFO strengthen the monitoring component of DFO's Habitat Management Program. Given the changes to the *Fisheries Act*, this recommendation is all the more critical to the long-term sustainability of Fraser River sockeye.

Another concern I have with the amendments, including the introduction of the CEAA, 2012, is that they limit the statutory habitat protection to those habitats that are linked to a specific type of fishery. Witnesses told me that fisheries management should no longer be focused on a single

species. The revised Act, however, narrows the approach to habitat management. This approach is contrary to the evidence I heard from senior DFO management and scientists about the importance of, and DFO's shift toward, ecosystem-based management. The evidence was that ecosystem health is important to support Fraser River sockeye. Moreover, the amendments appear contrary to legislative commitments to ecosystem-based management in the *Oceans Act*.

One key question arising from the amendments is whether habitat of Fraser River sockeye stocks or Conservation Units that are not part of a commercial, recreational, or Aboriginal fishery will be protected by the Act. On the face of the provisions, such habitat will not be protected if "fishery" is construed to mean a fishery at the Conservation Unit level rather than the Fraser River sockeye fishery as a whole. Not only is that interpretation contrary to ecosystem-based management generally, but it is contrary to the spirit and intent of the Wild Salmon Policy (WSP). WSP implementation requires ecosystem-based management. In addition, Bill C-38 reverses the explicit approach to fish protection set out in the WSP. The policy directs that, when a Conservation Unit is assessed to be in the red zone (and would presumably not be able to support a fishery), management action is required. With the amendments, when a Conservation Unit is in the red zone,* it could then have less statutory protection. I note that the *Species at Risk Act* has protections analogous to those in the WSP for species deemed to be at risk.

Further, in signing on to the *Convention on Biological Diversity* (Convention), Canada has agreed, among other things, "as far as possible and appropriate" to do the following:

> Introduce appropriate procedures requiring environmental impact assessment of its proposed projects that are likely to have significant adverse effects on biological diversity with a view to avoiding or minimizing such effects and, where appropriate, allow for public participation in such procedures. (Article 14.1(a))[46]

"Biological diversity" in the Convention is defined as "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems."[47] This commitment to protect biological diversity is not limited to protection of organisms with economic value. Indeed, the Convention recognizes that biological diversity has intrinsic value in social, genetic, scientific, cultural, and aesthetic terms, in addition to economic value.

The Convention therefore suggests a focus on conservation of all fish, and not just those that support fisheries. In its preamble, it notes that "the fundamental requirement for the conservation of biological diversity is the *in-situ* conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings."[48]

The precautionary principle is an important feature of this Convention. (See Volume 1, Chapter 3, Legal framework, for a discussion of the precautionary principle.) Canada has also committed to applying the precautionary principle in domestic legislation, including the *Oceans Act* and the *Species at Risk Act*. As noted in Chapter 2, Recommendations, of this volume, the Wild Salmon Policy is Canada's expression of the precautionary principle applied to Pacific salmon. Through protecting biodiversity within salmon species, the Wild Salmon Policy ensures that a species as a whole has the genetic diversity to better survive future threats. In this way, the long-term future of the fishery is protected. However, if the focus of the legislative amendments is to protect only habitat linked to a current fishery, such limited protection could actually jeopardize future fisheries by undermining precautionary protections for biodiversity.

Additionally, I am concerned about the implications of the amendments for DFO's conservation mandate. In Volume 1, Chapter 3, Legal framework, I explain that the primary legislative exercise of the federal conservation mandate is subsection 43(*b*) of the *Fisheries Act*, which provides the power to DFO to make regulations "respecting the conservation and protection of fish." DFO has regulated extensively pursuant to subsection 43(*b*). Furthermore, in its 1990 decision in *R. v. Sparrow*, the Supreme

* A Conservation Unit in the "red zone" has low spawning abundance and distribution and requires a high extent of management intervention (Exhibit 8, p. 17).

Court of Canada determined that conservation takes precedence over food, social, and ceremonial fisheries.[49] Subsequent to *Sparrow*, several DFO policies set out that conservation is DFO's primary mandate (see the discussion in Volume 1, Chapter 4, DFO overview).

The amendments focus on fisheries explicitly. Fisheries are also an important DFO mandate, and the goals of conservation and a sustainable fishery are complementary. Conservation measures are intended to promote abundant healthy wild stocks that may in turn permit harvesting, while fisheries management activities regulate the catch so that future productivity is ensured. However, if the Act protects only fish that are part of a fishery, then the careful balance between conservation and fisheries would tip toward fisheries at the expense of conservation. Ultimately, this imbalance would likely have a negative impact on fisheries as well. As I state in Chapter 2, Recommendations: "DFO's conservation mandate extends to all fish habitat. It also extends to all fish, not just fish that are important to a fishery. I accept that diversity in Fraser River sockeye stocks is essential for the conservation and future sustainability of the species." As the participant FNC put it, "If the goal is to ensure the long term sustainability of FRSS [Fraser River sockeye salmon], it is evident that protecting the habitat of FRSS cannot be limited to those fish currently harvested."[50]

In my review of the legislative amendments in Bill C-38, I have focused on the possibility that these amendments may collectively weaken the *Fisheries Act*'s protection of fish habitat and may undermine an ecosystem-based approach to fisheries management. My focus on these themes is directed by what, in my view, is relevant to my mandate to make recommendations that ensure the future sustainability of the Fraser River sockeye salmon fishery. However, as noted, I asked participants to provide submissions on how, if at all, Bill C-38 might affect their final submissions. A number of participants raised the issues I canvass above, but participants also had other concerns, including the following:

- changing the environmental protection provisions of the *Fisheries Act* from being among the strongest legislative tools for environmental protection to among the weakest;[51]
- increasing the discretion of the minister and cabinet whereby important questions of biodiversity and the protection of ecosystems, fish, and fish habitat are affected by political interests and influences and result in decreased transparency in decision making;[52]
- allowing government to ultimately suspend application of laws designed to protect fish, fish habitat, and the environment;[53]
- raising a potential lack of constitutionality of protecting only stocks that are currently being harvested;[54]
- exempting ministerial regulations from the normal process of regulatory review and publication;[55]
- exempting harms caused by fishing practices from the scope of subsection 35(1);[56]
- making the application of subsection 35(1) to aquaculture more tenuous;[57]
- criminalizing Aboriginal peoples who exercise their Aboriginal rights to fish;[58]
- potentially infringing on rights to traditional Aboriginal fishing practices that use nets or other fishing apparatus;[59]
- increasing uncertainty around consultation with First Nations, including concern that the Crown may no longer be required to consult with First Nations on developments affecting waterways that will not attract protection under the revised Act;[60]
- exempting the National Energy Board from ensuring conditions are in place to protect critical habitat (designated under the *Species at Risk Act*) on projects it approves and extending indefinitely, at the discretion of the competent minister, permits under the *Species at Risk Act*;[61]
- repealing the *Kyoto Protocol Implementation Act* and thus reducing Canada's ability to address the impact of climate change;[62]
- providing greater discretionary powers to the Canadian Food Inspection Agency in the *Health of Animals Act* to control infected places – and concern that these powers may be exercised in the interests of trade rather than wild stocks;[63] and
- allowing multiple renewals of Disposal at Sea permits through changes to the *Canadian Environmental Protection Act*.[64]

Conclusions

In this chapter, I have reviewed Bill C-38's amendments to the environmental assessment process and to the *Fisheries Act* that might affect DFO's and Environment Canada's management of Fraser River sockeye and sockeye habitat. I described my concerns about significant changes to the management of Fraser River sockeye that may occur as a result of the enactment of Bill C-38. My review satisfies me that many of the amendments will have a significant impact on policies and procedures examined by this Commission, and on important habitat protection measures.

The complexity of Fraser River sockeye salmon management illustrates the difficult policy questions arising from this fishery. Indeed, this complexity appears to be one of the reasons behind DFO's past significant efforts to obtain First Nations and stakeholder input into draft policies before introducing a change in its management regime. The development of the Wild Salmon Policy, described in Volume 1, Chapter 10, Wild Salmon Policy, is a good example of the measured approach DFO has taken to policy development. In light of this approach, the federal government's tabling of Bill C-38 is disappointing. The bill was introduced very late in this Commission's life – five months after completion of the evidentiary hearings, and when my Final Report was in the late stages of drafting. I learned nothing of impending amendments to the environmental assessment process or the *Fisheries Act* from any witness at the hearings and saw nothing in any of the exhibits. Based on the evidence, as well as the supplementary written submissions of participants, there were no consultations with First Nations or stakeholders about Bill C-38. Moreover, the introduction of the amendments long after the conclusion of this Inquiry's evidentiary hearings means that neither Commission counsel nor counsel for participants had the opportunity to explore the potential impact of these changes on DFO's fisheries and habitat management.

I am not in a position to make recommendations regarding Bill C-38. I do not know what regulations may be enacted under the CEAA, 2012, or the *Fisheries Act*. I also do not know how officials and the courts may interpret the CEAA, 2012, or an amended *Fisheries Act*. However, as required by my Terms of Reference, I have set out my findings and recommendations in this Report for the future sustainability of the Fraser River sockeye fishery. Notwithstanding Bill C-38, I urge the federal government to heed my findings and to implement these recommendations.

Finally, I note that in Chapter 2, Recommendations, I recommend that an independent body, such as the office of the Commissioner of the Environment and Sustainable Development, report to the Standing Committee on Fisheries and Oceans and to the public on the extent to which, and the manner in which, this Commission's recommendations are implemented (Recommendation 75). I expect that, in the course of this review, the impact of Bill C-38 on the management of Fraser River sockeye will also be assessed.

Notes

1 *Canadian Environmental Assessment Act, 2012*, being Part 3, Division 1, of Bill C-38, *An Act to implement certain provisions of the budget tabled in Parliament on March 29, 2012 and other measures* (CEAA, 2012).
2 CEAA, 2012, s. 8.
3 CEAA, 2012, s. 10(*a*).
4 CEAA, 2012, s. 10(*b*).
5 CEAA, 2012, ss. 2(1), 6–7, 13–14, 27, 52, 84.
6 CEAA, 2012, ss. 15, 38.
7 CEAA, 2012, ss. 53–54.
8 CEAA, 2012, s. 2(1).
9 CEAA, 2012, ss. 26, 32–37.
10 CEAA, 2012, ss. 9–10, 17, 19, 24–25.
11 CEAA, 2012, ss. 57–58.
12 CEAA, 2012, s. 78.
13 CEAA, 2012, ss. 2(1), 19, 29–31, 43, 53.
14 CEAA, 2012, ss. 67–70.
15 Bill C-38, Summary. The amendments to the *Fisheries Act* are found in Part 3, Divisions 5 and 18, of Bill C-38.
16 *Larocque v. Canada (Minister of Fisheries and Oceans)*, 2006 FCA 237, 270 DLR (4th) 552 *(Larocque)*.
17 *Larocque*, para. 13, citing *Comeau's Sea Foods Ltd. v. Canada (Minister of Fisheries and Oceans)*, [1997] 1 SCR 12, 142 DLR (4th) 193.
18 Conservation Coalition's supplementary submissions, p. 4, available at www.cohencommision.ca.
19 Western Central Coast Salish First Nation's supplementary submissions, pp. 5–6, 8, available at www.cohencommision.ca.
20 Conservation Coalition's supplementary submissions, p. 4, available at www.cohencommision.ca.
21 First Nations Coalition's supplementary submissions, p. 6, available at www.cohencommission.ca.
22 Aquaculture Coalition's supplementary submissions, p. 5, available at www.cohencommission.ca.

23 Conservation Coalition's supplementary submissions, p. 5; Western Central Coast Salish First Nation's supplementary submissions, pp. 8–9, available at www.cohencommission.ca.
24 Conservation Coalition's supplementary submissions, May 14, 2012, pp. 5–6; Western Central Coast Salish First Nation's supplementary submissions, p. 8, available at www.cohencommission.ca.
25 Western Central Coast Salish First Nation's supplementary submissions, p. 6, available at www.cohencommission.ca.
26 Western Central Coast Salish First Nation's supplementary submissions, pp. 6, 8, available at www.cohencommission.ca.
27 Western Central Coast Salish First Nation's supplementary submissions, p. 8, available at www.cohencommission.ca.
28 Conservation Coalition's supplementary submissions, May 14, 2012, p. 6; Aquaculture Coalition's supplementary submissions, p. 4, available at www.cohencommission.ca.
29 Aquaculture Coalition's supplementary submissions, p. 4, available at www.cohencommission.ca.
30 Supplementary submissions of Area D Salmon Gillnet Association and Area B Harvest Committee (Seine), May 14, 2012, p. 2, available at www.cohencommission.ca.
31 First Nations Coalition's supplementary submissions, p. 13; Western Central Coast Salish First Nation's supplementary submissions, pp. 6, 9–10, available at www.cohencommission.ca.
32 First Nations Coalition's supplementary submissions, pp. 6–7, available at www.cohencommission.ca.
33 First Nations Coalition's supplementary submissions, pp. 14–15, available at www.cohencommission.ca.
34 First Nations Coalition's supplementary submissions, pp. 15–17, available at www.cohencommission.ca.
35 First Nations Coalition's supplementary submissions, p. 18; Western Central Coast Salish First Nation's supplementary submissions, p. 3, available at www.cohencommission.ca.
36 Exhibit 35, p. 29.
37 Conservation Coalition's supplementary submissions, p. 13, available at www.cohencommision.ca.
38 Transcript, August 19, 2011, pp. 43–45.
39 Transcript, September 26, 2011, p. 5.
40 Western Central Coast Salish First Nation's supplementary submissions, pp. 2–3, available at www.cohencommission.ca.
41 First Nations Coalition's supplementary submissions, p. 10; supplementary submissions of the Stó:lō Tribal Council and Cheam Indian Band, p. 4, available at www.cohencommission.ca.
42 First Nations Coalition's supplementary submissions, p. 8, available at www.cohencommission.ca.
43 First Nations Coalition's supplementary submissions, pp. 9–10, available at www.cohencommission.ca.
44 Exhibit 261, p. 3.
45 DFO, Frequently Asked Questions – New Fisheries Protection Measures, April, 2012, online, DFO: www.dfo–mpo.gc.ca/media/back–fiche/2012/hq–ac12b–eng.htm.
46 Exhibit 13, p. 151.
47 Exhibit 13, p. 145.
48 Exhibit 13, p. 146.
49 *R. v. Sparrow*, [1990] 1 SCR 1075, 70 DLR (4th) 385.
50 First Nations Coalition's supplementary submissions, pp. 10–11, available at www.cohencommission.ca.
51 First Nations Coalition's supplementary submissions, p. 11, available at www.cohencommission.ca.
52 First Nations Coalition's supplementary submissions, pp. 4, 7; see also Conservation Coalition's supplementary submissions, p. 14, available at www.cohencommission.ca.
53 Conservation Coalition's supplementary submissions, pp. 10–12, available at www.cohencommission.ca.
54 First Nations Coalition's supplementary submissions, p. 9, available at www.cohencommission.ca.
55 Conservation Coalition's supplementary submissions, p. 10, available at www.cohencommission.ca.
56 Conservation Coalition's supplementary submissions, p. 10, available at www.cohencommission.ca.
57 Aquaculture Coalition's supplementary submissions, pp. 1–2, available at www.cohencommission.ca.
58 Supplementary submissions of the Stó:lō Tribal Council and Cheam Indian Band, p. 4, available at www.cohencommission.ca.
59 Western Central Coast Salish First Nation's supplementary submissions, p. 4, available at www.cohencommission.ca.
60 Western Central Coast Salish First Nation's supplementary submissions, pp. 4, 9, available at www.cohencommission.ca.
61 Conservation Coalition's supplementary submissions, pp. 15–16, available at www.cohencommission.ca.
62 Supplementary submissions of the Stó:lō Tribal Council and Cheam Indian Band, pp. 1–2; Conservation Coalition's supplementary submissions, p. 15, available at www.cohencommission.ca.
63 Supplementary submissions of the Stó:lō Tribal Council and Cheam Indian Band, p. 3; Conservation Coalition's supplementary submissions, p. 16, available at www.cohencommission.ca.
64 Conservation Coalition's supplementary submissions, p. 16, available at www.cohencommission.ca.

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).

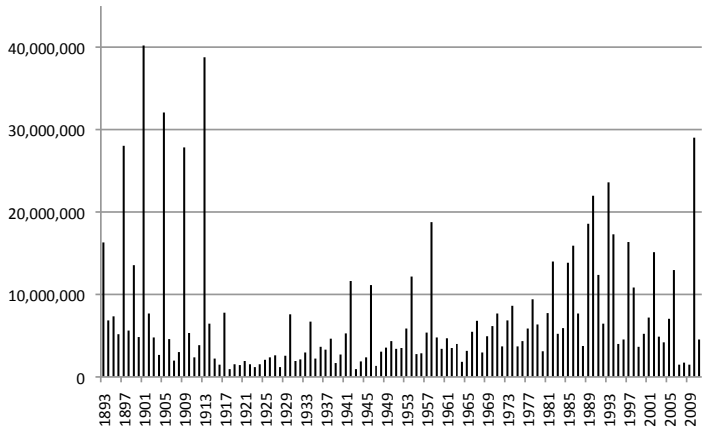

Figure 3.4.1 Total Fraser River sockeye returns, 1893–2011

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.

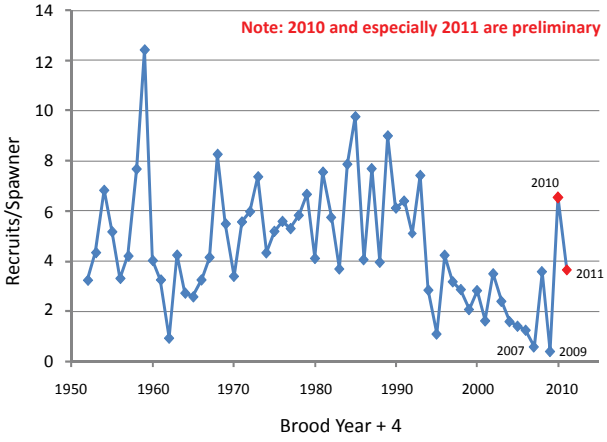

Figure 3.4.2 Annual variation in total Fraser River sockeye salmon productivity, 1952–2011

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.

Chapter 5 • Commission process

The Commission

On November 6, 2009, the Governor General in Council issued Order in Council 2009-1860 establishing this Commission of Inquiry and appointing me as sole Commissioner under Part 1 of the *Inquiries Act* to inquire into the decline of sockeye salmon in the Fraser River. The same Order in Council set the Commission's Terms of Reference, which are included as Appendix A. As Commissioner, I was mandated to investigate and report on the reasons for the decline of sockeye salmon in the Fraser River and to make recommendations for improving the future sustainability of this fishery – including, as required, changes to the policies, practices, and procedures of the Department of Fisheries and Oceans (DFO) in relation to the management of the Fraser River sockeye salmon fishery.

Immediately following my appointment, I began the process for engaging Commission staff and setting up the office for the Commission. I was fortunate to retain Brian Wallace, QC, as senior Commission counsel; Keith Hamilton, QC, as policy counsel; Dr. Leo Perra as executive director; and Cathy Stooshnov as director of finance and administration. I benefited from their substantial background in the conduct and operation of public inquiries. I was also able to hire a talented team of Commission lawyers, a fisheries research consultant, a director of communications, and office staff, and to establish the office of the Commission in a timely fashion. Because of the complexity of the topic, a difficult and time-consuming document disclosure process, the large number of participants* in the Inquiry, and a comprehensive evidentiary hearings schedule, I requested an extension to the original deadline for submitting my Final Report, in order to ensure that the Commission's mandate would be properly fulfilled. The Governor General in Council amended the

* Participants, throughout this Report, refers to groups and individuals who were approved by me to participate in the Inquiry within their areas of interest.

Commission's Terms of Reference and stipulated that I submit the Final Report on or before June 30, 2012. The Governor in Council further amended the Terms of Reference to extend that deadline to October 29, 2012.

The purpose of this chapter is to set out the process we followed for the Inquiry, including establishing the Commission's infrastructure, inviting individuals and organizations to apply for standing and funding, gathering public input through public forums and the Commission's website, compelling document production, conducting evidentiary hearings, and completing the Commission's Interim Report as well as this Final Report. At the end of this chapter, I include a chart that illustrates our journey (Figure 3.5.3). I hope that this chapter will be useful not only to those who are engaged in future commissions of inquiry – commissioners, lawyers, administrators, government representatives, and participants – but also to members of the public, providing a window into some of the complexities of the work of a public inquiry.

On matters of substance, the Commission is independent. Functionally, however, it operates and is funded as a government department falling within the general purview of the prime minister, and it receives administrative and technical support from the Privy Council Office (PCO).

Privy Council Office

PCO has developed extensive policies and procedures to provide checks and balances for the operations of the federal government. These policies and procedures also apply to agencies such as commissions of inquiry. PCO provided policy documents to guide my staff in areas such as contracts, employment of staff, procurement of goods and services, information services, document management, and security. Although PCO staff assisted my staff substantially in applying these policies and procedures, we found it a challenge to obtain the necessary approvals for timely procurement of goods and services. The requirement that "all advertising" be processed through Public Works and Government Services Canada (PWGSC), for example, added weeks to the time required to purchase a simple advertisement notifying the Canadian public of our existence. As a result of the costs involved and our initial experience in placing an ad, we delivered subsequent public communications through media releases and via the Commission's website.

Another major activity for us was to issue contracts for the many individuals providing services to the Commission. Each contract had to be reviewed initially and then approved by PCO before being executed by me. This review process also applied to any amendments to a contract, such as additional tasks to be performed, adjustments in completion dates, and similar changes that occur in contractual relationships. In some instances, PCO approvals were provided within two or three days, but occasionally they required two or three weeks. In addition, contracts of more than $100,000 annually had to be approved by the Treasury Board.

Administration Division

The Privy Council Office is a large organization, and responsibilities related to commissions of inquiry are parcelled out among different departments. Our concerns, issues, and needs were initially raised with the manager, Commissions of Inquiry, who solved our problems or referred us to the appropriate officers.

Manager, Commissions of Inquiry

The manager for commissions greatly assisted my staff during the start-up phase of the Inquiry in complying with the many policies, procedures, and regulations of the Privy Council Office. The Commission's director of finance and administration and PCO's manager, Commissions of Inquiry, held conference calls at least once a week to make sure that the Commission's interaction with the government flowed smoothly. The manager was also a source of help in setting up contacts with the other administrators and managers within PCO.

Informatics and Technical Services Division

The Informatics and Technical Services Division played a key role in the initial set-up of the

Commission's information systems. This work included the procurement of desktop computers, laptops, servers, printers, and BlackBerry devices and their installation in the Commission's facilities. The division also provided initial help-desk and troubleshooting support during the start-up phase of the Commission. PCO staff members who were deployed to Vancouver during this time went beyond the call of duty in getting the office operational by February 1, 2010.

The storage capacity of the initial server set-up included 50 gigabytes (GBs) of memory, but this capacity soon proved inadequate for the needs of the Commission. Several factors contributed to the need for significantly more memory:

- the requirement to use Ringtail Legal, a complex document management system;
- the disclosure of documents, which eventually exceeded 570,000, with more than 3 million image files – the primary format for Ringtail;
- the decision to provide participants with access to all disclosed documents, thereby requiring a second complete database; and
- the Commission's need for three databases of 315 GBs each for Ringtail, plus additional storage for its administrative needs.

Despite some initial start-up difficulties and the need for significantly more data storage capacity, the information systems for the Commission functioned well and met our needs.

Accommodation and Building Services

The procurement of facilities for the Commission involved several government departments. PCO staff members were involved in the broad planning activities for space and served as a liaison between my staff and Public Works and Government Services Canada. PWGSC provided assistance with the location and leasing of the office facility and the fit-up requirements to prepare it to meet federal government standards and the Commission's needs. It also handled the negotiations for the facility, preparation of detailed construction plans, selection of a contractor, and supervision of the site work, all subject to our approval.

The early planning activities indicated the need for a facility to accommodate approximately 30 people, with a reception area, boardroom, meeting room, interview room, staff lunchroom, offices, common work areas, print room, LAN / server room, library space, and secure file storage room. The total estimated area to accommodate all these functions was 6,000 to 7,000 square feet. I wanted the Commission to be located in Vancouver's downtown area, with easy access to transportation corridors and close to suitable hearing-room facilities.

Based on these initial concepts, the PWGSC procurement division looked for facilities that met these requirements. Eventually they located three sites, which were assessed by the Commission team. We recommended a location at 650 West Georgia Street, across the street from the Federal Court and close to the new Canada Line rapid transit system and other public transportation services. The Federal Court has the large courtroom and support facilities that I had requested for our evidentiary hearings, and we were able to use it for almost all of them.

The number of individuals and groups involved in different aspects of the facility procurement process presented challenges to my staff. Different people were responsible for overall planning, security, leasing, budgeting, construction planning, and renovations, along with a cadre of individuals representing the landlord. My staff members were ultimately responsible for approving all relevant decisions. Those decisions, however, had to be consistent with federal requirements and procedures.

Security

Security of facilities and information was an important consideration, so the security of the perimeter walls for the facility was a key renovation requirement for us. Wire mesh was installed between the top of all the perimeter walls and the concrete ceiling. The reception entry was also secured, with the receptionist controlling access both to the reception area and, from there, into the office area. Staff used electronic access cards to enter. An electronic security surveillance system was installed and was activated by the last staff member to leave each evening.

A secure LAN / server room and file room area were created, with access limited to those with a direct need to go there. Once a week, backup tapes for the servers were taken off site to a nearby bank vault.

Remote access to the Commission's server was through a virtual private network (VPN) protocol. This same protocol was used by the participants to connect to the Ringtail database. Information system requirements needed ongoing maintenance support throughout the life of the Commission – particularly for participants, who were using a wide variety of equipment and operating system software with various levels of firewalls and security systems.

Selecting and appointing staff

The senior Commission counsel, policy counsel, executive director, and director of finance and administration served as my executive and planning officers during our start-up phase. They prepared plans for the direction of the Inquiry; outlined the activities the Commission would pursue; and estimated its personnel, facility, and financial requirements.

Our initial set of planned activities included a learning phase, a review of previous reports, community forums, site visits, evidentiary hearings, an interactive website, and the preparation of Interim and Final reports. We required personnel in the following areas to complete these tasks: counsel and legal staff; a director of research; research and analysis coordinators; a director of communications (bilingual); a document manager; Ringtail administrators; information technology support staff; a webmaster; receptionists (bilingual); a hearings coordinator; and paralegal support staff. A list of the Commission's personnel is given in Appendix B.

My executive team had experience with other commissions of inquiry, and they recruited counsel and staff with inquiry or related experience. We initiated a search to fill the key research and communications positions using both print media and the website, and with some assistance from placement agencies, professional associations, university placement offices, and other agencies. Suitable candidates were interviewed and references checked before appointments were made.

Many people with expertise in west coast salmon fisheries have worked for DFO in the past and may wish to do so in the future. My counsel and staff were aware of this potential for a real or perceived conflict of interest in selecting staff members and contractors, and they considered carefully the nature and currency of such relationships.

All staff members and contractors who worked within the Commission's facility or who had access to our network were required to obtain level 2 (secret) security clearance.

Learning phase

Each commission of inquiry is unique, with its own needs and challenges. Fortunately for me, many other commissions, reviews, and examinations had looked at some of the issues mandated for our Inquiry. I contacted some of the people involved who were available to share their experiences and to provide suggestions on how the Commission might undertake its responsibilities.

I found the principles adopted by the Walkerton Inquiry led by Justice Dennis O'Connor appropriate to help us determine our needs:

- Be open.
- Present opportunities for public participation.
- Provide open and fair processes and procedures.
- Be thorough but not exhaustive, basing the process on the principle of proportionality.
- Be timely.
- Be responsible.[1]

I convened briefings for Commission staff with the Honourable John Fraser, the Honourable Bryan Williams, and Dr. Peter Pearse, all of whom had conducted fisheries- and sockeye-related studies and inquiries. Commission staff and I also met with Dr. Harry Swain, who had chaired the Research Advisory Panel of the Walkerton Inquiry and the subsequent Ontario Expert Panel on Water and Wastewater. Members of my executive team participated in think-tank sessions hosted by Simon Fraser University, the Integrated Salmon Dialogue Forum, meetings and conferences of the Pacific

Salmon Commission, and an orientation session hosted by the Department of Fisheries and Oceans.

I liaised with colleagues across the country who had served recently as commissioners and sought their wisdom and advice on their experiences conducting commissions of inquiry. The Oliphant Commission had not yet completed its inquiry, and its commissioner, senior lead counsel, and director of finance and administration met with me and my executive team.[2] We also had the benefit of discussions with other commissioners of recent commissions of inquiry, in particular Justice Denise Bellamy, Justice Stephen Goudge, and Justice Dennis O'Connor.[3] Early on, I read *The Conduct of Public Inquiries: Law, Policy, and Practice* by Ed Ratushny[4] and *The Law of Public Inquiries in Canada* by Simon Ruel.[5] Both texts were valuable ongoing guides to me, counsel, and staff during the life of the Commission.

Role of counsel

I appointed the senior Commission counsel to manage the substantive work of the Commission, and I depended on him and his legal team to handle all aspects of the Inquiry. This work included identifying the issues and themes to be investigated; requesting the disclosure of documents; determining the witnesses, including expert witnesses; planning and revising the hearing schedule; overseeing the hearing-room procedures; collaborating with the participants' counsel in the conduct of the Inquiry; and calling all the witnesses and leading their evidence.

The Rules for Procedure and Practice that I set provide: "Commission counsel have the primary responsibility for representing the public interest, including the responsibility to ensure that all matters that bear upon the public interest are brought to [my] attention."* This rule placed significant responsibility on Commission counsel to manage all aspects of the Inquiry and to ensure that the Inquiry fulfilled the mandate I had been assigned. Throughout the Inquiry I depended on the advice and diligence of my legal team, and I was pleased with the manner in which Commission counsel engaged participants' counsel and worked collaboratively to ensure that the Inquiry was achieving its intended purposes. I discuss the hearing process more fully later in this chapter.

Budgeting

An early requirement of the Commission was to prepare a budget that was consistent with the dates specified in the Terms of Reference, although it was unclear in the early stages if the time frame given to the Commission would be adequate. PCO staff members were very helpful in drafting the budget, and they worked with Commission staff to prepare an interim budget for the balance of the first fiscal year and a budget for the second and third years of the Commission. The first budget was covered by PCO resources because it was too late in the fiscal period to forward a submission to the Treasury Board.

Many standard budget items are common to most commissions of inquiry, including administrative and support personnel, legal counsel, media, production of reports, information technology and websites, hearings-related rentals and support, transcription services, travel and accommodation, office and commission supplies, facilities, and furniture and equipment. Federal commissions include a requirement for simultaneous interpretation during hearings and provision of all documents and reports produced by the Commission in both official languages. The Commission administered a federally funded Contribution Program to assist participants who lacked the resources to hire legal counsel to represent them. In addition, the budget included estimates for public forums in Fraser River and coastal communities as well as visits to particular sites there.

Because none of the Commission administrative staff had previous experience in managing a federal commission, we depended on assistance from PCO staff and the director of finance and administration for the Oliphant Commission. At the time we were getting under way, the Contribution Program was being revised by PCO in response to the experiences of previous commissions. Developing a budget without a firm policy in place presented some challenges. A list of the budget categories we used appears as Table 3.5.1.

* See www.cohencommission.ca/en/rules, a copy of which is on the DVD accompanying this Report.

Table 3.5.1 Categories included in Commission budget

Category	Items included
Legal	
Commission counsel	Fees and expenses
Legal advice (external)	Independent legal advice, when required
Document reviewers	Fees and expenses
Miscellaneous disbursements	Minor expenses for legal team
Research	
Research director	Fees and expenses
Research assistants	Salary and benefits
Advisory panel	Fees and expenses for expert panel members
Researchers / peer reviewers	Fees and expenses
Library materials and searches	Books, reports, Internet searches, etc.
Miscellaneous research	Fees and expenses for other experts (learning sessions)
Staff	
Commission staff	Salary and benefits for executive director, director of finance and administration, director of communications, Contribution Program manager, document manager, coordinators, administrative / legal assistants, receptionists, finance clerk, hearings coordinator, etc.
Government support staff	Share in cost of PCO employees assisting Commission in various capacities (procurement, human resources, financial, administrative, contracting)
Miscellaneous	Training courses, minor staff expenses
Meeting expenses	
Hospitality	Catering for in-house meetings, lunches for visitors
Miscellaneous	Kitchen supplies, minor petty cash purchases, etc.
Hearings	
Contribution Program	Legal fees and expenses for groups or individuals granted participant status
Hearings support	Court registrar, commissionaires, sheriffs, audio / visual needs
Transcripts and interpretation	Daily transcripts, fees / expenses for court interpreters (for federal commissions), translation services
Witnesses	Fees and expenses for witnesses who received summonses
Public forums and site visits	Travel, rental of venues, staff expenses, catering, audio / visual
Communications	
Advertising	Commission notices / call for submissions, press releases, advertisements for hiring senior staff members
Communications staff	Communications director; communications assistant(s)
Media monitoring and wire services	Canada Newswire, media monitoring services, newspaper subscriptions
Reports and publications	Design / layout, editing / proofreading, translation, printing, mailing
Translation services	Documents for website (required to be in both official languages for federal commissions)
Website	Webmaster, website registration, search engines
Miscellaneous	Media training, photography, map production, etc.
Office operations	
Furniture and equipment	Office furnishings, computer equipment, software (Ringtail, translation)
IT support (including Ringtail)	Technical / help-desk support, database support, maintenance agreements
Lease of premises	Cost of lease, installation of security system, renovations / alterations
Office supplies	Stationery, kitchen supplies
Miscellaneous	Postage / courier, cable, telephones, shredding services, water, building charges (security cards), government procurement fees

As the Inquiry progressed, I was granted extensions to submit my Final Report, first to June 30, 2012, and ultimately to October 29, 2012. These extensions necessitated revised budgets for the 2011/12 fiscal period and a partial budget from April 1 to December 31, 2012. The budgets were conservatively estimated and a challenge to administer, given that we held more hearings than initially planned. The additional hearing days and an unanticipated requirement to address the 35 applications for interlocutory rulings required additional resources for both Commission and participants' counsel.

Ultimately, however, the Commission carried out its mandate within its approved budgets.

Fisheries Research Program

My mandate included an assessment of environmental changes, marine environmental conditions, aquaculture, predators, diseases, water temperature, and other factors that may have affected Fraser River sockeye salmon. To address these issues, the Commission retained a senior fisheries research consultant to coordinate, review, and interpret relevant and current research; manage the Commission's research projects; and provide briefings for me and Commission counsel.

Science Advisory Panel

Consistent with the approach used by the Walkerton Inquiry, I established a Science Advisory Panel to provide guidance to the Commission on its fisheries-related research activities. The Commission appointed six prominent fisheries experts – four academics drawn from Simon Fraser University, the University of British Columbia, and the University of Washington, and two practitioners with extensive experience in fisheries-related and science research. However, because of concerns expressed by some participants that the panel would advise the Commissioner "behind closed doors," we discontinued it in favour of a peer-review process for each research project. The Science Advisory Panel was of great assistance in the establishment of the science research projects described below.

Selection of research themes: discussion paper

One of the first tasks of the research program and the Science Advisory Panel was to identify the Commission's research needs. In June 2010, a summary of a dozen proposed research projects and a list of proposed contractors were circulated to the participants as part of a discussion paper. The participants were invited to make suggestions for changes as well as to identify additional research topics for consideration. The discussion paper is available on our website and is included on the DVD accompanying this volume.

Research projects

Following input from the participants, the Commission approved 15 research projects and selected contractors from organizations and firms involved in fisheries research and from provincial universities. Contractors were provided with a scope-of-work statement defining in broad terms the deliverables required by the Commission. These researchers were not asked to engage in primary research but rather to report on the best available existing research. The one exception was a statistical analysis of data relating to salmon farms. The contractors were required to prepare a work plan within two weeks of signing the contract and to review it with the Commission's research consultant.

Peer reviews

Toward the end of each project, the draft technical report was reviewed by three experts in the field of investigation. These peer reviews, which were provided to the contractors for consideration, are appended to the final technical reports. A few months into the research projects, following the submission of the draft technical reports, all the contractors participated in a roundtable discussion on their findings up to that point.

Publication of reports

As the final technical reports became available, they were circulated to the participants. Once entered as exhibits at the hearings, the reports were posted to our website. They were also added to Ringtail, as discussed below, where they formed part of the searchable database.

Commission counsel decided not to present Project 11, Fraser River Sockeye Salmon – Status of DFO Science and Management, into evidence. The financial information requested by the Commission's researcher for this project could not be obtained in the time frame needed to complete the intended analyses. I did, however, hear direct evidence on the issues covered in this report, in particular from DFO witnesses during the final hearing theme, DFO Priorities and Summary. The Commission also reviewed an analysis of DFO's accounting records prepared by an external contractor.

Documents

Understandably, the Inquiry was document intensive. On November 25, 2009, soon after I was appointed, I required DFO to produce all records relating to Fraser River sockeye. In January 2010, Commission counsel accepted the proposal of the Department of Justice to concentrate on documents from the previous five years, but to produce clearly relevant documents going back further. Commission counsel accepted five years because it was sufficient to cover the four-year life cycle of a generation of sockeye. I felt that the most recent documents would be the most useful and would give Commission counsel the information on which to base demands for specific earlier documents. A blanket requirement going back further would have made the difficult document production process virtually impossible.

DFO, the Department of Justice, and the other government departments from which we required document production put immense efforts into the process, but, inevitably there were challenges arising from the sheer scale of the undertaking, considerations of what types of documents would be likely to be helpful to me, and assertions of privilege. Some of these issues were the subject of rulings, which are included on the DVD accompanying this Report.

The Terms of Reference required us to "use the automated documents management program specified by the Attorney General of Canada" – Ringtail Legal (Ringtail), a comprehensive, complex, and sophisticated application that assists users in searching millions of documents on many fields. Users can label, sort, tag, annotate, redact, and create electronic "binders." These binders can be shared across all users or limited to a specified group.

Ringtail is an Australian product that is handled by FTI Technology, with offices worldwide. A Canadian firm, Commonwealth Legal (CWL), with an office in Vancouver, provides a variety of services, including help-desk support, for Ringtail. The Commission contracted CWL to provide training for users, technical help-desk support, and document management services (e.g., preparing documents to be imported and creating content files from documents that contained redacted information).

A key feature of Ringtail is its Internet interface. Anyone with an Internet connection is able to access the application, subject to security provisions. This feature meant that Commission staff, Commission counsel, and the participants could, through the Internet, access the documents housed within Ringtail at any time, including in the hearing room.

Once the application had been installed, a one-week full-time training program was provided for the staff members selected to serve as Ringtail administrators, with core support coming from the Commission's document manager, a research assistant, and, to a lesser extent, the executive director. Following the training of key staff members, CWL provided training for the users of the document management system, including Commission and participants' counsel and document reviewers, the hearings coordinator, the webmaster, and Commission research staff. Training initially took place in an off-site classroom and involved several sessions; subsequently, CWL gave additional training through the Internet and by telephone conferencing.

The Commission acquired 64 Ringtail licences, allowing us to allocate more than one licence to most participants. Additional licences were issued on a priority basis; participant coalitions received first priority for multiple licences. Some participants requested additional licences, and in a few cases,

three licences were issued with the understanding that one or more would be withdrawn if another participant group asked for a second licence. Only one user for each licence could access the Ringtail program at a time. If a second user from that participant attempted to use the licensed account, the first user would be bumped.

Participants were also provided with a secure VPN account on the Commission's server for each Ringtail licence issued. This account allowed access to Ringtail through the user's desktop Internet browser. For a participant group with two or more licences, all users (with one exception) shared the group account – meaning that electronic notes, tags, comments, redactions, and binders were shared electronically within the group. One participant coalition group used a separate account to allow internal privacy.

In addition to the electronic binders prepared by participants for their own use, the Commission's reviewers and counsel prepared binders of documents on particular themes and issues. These binders were made available electronically to all participants through their Ringtail accounts.

Before being given access to the Ringtail database, participants and their counsel were required to sign a confidentiality undertaking that they would use the documents or information from the database solely for the purposes of the Inquiry and not disclose them except for those purposes. Because licences could be shared among users, the senior counsel for each participant was responsible for ensuring that every user from that participant had signed an undertaking.

Late in the evidentiary hearings in 2011, a concern arose that documents from Ringtail were being leaked to the media and to non-participants. Some participants complained to me about this situation, and at that point, Commission counsel and I agreed to tighten access: only counsel for the participants would be able to access documents in Ringtail. Counsel could discuss documents with participants who had signed the undertaking but not give them copies.

We received the first set of disclosure documents (a "production") from Canada in early February 2010. Subsequent productions from the Department of Justice were received every second week, and the final and 67th production arrived on January 10, 2012, a few days after the conclusion of the infectious salmon anemia virus (ISAv) evidentiary hearings. When documents could not be disclosed in sufficient time before the hearings to be entered into the Ringtail database, electronic copies were distributed to participants. The total number of documents disclosed by Canada exceeded 525,000.

Participants other than Canada also disclosed about 7,800 documents. Although the Commission had prepared guidelines for the participants to follow in preparing disclosure documents, materials arrived in various formats. Some participants without significant resources simply provided boxes of materials, which were sent to CWL to be prepared for importing into Ringtail. The electronic files provided by other participants were also forwarded to CWL.

The cost of the Ringtail program was more than $100,000 and included the purchase of the application, the initial and upgrade installations, individual licences for 64 users, annual maintenance agreements, and training for the system administrators and users. The vast majority of documents imported into the program were provided in Ringtail format by the Department of Justice. About 1.5 percent of the documents were provided by other participants, and the conversion to a Ringtail format added approximately $30,000 to the cost.

Three staff members were responsible for providing administrative support for the Ringtail application, and during the first few months, their combined time easily exceeded that of a full-time position. Their tasks included managing two separate databases, assigning licences to users, providing help-desk support for internal users and reviewers of participants' documents, troubleshooting problems, importing documents into the two databases, and managing the production of Ringtail documents for the participants.

The help-desk support provided by FTI Consulting was very good to excellent and, for the most part, was delivered in a timely manner. A log record of all the help-desk issues was shared among the administrators. As users became comfortable with the program, the demands on its administrators dropped off appreciably.

In addition to the management of the Ringtail disclosure document system, the Commission set up an internal system to manage all the non-disclosure documents it received. These documents

consisted of correspondence, facsimiles, emails, reports, CD-ROMs, DVDs, and electronic files. The document manager received and kept all the documents and circulated copies as appropriate. A record of the documents was entered in a database, with hard copies stored in the secure file room. A record of all outgoing Commission correspondence was kept by the document manager and included in the database.

Public forums

I held public forums in 10 communities throughout the Fraser River drainage basin and in coastal centres involved in the sockeye fishery (see Appendix C). Their purpose was to receive public input on the issues identified in the Commission's mandate. Summaries of the presentations from each public forum were made available on the Commission's website.

Public Forum, Lillooet, BC, 2010

More than 600 people attended the forums, and 109 people made oral presentations. As noted in the Commission's Interim Report, all the presenters spoke passionately about the importance of the Fraser River sockeye fishery. Commission staff reviewed the presentations, which helped to inform the Commission's work and which I considered in writing this Report.

Table 3.5.2 sets out the date and location for each of these forums.

Table 3.5.2 The Commission's public forums

Date	Location
August 18, 2010	Lillooet
August 25, 2010	Campbell River
September 1, 2010	Prince Rupert
September 13, 2010	Steveston
September 14, 2010	Nanaimo
September 16, 2010	Victoria
September 20, 2010	New Westminster
September 23, 2010	Prince George
September 29, 2010	Chilliwack
October 21, 2010	Kamloops

The forums were informal sessions that provided an opportunity for community members to share their views on the Commission's mandate. The seating for each forum was arranged in a circle, and attendees were given the opportunity to speak from their seats or from the podium. I chaired the forums from a small table next to the podium, both set inside the circle. Most of the presenters (see Appendix C) spoke from the podium, and many used PowerPoint to support their presentations.

A pre-registration application, available on the website, was used by most presenters. Time permitting, any attendee was given the opportunity to make a presentation. Presenters were usually given 10 minutes and, for the most part, finished within this time limit. Subject to the time available and the number of speakers, some extensive presentations were allowed more time. Written material provided by presenters was posted on our website as a public submission. A short summary of the key points of each presentation was also placed on our website.

Each forum began with a welcome from an elder from the local First Nations community. This welcome was followed by a short video produced by the Commission which explained our purpose and our mandate.* I invited presenters to appear in the order in which their materials had been received by the Commission. Consistent with the requirement to conduct our affairs according to the *Official Languages Act*, simultaneous French translation services were provided at all forums.

* The video is available on the DVD accompanying this Report.

Site visits

I visited 14 sites in the Fraser River watershed and on the migration routes of Fraser River sockeye in the same general areas as the public forums. Locations included First Nations fishing sites; a land-based aquaculture facility; net-pen fish farms, hatcheries, and spawning grounds; counting stations on the Fraser River; a cannery; fishing museums; and a pulp mill. Many of the site visits had limited capacity and were typically restricted to one or two Commission staff, one media representative, and two video-recording personnel. A video of each site visit was prepared and made available to any participant who wanted a copy. The site visits provided a context for information I would receive over the coming months. Table 3.5.3 sets out the date, location, and description of each of these site visits.

Commission staff are grateful to the many people who assisted with the site visits, along with various organizations. Together with the public forums, these events deepened my understanding of different aspects of the Fraser River sockeye fishery.

Dip net fishing on the Fraser River, BC, 2010

Written public submissions

To enable members of the public to participate in the Inquiry, the Commission accepted written public submissions through our website from March 2010 to October 3, 2011 (the end of the evidentiary hearings). When the Commission added additional hearing days on the infectious salmon anemia virus (ISAv), the public submission process was reopened in November 2011 and lasted until December 20, 2011. Written submissions also came from the public forums held in 2010. In total, the Commission received 892 relevant and appropriate written submissions from members of the public. All these public submissions are summarized and posted in full on our website. A list of the submitters can be found in Appendix D.

A concerned and engaged public embraced the opportunity to express opinions to me through

Table 3.5.3 The Commission's site visits

Date	Location	Description
August 12	Mission / Agassiz	• Traditional native fishery at Cheam Beach • Mission hydroacoustic station • Inch Creek hatchery • Swift Aquaculture (land-based aquaculture facility)
August 19	Lillooet	• First Nations fishery on the Bridge River
August 19	Yale	• Qualark hydroacoustic monitoring site
August 26	Campbell River	• Marine Harvest salmon fish farm
September 1	Prince Rupert	• North Pacific Cannery Heritage Museum
September 2	Prince Rupert	• Canadian Fishing Company Cannery
September 13	Steveston	• Gulf of Georgia Cannery National Historic Site
September 23	Prince George	• Northwood Pulp Mill
September 29	Maple Ridge	• Alouette sockeye reanadromization project
October 21	Harrison Mills	• Weaver Creek spawning channel
October 22	Kamloops	• Adams River salmon run

these processes. Many submissions were lengthy documents presenting scientific, political, or historical information about salmon habitat, research, cultural significance, or other related issues. Many more submissions were brief expressions of opinion, which offered me a useful snapshot of public thought on several issues.

Although submissions came in continually, we received submissions in larger numbers when the Commission undertook public activities or when it was receiving a good deal of media coverage. At the time of the initial hearings in June 2010, we observed a spike in the number of submissions, as we did again when the Commission held public forums from August through mid-October 2010. Another spike occurred when evidentiary hearings began in late October 2010. The Commission received less media coverage during the winter and spring months of 2011, and public submissions declined during that time.

When the Commission resumed hearings in August 2011 after a summer recess, we began hearings on disease and aquaculture, both of which garnered much media and public interest. During the final two months of public hearings, the numbers of public submissions spiked, with most submitters commenting on those topics. When the public submission process was reopened for several weeks for the December 2011 hearings, I received an abundance of submissions, primarily on salmon farming and with comments on the process undertaken by the Commission for those hearings (see Figure 3.5.1).

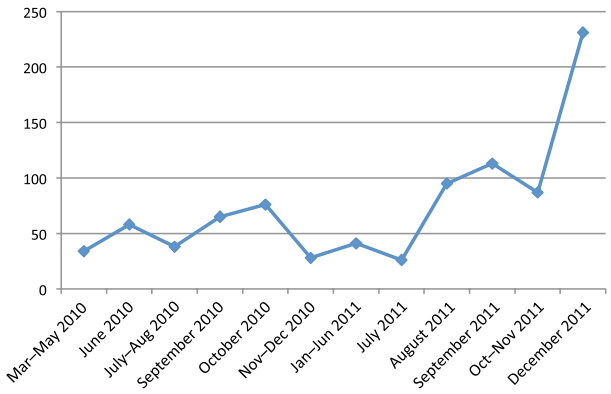

Figure 3.5.1 Number of public submissions by date

Public submissions covered most of the topics discussed in this Final Report, though some topics generated more submissions than others (see Figure 3.5.2). The largest number of submissions was on the topic of salmon farms. I also received a great number of submissions discussing my mandate and the manner in which I would be conducting the Inquiry. Many submitters had comments or information about specific habitat issues; others made comments about the roles and responsibilities of DFO; and some had much to say about management of the sockeye fishery. Although a large number of oral presentations at the public forums focused on Aboriginal history and rights, the Commission received fewer written presentations on these topics. Similarly, we heard more about commercial fishing at public forums, and less in written submissions.

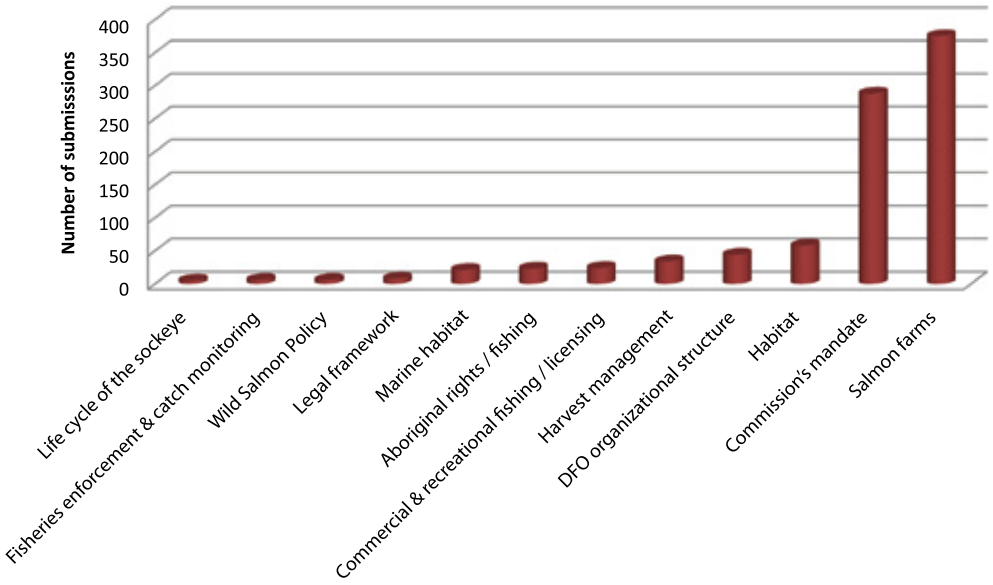

Figure 3.5.2 Public submissions by theme

I appreciated all the submissions we received, both at the public forums and in written form through our website. They were reviewed by Commission staff and form part of the body of evidence I used to make findings of fact and recommendations, as evidenced in this Report. I respect the passion of British Columbians and the depth of their experience and knowledge. Their participation helped me to understand the situation facing Fraser River sockeye and the impact of this important resource on the entire province.

Hearing process

Hearings were carried out over a 15-month period. The testimony of witnesses and the exhibits filed during the hearings were the primary source of evidence I considered for this Report. The following information provides a brief glimpse into how the hearings were conducted.

Hearing-room facilities

The Federal Court operates a number of courtrooms at 701 West Georgia Street, across from our offices. One of these rooms is large enough to accommodate 20 or more counsel, an interpretation booth, and an audience capacity of at least 120 people. We were fortunate to be able to use it for virtually all our hearings. On the same floor as the courtroom are rooms that we used for office services and for me, Commission counsel, participants' counsel, witnesses, and a media centre.

The courtroom was equipped with telephone and Internet ports. A wireless router, connected to the Internet port, provided direct cable connections for the Commission's support staff and for transcription staff, and wireless connections for me, counsel, and, eventually, members of the audience. This approach enabled staff to access Ringtail documents from the Commission's server and to send images to monitors and two data projectors. Monitors were strategically placed for me, counsel, Commission staff, witnesses, media, transcribers, and interpreters. Two data projectors provided the audience with a view of the displayed information.

Exhibits were posted on our website as soon as possible after being entered. In some cases, the sheer volume of exhibits made it impossible for staff to keep pace, and it took a few days for them to catch up. All exhibits were eventually posted to the website and were available to the public on an ongoing basis.

Occasionally, witnesses from distant locations were called to testify at the hearings. These witnesses were linked to the courtroom via Skype and a telephone conference unit in the courtroom. This approach saved travel time and expense and provided an effective mechanism for introducing evidence from these witnesses.

Commissionaires, and occasionally members from the BC Sheriff Services, provided security services. During periods of high interest, the Commission set aside and monitored reserved seating for participants.

Identification of issues

The Terms of Reference required the Commission to assess previous examinations, investigations, and reports relevant to the Inquiry; to consider the responses of the DFO and the government; and to file an Interim Report by August 1, 2010, later extended to October 29, 2010. On that date, I submitted my Interim Report, *Fraser River Sockeye Salmon: Past Declines. Future Sustainability?*, to the Governor in Council. that report includes my preliminary views on and assessment of previous examinations, investigations, and reports that I considered relevant to the Inquiry, along with the government's responses.

The Terms of Reference and this review identified many issues the Inquiry needed to consider. Commission counsel and staff, with input from the Science Advisory Panel, developed a draft discussion paper that included a list of issues to be considered. The Commission circulated that draft to participants for their comments. The final discussion paper, which was made public, provided an outline for the Commission for the conduct of the Inquiry.

Commission counsel prepared a list of themes and developed a hearing schedule for examining them. Detailed hearing schedules listing planned witnesses and outlining topics

Table 3.5.4 Themes covered in Commission hearings, in alphabetical order

Theme	Days of Hearings
Aboriginal fishing	7
Aboriginal world view, cultural context, and traditional knowledge	3
Advice to the minister regarding sockeye returns in 2009	1
Aquaculture	9
Commercial fishing	7
Conservation, sustainability, and stewardship	2
Cultus Lake – SARA listing decision	3
Cultus Lake – recovery efforts from 2005 onward	2
Cumulative impact assessment	2
DFO priorities and summary	5
DFO's organizational structure	4
Diseases	4
Effects on habitat in the marine environment	5
Effects on the Fraser River watershed – gravel removal	2
Effects on the Fraser River watershed – logging	1
Effects on the Fraser River watershed – municipal wastewater	2
Effects on the Fraser River watershed – pulp and paper effluent, mining effluent	1
Effects on the Fraser River watershed – urbanization	3
Examination on scientific reports: Project 10, Fraser River Sockeye Production Dynamics	2
Examination on scientific reports: Project 12, Fraser River Sockeye Habitat Use in the Lower Fraser and Strait of Georgia	2
Examination on scientific reports: Project 2, Potential Effects of Contaminants on Fraser River Sockeye Salmon	2
Examination on scientific reports: Project 3, Evaluating the Status of Fraser River Sockeye Salmon and the Role of Freshwater Ecology in Their Decline	2
Examination on scientific reports: Project 7, Fraser River Sockeye Fisheries and Fisheries Management and Comparison with Bristol Bay Sockeye Fisheries	2
Examination on scientific reports: Project 9, A Review of Potential Climate Change Effects on Survival of Fraser River Sockeye Salmon and an Analysis of Interannual Trends in En Route Loss and Pre-spawn Mortality	2
Fisheries monitoring and enforcement	4
Fraser River sockeye life cycle	1
Habitat enhancement and restoration	1
Habitat management and enforcement	5
Harvest management	19
Hydroelectric power, water flow, and temperature	2
Pacific Salmon Commission and the Pacific Salmon Treaty	2
Perspectives on the Aboriginal and treaty rights framework underlying the Fraser River sockeye salmon fishery	1
Predation	3
Recreational fishing	3
Wild Salmon Policy	14

were circulated two or three weeks in advance of each block of hearing and revised as needed. The hearings coordinator provided daily updates throughout the hearings process, including a summary of the current day's activities and the proposed activities for the next day.

Commission counsel met with participants' counsel regularly throughout the life of the Commission to discuss procedural issues and concerns. I did not participate in these meetings.

Between October 2010 and September 2011, I heard 125 days of evidence, including testimony from 172 witnesses (see Appendix E) and information provided in 1,993 exhibits. The themes covered by the evidentiary hearings are listed alphabetically in Table 3.5.4, along with the number of days (or partial days) on each theme.

From November 4 to 10, 2011, I heard five days of final oral submissions from participants. Because the Federal Court facility was not available, I heard these submissions in the 12th-floor hearing room of the BC Securities Commission, in the same building as the Federal Court. This room cannot accommodate many observers, so the Commission arranged for audio broadcast of the hearings in both English and French through a link on the Commission's website.

In October 2011, new information came to light regarding testing for the infectious salmon anemia virus (ISAv) in wild sockeye salmon. To deal with this additional information, I added three days of evidentiary hearings from December 15 to 19, 2011, at the Asia Pacific Hall at the Morris J. Wosk Centre for Dialogue, 580 West Hastings Street, in Vancouver. These hearings included testimony from eight witnesses and an additional 152 exhibits.

In total, the Commission held 128 days of evidentiary hearings over 15 months. We heard from 179 witnesses and entered 2,145 exhibits. Exhibits and transcripts of the oral testimony were posted on the Commission's website. All transcripts, along with exhibits referred to in this Report, are on the DVD accompanying this Report.

The calendar on the Commission's website listed each hearing day, showing the witness(es) who appeared (see Appendix F) and the exhibits that were entered. Transcripts were also posted for each hearing day once they were translated, which generally took about two weeks.

Rules of procedure

Under the authority of the *Inquiries Act* and the Commission's Terms of Reference, the Commission developed rules for the conduct of the Inquiry. I adopted two sets of rules: one covering applications for standing, and the other to guide the Inquiry process. Commission counsel circulated the Rules for Procedure and Practice to participants for review and comment before I formally adopted them. The rules allowed for revisions, of which there were two during the Inquiry: one to clarify the process for bringing applications, and one to clarify the process whereby participants could bring forward expert reports. The Rules of Procedure and Practice are included on the DVD accompanying this Report.

Preparing and calling evidence

As discussed above, Commission counsel were responsible for presenting all material evidence at the Inquiry, without advancing any particular interest. Therefore, the Rules did not restrict Commission counsel in the introduction of evidence, and Commission counsel both led direct evidence and cross-examined witnesses.

Commission counsel determined who would be called as witnesses for all hearings and invited participants to suggest potential witnesses. Under the Commission's Rules of Procedure and Practice, participants were entitled to apply to the Commissioner to call any witness whom Commission counsel declined to call, although such applications were rare.

Before being selected, prospective witnesses were interviewed by a Commission counsel team consisting of the senior counsel or an associate counsel, a junior counsel, and perhaps a document reviewer / legal researcher who provided support to the team. (Document reviewers / legal researchers were law students, recent graduates of law programs or lawyers who had recently been called to the bar.) In many cases, witnesses were accompanied by legal counsel, typically a participant's counsel. For the most part, interviews were conducted in face-to-face meetings in the Commission's offices, though, occasionally, the Commission team met the interviewees

in their home community. In a few instances, interviews were conducted through conferencing facilities, including video-conferencing facilities arranged by the Department of Justice for federal witnesses.

Commission counsel conducted 380 interviews of prospective witnesses in preparation for the evidentiary hearings. Many of the interviewees were current or former employees and managers from DFO, while others were commercial and recreational fishers, environmentalists, members of First Nations, scientists and academics, and consultants.

Before the start of a new topic at the hearings, Commission counsel circulated to all participants a summary of the anticipated evidence of each witness, an electronic "binder" of the documents that Commission counsel considered to be potentially useful to the topic, and a list of documents that Commission counsel intended to ask the witness to identify.

Given our time constraints, Commission counsel used several time-saving methods for entering evidence. They entered the evidence of a number of witnesses by way of affidavit: on some occasions, the affidavits represented a witness's entire evidence; on others, the affiant attended the hearing to provide additional testimony and for cross-examination. Generally, the questions and the answers were set out in exhibits to the affidavit. For some witnesses, time ran out before all counsel had completed their examination. In such cases, Commission and participants' counsel (see Appendix G) posed the remaining questions in writing. Where questions were completed in writing, the questions and answers were entered as exhibits.

Panels of witnesses were used for most of the oral testimony. The panels consisted of two, three, or four witnesses who could speak to the issue under discussion, with the witnesses often representing divergent perspectives. Panels at times included witnesses participating by video link. The panel members gave evidence and were cross-examined. This approach allowed me to hear from many more witnesses than would have been possible if they had all been called individually, and it allowed for an exchange among the witnesses – often permitting them to discuss one another's comments and reconcile their views in a way that was helpful to my mandate to encourage broad co-operation among participants.

Technical reports

As discussed above, commission counsel entered 15 technical reports into evidence at the hearings and called their authors as witnesses. Summaries of these reports are found in Volume 2, Appendix B. The full reports are available on the Commission's website and are also included on the DVD accompanying this Report. The technical reports were not advanced by Commission counsel to support a particular interest but, rather, to provide me with the authors' technical expertise. The authors were subject to cross-examination by Commission counsel as well as by participants' counsel. Before testifying, a number of the authors corrected, clarified, or expanded their reports on errata sheets, which were marked as exhibits along with the reports.

Policy and practice reports

To provide background on uncontroversial matters for me and the participants, Commission counsel prepared policy and practice reports (PPRs). These reports were developed through Commission counsel's review of documents and interviews of witnesses on the policies and practices of DFO. A list of the PPRs is included in Volume 1, Appendix E, and the full PPRs are available on the website and included on the DVD accompanying this Report.

The PPRs were circulated to all participants in advance of the hearing on the topic covered. They were marked and entered into the record as PPRs rather than as exhibits, and I considered them and the documents referenced in them in the preparation of my Report. Participants were able to challenge information contained in the PPRs through witness examination. In addition, participants were invited to make submissions on the content of the PPRs. Initially, these submissions were received at the beginning of the hearing topic and appended to the PPRs. However, this process quickly became unwieldy, and participants were asked instead to include any submissions on the PPRs as part of their final submissions.

Expert witnesses

Many witnesses were experts in a field of study or work and were qualified as such in the hearings. The authors of the technical reports were called as expert witnesses to address their findings. The preparation process for expert witnesses followed the same process used for all witnesses.

In addition to the technical reports prepared at the request of the Commission, some participants had their own expert reports prepared. Notice of such reports had to be given to Commission counsel for consideration 45 days before the start of the relevant hearing topic. Several such expert reports prepared on behalf of participants were entered as exhibits, and their authors were called as witnesses. If Commission counsel was not persuaded to enter the report, the participant could apply to me for a ruling on the admission of the report.

Limits on examinations by participants

This Inquiry covered a vast number of complex issues, many of which could be the subject of their own inquiries. Completing the hearings in a timely way was very important and required discipline on the part of counsel. In order to try to manage the available time for each hearing topic, Commission counsel canvassed participants' counsel in advance to understand which witnesses they were interested in examining and how much time they felt they would need. Commission counsel then attempted to allocate the available time fairly among the parties. In many instances the requested time exceeded the available time, and participants' counsel were asked to adjust their requests. Ultimately, a schedule of estimated time allocations was prepared for each day, and as the day progressed, Commission counsel refined allocations in an attempt to be fair to all participants.

Hearings logistics

The hearings coordinator was generally responsible for the day-to-day operations of the hearings. One of his key responsibilities was to manage the exhibit process, which was entirely electronic. A registrar assisted in the swearing in of witnesses and in keeping records of daily activities. The registrar, a former employee of the Federal Court Administration Services, also served as the Commission's liaison to that group. His knowledge of the personnel, the policies and practices, and the facilities was a significant factor in the smooth functioning of the hearings.

Daily transcripts were prepared and delivered to the Commission the morning following the hearing. They were circulated to participants' counsel electronically on a confidential basis until they were translated and posted on the Commission's website. The transcripts were also imported into Ringtail, where they were searchable along with all the other disclosed documents.

All 2,145 exhibits were made available to the public through the Commission's website. Those referred to in this Report are on the DVD accompanying this Report.

The Canadian Broadcasting Corporation (CBC) installed cabling from the courtroom to a separate media room and supplied a video media box that permitted other members of the media to access the video feed. A monitor set up in the media room allowed individuals there to see the documents as they were presented in the courtroom. Commission staff also installed audio-feed boxes for both English and French to allow the media to make audio recordings. Although media networks video recorded only a limited number of sessions, a documentary video producer recorded all the hearings and made his signal available to the media through the CBC's cabling and equipment.

Media interest in the hearings varied greatly, with some hearing days having a few reporters and others having a large number. An online media site attempted to provide an audio webcast of the August 2011 aquaculture hearings. Although the webcasts were successful for a few days, technical issues prevented the site from continuing the service.

The only camera that I permitted in the courtroom was the one video camera described above. On several occasions, I permitted a brief photo opportunity during a break in the proceedings for still and video news cameras.

The Commission's director of communications or her assistant was in the courtroom facility on most

hearing days to monitor the use of the media room and respond to reporters' requests for information.

The new media presented challenges for our communications team, as bloggers and other non-accredited media requested access to services normally provided only to accredited media. Ultimately, because non-accredited media were able to attend hearings, view exhibits, and have complimentary Internet access, Commission staff decided that media facilities would be limited to accredited media.

The Federal Court requires that access to its facility be controlled. When the hearings were in session, therefore, a commissionaire provided basic security for the facility, helped give directions, and took care of items that were prohibited in the courtroom. During some hearing days, when large crowds were anticipated, the Commission arranged for the BC Sheriff Services to have one or two sheriffs in attendance, or for the BC Corps of Commissionaires to provide additional commissionaires to monitor activities in the courtroom.

Participants

Shortly after selecting most of my counsel team, we addressed the matter of selecting individuals and organizations with an interest in the mandate of the Commission. The counsel team prepared Rules, a Notice, and Guidelines for Standing and Funding. The Commission invited participation by the following media release:

> The Cohen Commission invites interested persons (individuals, groups, governments, agencies, institutions, or other entities) to apply for standing in the inquiry. Detailed information is available on the "Standing and Funding" page at the Cohen Commission's website.

The Commission received 50 applications for standing from individuals, organizations, and coalitions. We were concerned that the hearings process could become unwieldy with such a large number of participants, so to make our work more manageable and efficient, Commission counsel asked those seeking standing to explore whether they could share a grant of standing with others. Commission counsel also contacted several applicants directly to explore the possibility of participant coalitions. I appreciate the substantial level of co-operation among participants in their willingness to share grants of standing. As a result of these discussions and after identifying common and shared interests, I granted standing to 20 participants, or participant groups comprising associations, organizations, Aboriginal bands and organizations, and governments. The Government of Canada was granted standing without application. Shortly after the start of the hearings, one of the groups within a coalition requested separate status as a participant because of a difference in interests. Following a review of its submission, I granted this group separate participant status, bringing the total number of participants to 21. A list of the participants is included in Appendix H. During the course of the Inquiry, one or two participants withdrew from their participant groups owing to financial burdens.

Funding for participants

The Terms of Reference authorized me to recommend to the clerk of the privy council that participants be funded – to ensure the appropriate participation of any person granted standing at the Commission to the extent of the person's interest and in accordance with the terms and conditions approved by the Treasury Board – if I was of the view that the person would not otherwise have been able to participate in the Commission. The terms and conditions of the Contribution Program provide for the following participant funding:

> Eligible expenditures are restricted solely to legal costs, including disbursements and inter-city travel expenses incurred by counsel, subject to the maximum aggregate number of hours recommended by the Commissioner and approved by the Clerk of the Privy Council, and the limits set out herein. Any other types of costs incurred by a Recipient are excluded.

Participants requesting funding applied to me for a recommendation. They were required to support

their applications with affidavits setting out facts demonstrating that they did not have sufficient financial resources to participate in the work of the Commission without financial assistance for legal counsel.

Commission counsel reviewed the applications for assistance under the Contribution Program, and I accepted some participants for the Contribution Program on the basis of their initial submissions. After I asked others to provide additional information and justification, a few more groups were accepted. Finally, I held hearings where participants whose applications I had not yet accepted had the opportunity to present evidence and arguments to support their need for funding assistance. Initially, I recommended that 14 participants receive assistance under the Contribution Program.

In preparing funding recommendations, I bore several considerations in mind. For example, the Commission's approach was to look to junior counsel for much of the preparation work, but to increase the proportion of funding for attendance at hearings by senior counsel. The funding recommendations reflected that Commission counsel have the primary responsibility for representing the public interest, including being responsible for document review and for organizing and leading all the evidence at evidentiary hearings. Participants' counsel were expected to attend hearing days and examine witnesses when their client's interests, as set out in the Standing Ruling, were directly engaged.

The process for being approved for funding under the Contribution Program included the following steps. Once a participant was accepted for consideration, a small team of the Commission counsel reviewed each applicant to determine its areas of interest in the Inquiry and how many days of hearings were anticipated for each area of interest. They established some basic hours for attendance at hearings, preparation for hearings, meetings, and other typical activities, which were distributed by formula to the senior and junior counsel. The counsel team then proposed a recommendation for my approval, based on this formula for each participant. I reviewed these suggestions and, following adjustments, provided a recommendation to the clerk of the privy council for approval.

Commission counsel informed participants of the approved funding under the Contribution Program. The approved funding and the formula are found in the Rulings section on the DVD accompanying this Report.

Once my recommendation had been approved and communicated to the participants, Commission staff prepared a retainer agreement which was executed by the participant and the Government of Canada. That agreement set out the terms and conditions of the Contribution Program agreement and the funding requirements for the participant. In the case of coalitions, the retainer agreement required each group to designate an individual recipient who would represent the participant group. Following the signing of the retainer agreement, the recipient signed the contribution agreement, which identified the counsel and provided a breakdown of approved hours for the activities detailed in my recommendation.

Throughout the Inquiry, conditions changed, interests expanded, and participants sought amendments to their Contribution Program agreements. Counsel for participants submitted applications, which I reviewed with staff and counsel. I prepared recommendations and forwarded them for approval by the clerk of the privy council. All approved changes required amendments to the retainer agreement.

The Contribution Program is a positive feature of federal inquiries because it allows for the full participation of those who have been granted standing but lack the financial means. Following the completion of the hearings, the Commission and PCO undertook a detailed evaluation of the program, with the intent that it will be considered when the terms and conditions of the Contribution Program are established for future inquiries by the Treasury Board.

Participants' roundtable

Near the end of the evidentiary hearings schedule, Commission counsel invited participants to attend two days of discussions to determine if there was any common ground among them that might be reflected in joint final submissions to me on possible recommendations. I did not participate in these discussions.

Final submissions and replies

Following the close of evidentiary hearings, the participants provided their final written submissions. Written replies by the participants were sent a few days before the presentation of final oral submissions. Owing to the number of participants, Commission counsel set the order of presentations and time limits for the oral submissions; however, consistent with their neutral role, Commission counsel did not make submissions on substantive issues.

As a result of information relating to ISAv, which came to light only at the very end of the evidentiary hearings, I convened a further few days of hearings to address that issue after final oral submissions. Participants were invited to provide further written submissions following those hearings.

Rulings

During the Inquiry, I made 44 rulings or recommendations for funding. They included the initial Ruling on Standing and several amendments to it. All told, there were nine Contribution Program recommendations. The List of Rulings appears as Appendix I, and the rulings are also found on our website and included on the DVD accompanying this Report.

Status reports

The Commission produced five status reports, which provided general information about its main activities during a specific time frame. Status reports were released in March 2010, July 2010, January 2011, April 2011, and October 2011. These reports are included on the DVD accompanying this Report.

Media / public relations

The mandate of my Inquiry was of interest to many groups and individuals, especially on the West Coast, and I wanted to ensure that the public was kept well informed of our activities. I appointed a director of communications and gave her responsibility for many media-related tasks, among them preparing and monitoring media releases, preparing status reports for government and the public, managing the website, and providing general support and advice on all communications issues. Our website became our primary vehicle for keeping the public informed of and involved in the challenges facing our Inquiry.

I agreed with Commissioner Bellamy that it was not wise for the commissioner to serve as the spokesperson for a commission. I therefore appointed the senior Commission counsel to be our primary spokesperson, especially for dealing with sensitive issues. The director of communications served as the spokesperson for addressing specific information needs and routine process issues, and the fisheries research consultant for matters of a scientific or research nature.

Website

As noted, our website was the primary tool for communicating with the public. The requirement to have a bilingual website meant that the information placed on it was not always "breaking news," given that the need to translate all Commission-generated documents delayed their posting for a day or two, and for up to one or two months for large technical documents. We hosted both English and French websites, which were cross-linked. The home page of our websites featured the introductory video, originally produced for the public forums, which explained my mandate and the role of the Commission.

The Calendar and Transcripts section provided a rolling two-month, colour-coded calendar identifying activities such as the public forums and the hearings schedule, which is available in Appendix F. For each hearing day, the location, time, theme, and list of witnesses were provided. Links were included for transcripts and exhibits. Exhibits were posted in the language in which they were received; however, the transcripts required translation, delaying their posting by one or two weeks.

The Hearings section included links to the 2,145 exhibits, 21 policy and practice reports, submissions from the participants, witness lists, list of participants and their counsel, and Rules for Procedure and Practice. Information on the Standing and Funding procedures for

participants was also found in the Hearings section. Links to the Rules, Notice and Guidelines for Applications for Standing and Funding, Terms of Reference, and Contribution Program were also included.

In the Reports and Publications section, we posted reports prepared by the Commission, including the

- discussion paper that outlined the themes to be investigated by the Commission;
- Interim Report, *Fraser River Sockeye Salmon: Past Declines. Future Sustainability?*
- 21 policy and practice reports;
- 15 technical reports; and
- five status reports on the progress of our Commission.

The website will continue to be available through Library and Archives Canada.

All my recommendations for the Contribution Program and my formal decisions or rulings were accessible on the Rulings page. Communications from the clerk of the privy council in response to my recommendations and rulings were also included on this page.

The Media section provided links to news releases, backgrounders, and the Commission's media contact. High-quality photos of me, senior Commission counsel, and the research director, as well as a map of the Fraser River basin, were made available for media use.

The Public Forums section included a schedule for the public forums and an online interactive registration form for anyone interested in making a presentation to me.

The Public Submissions section allowed individuals to enter their submission directly online or to attach it in a common electronic format. Submissions were searchable by submission number, date, author, and content.

Translation services

Throughout the initial two years of the Commission, the primary provider of translation services for print material was the Translation Bureau in Ottawa. In addition, the Commission contracted with local translators familiar with reports for federal commissions of inquiry to handle brief items and items requiring a fast turnaround.

The Translation Bureau provided most translations, but turnaround time was an issue. In addition, the cost of using this service was about twice as much as employing local translators, although there were benefits in that the bureau could handle the high volume of work that came up during our hearings, with reports, transcripts, and other documents all needing translation at the same time. I suggest that future federal commissions clarify any contracts with the Translation Bureau to ensure that the commission retains ownership of intellectual property, including any databases or lexicons developed by the bureau in doing the commission's work.

The turnaround time for translating the Final Report into French was a concern since the Report was anticipated to be a voluminous document. Owing to time pressures, I decided to appoint a team of local translators, including translators from the Translation Bureau, to translate my Final Report. This in-house arrangement shortened the period for translation. The translators worked closely with the writing and editing teams to make the needed changes to the French version, because changes were being suggested and included in the English version of the Final Report.

Report production

The Commission's policy counsel drafted the Commission's Interim Report under my direction. He developed an outline for the Final Report and, collegially with the other members of the Inquiry team, drafted the Final Report. I reviewed these drafts with members of the legal team, the research team, and senior members of the staff. An editorial team provided editorial support for the two major reports of the Commission. The editors did two rounds of editing and completed a full review of the final document before it was approved for printing. I reviewed their edits and suggestions with Commission counsel. A proofreader was retained to complete two rounds of proofreading following the editing process, and Commission counsel, staff, and I reviewed and considered her suggestions.

Our translation team translated, edited, and proofread the two reports. A number of reviewers also reviewed and proofread the translations before layout.

We appointed a local firm to design and handle the layout of the reports. This work was reviewed by me and the Commission's writing team. Once all reviews had been completed and final corrections made, the documents were forwarded to an Ottawa-based printer. Printing the reports in the area where most of the copies would be distributed seemed the most cost-effective option, given the weight of the documents.

The distribution of printed reports of federal commissions is limited to members of Parliament, relevant departments, members of the press gallery, and people directly involved in the inquiry. The primary access for the public is through our website. Printed copies of the Interim Report and Final Report are also sold by Publishing and Depository Services, Public Works and Government Services Canada, and local booksellers.

To supplement the written reports, the Commission prepared a DVD of resource materials for the reader. This DVD contains the Terms of Reference, the Final Report, the Interim Report, relevant statutes, the transcripts, the exhibits cited in the Report, the 15 technical reports, the 21 policy and practice reports, and the recommendations summary of previous reports and responses. A CD-ROM version was prepared for the Interim Report.

Archives

Following the submission of my Final Report, the Commission staff will prepare all records for archiving. This task was initiated in the early days of the Commission, and before the Commission office closes, all materials will be ready for submission to PCO for transmittal to Library and Archives Canada.

The manager of documents and records was responsible for the collection and custody of these records in both electronic and hard-copy formats. Most of the Commission's records were in an electronic format, which was also acceptable for archival purposes. All electronic material was kept within a Microsoft Access database that made retrieval reasonably easy both during the existence of the Commission and after it completed its work.

A major undertaking was the archiving of the Ringtail databases. Because each participant's Ringtail database was treated as confidential to that participant, the Commission contracted with CWL to prepare two copies of the database. One copy was stripped of any notes or comments that participants made during the Inquiry. This database was forwarded for archiving, subject to the normal tests for confidentiality and access to information rules. The second database, a complete database of the participants' records, was delivered to Library and Archives Canada with the proviso that it may contain client-solicitor privileged information and is to be accessed only by me or my senior Commission counsel. The Commission's database was also saved in the same formats with the same proviso.

One of the participants had been provided a copy of the Ringtail database for installation on its in-house litigation software. This database was transferred to the Commission on a password-protected hard drive and then forwarded to Library and Archives Canada with the same proviso that it was to be accessed only by me or senior Commission counsel.

Dismantling of the Inquiry

PCO provided my staff with a copy of the directive to wrap up the Commission. As noted above, the records for the Commission were forwarded to PCO for transmittal to Library and Archives Canada. All the information technology equipment and software are to be dismantled, packed, and shipped to PCO. Before computers are dismantled, all desktop and laptop hard drives will be erased. Hard drives from copiers are to be removed, erased, and forwarded to PCO.

The furniture and other surplus equipment are to be transferred to Crown Assets Disposal as surplus furnishings and equipment.

In concluding its operations, the Commission requested all participants, contractors, and staff to destroy all Inquiry-related confidential information in their possession and to confirm in writing that they had complied with this request.

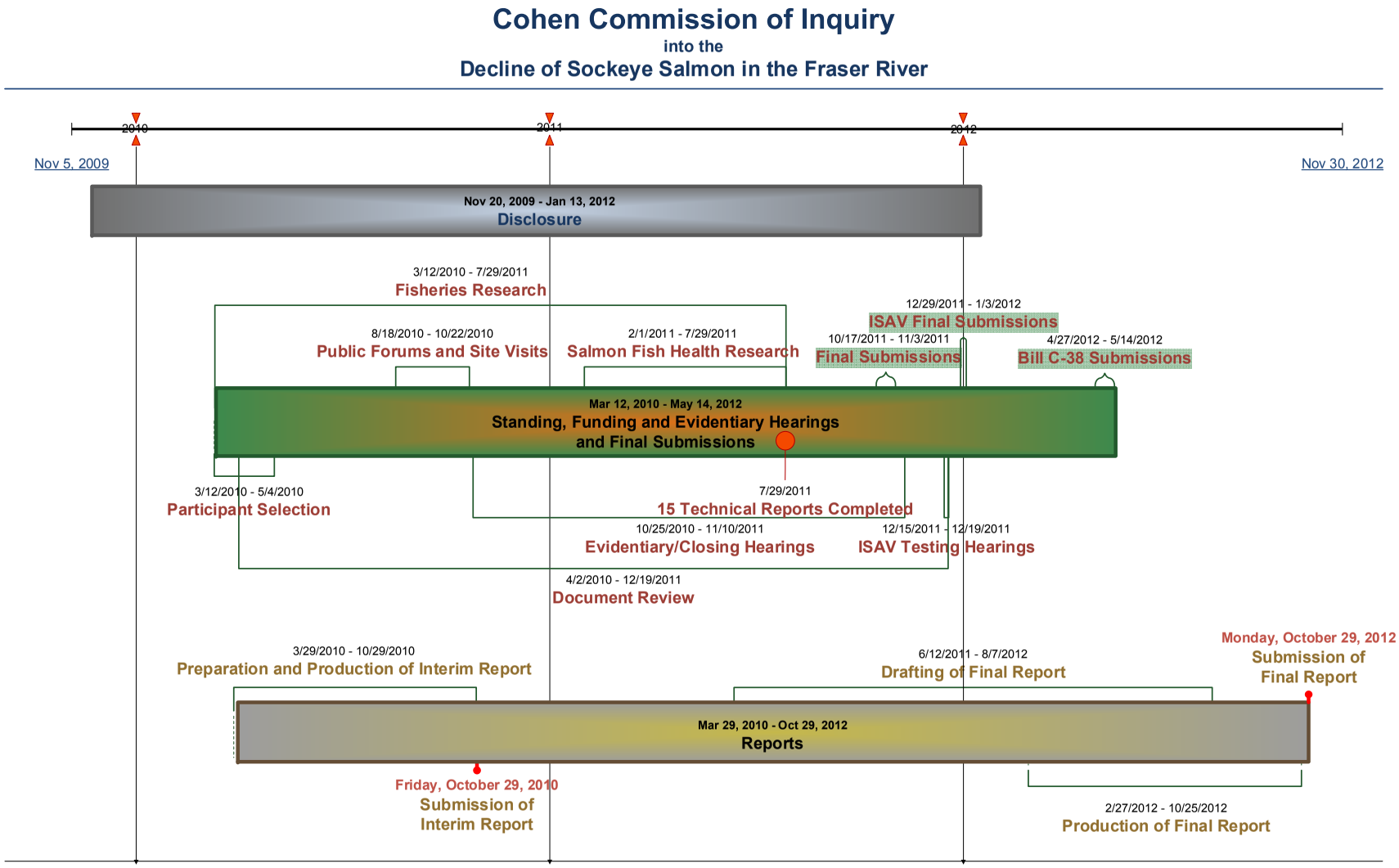

Figure 3.5.3 Cohen Commission timeline

Notes

1 Ontario, *Report of the Walkerton Inquiry: Part One, The Events of May 2000 and Related Issues* (Toronto: Ministry of the Attorney General, 2002) (Commissioner Dennis R. O'Connor), 472.

2 Canada, Commission of Inquiry into Certain Allegations Regarding Business and Financial Dealings Between Karlheinz Schreiber and the Right Honourable Brian Mulroney, Report (3 vols., Ottawa: Ministry of Public Works and Government Services Canada, 2010) (Commissioner Jeffrey J. Oliphant).

3 Toronto Computer Leasing Inquiry / Toronto External Contracts Inquiry Report (4 vols., Toronto, 2005) (Commissioner Denise Bellamy). Ontario, Inquiry into Pediatric Forensic Pathology in Ontario, Report (4 vols., Toronto: Ministry of the Attorney General, 2008) (Commissioner Stephen T. Goudge). Ontario, Report of the Walkerton Inquiry (2 vols. and summary, Toronto: Minister of the Attorney General, 2002) Commissioner Dennis R. O'Connor).

4 Ed Ratushny, *The Conduct of Public Inquiries: Law, Policy, and Practice* (Toronto: Irwin Law, 2009), 215.

5 Simon Ruel, *The Law of Public Inquiries in Canada* (Toronto: Carswell, 2010).

Acknowledgements

I express my appreciation to those former commissioners of public inquiries who so graciously and unstintingly provided me with information and assistance, based on their wealth of experience. They include Justices Denise Bellamy, Stephen Goudge, Dennis O'Connor, and Jeffrey Oliphant. In addition, my thanks to Dr. Peter Pearse, the Honourable John A. Fraser, and the Honourable Bryan Williams, the authors of previous reports relating to issues within my mandate, for the time spent with my Commission staff and me describing the process they followed in carrying out their respective mandates.

Professor Emeritus Ed Ratushny's book, entitled *The Conduct of Public Inquiries,* proved most valuable at the outset of the Commission and served as a continuing resource throughout our proceedings. Commission counsel also benefited from conversations with Professor Ratushny, as well as with Ronald Manes and Linda Rothstein, who have served as commission counsel to previous public inquiries.

I express appreciation to the staff of the Federal Court of Canada who accommodated our requests to use the court's excellent hearing and meeting facilities and who provided constant co-operation, assistance, hospitality, and kindness throughout the conduct of the Commission's work in that facility. I also wish to thank the staff at the British Columbia Securities Commission and the Morris J. Wosk Centre for Dialogue who graciously accommodated the Commission's meetings and hearings during those times when the Federal Court facilities were not available.

I appreciate the co-operation of the members and staff of the Prime Minister's Office, the Privy Council Office, and Public Works and Government Services Canada for their efficient handling of our requests regarding the administrative and financial requirements of the Commission. All these departments and their personnel moved quickly following the announcement of the Inquiry to secure office space in downtown Vancouver within one block of the Federal Court and then facilitated office improvements, furnishings, and the required security enhancement, as well as security clearance for the Commission's staff. I especially thank

Wayne Wouters, clerk of the privy council, and his counsel, Yvan Roy, for their advice to our counsel on matters pertaining to the Commission's process.

Operating a commission of inquiry requires a strong and dedicated team of administrative and professional staff who work together to accomplish the mandate of the Commission within the time constraints set out in the Terms of Reference. I was extremely fortunate to be supported by a team of Commission counsel, along with their support staff, who from the outset of the process worked tirelessly and effectively in the interests of the public to make sure that the Commission was able to meet its obligations. I am grateful for their dedication and commitment and for the outstanding manner in which they carried out their duties. Their assistance to me made it possible to take complex and multifaceted issues and, despite time constraints, to create a process and forum in which these issues were thoroughly and fairly investigated. Throughout the life of the Commission, this legal team demonstrated a high degree of professionalism to me, to Commission staff, to the participants, and to the public with whom it had frequent contact.

I was also fortunate to have the assistance of Dr. David Levy, consultant on fisheries research, and his assistant, Patricia Woodruff, who provided advice and guidance to me, Commission counsel, and staff on our science research projects. Their guidance and help enabled the Commission to develop terms of reference for investigations leading to reports on the potential causes for the decline of Fraser River sockeye salmon. The authors of these technical reports, and those who peer reviewed them, tackled a complex set of issues and ensured that the Commission's science research projects could be undertaken and completed in a timely fashion to serve the needs of Commission counsel and the participants as they prepared for the hearings.

The director of communications and her staff undertook their work with the same degree of professionalism shown by all those involved with the Commission's work. She and her staff kept me, Commission counsel, and the other staff abreast of media coverage of issues and topics related to our work and provided participants, the public, and the media with information about the Commission's activities. I received many compliments about our user-friendly website – an excellent tool for participants, the public, and everyone on staff to follow the activities of the Commission and to interact with it on the issues under investigation.

I wish to thank the Commission's dedicated and energetic office and hearing staff, who worked seamlessly with Commission counsel and the participants to ensure that our work could be completed in the most timely, constructive, and effective manner considering the constant pressure from time constraints and an enormous workload. Their collaboration and team efforts made our office a productive and pleasant environment for everyone involved. A measure of the esteem in which the Commission's counsel, office, and hearing staff are held by the participants and their counsel is reflected in their generous and kind remarks at the conclusion of the hearings.

The work of the Commission was in capable hands at all times, right from the executive director, director of finance and administration, manager of documents and records, and manager of the Contribution Program, through the legal administrative assistants, research assistants, bilingual receptionist and bilingual administrative assistant, document reviewers, and webmaster, to all those at the hearings, including the hearings coordinator, registrar, court recorder, interpreters, commissionaires, and sheriffs. Everyone showed a constant willingness to serve the Commission beyond the call of duty and to make sure that its work was carried out in the public interest.

I also wish to recognize the work of the editors, proofreaders, translators, and layout and design advisor who worked hard to support the Commission staff at every step in the production of the Commission's reports, first the Interim Report and then this Final Report.

I wish to single out Brian Wallace, senior Commission counsel; Keith Hamilton, policy counsel; Dr. Leo Perra, executive director; and Cathy Stooshnov, director of finance and administration, all of whom I had the privilege to work with previously on the British Columbia Electoral Boundaries Commission and the good fortune to have as my colleagues on this Commission. Their strong and constant support was critical to my being able to perform my duties as Commissioner, knowing that they would carry out their respective duties with excellence, efficiency, humour, and kindness. I simply could not have conducted the work of the

Commission without their involvement in every facet of our mandate.

I am also grateful that the participants, who were engaged in the development of the Commission's rules and consulted about its process, co-operated throughout with Commission counsel, and at all times showed them and me respect, courtesy, and patience. They, like Commission counsel, were under tremendous pressure to review tens of thousands of pages of documents and lengthy, complicated reports, and to complete their examinations and cross-examinations in a timely way. Although obviously there was not agreement at every step of the process, they displayed throughout the hearings a most collegial and co-operative relationship with one another, Commission counsel, and Commission staff. The participants or their counsel were always well prepared and of great assistance to the process of the Inquiry. I am grateful for their thoughtful and thorough final submissions that addressed the issues under investigation and, where appropriate given their respective positions on the issues, to collaborate on the approaches that should be taken in investigating the issues and finding common ground on solutions.

I also express my appreciation and thanks to the many witnesses who testified at the Inquiry. They participated in preparatory hearing interviews, readied themselves for the hearings, and accommodated our schedule. Their contributions assisted greatly in the Commission's work.

During the course of the Commission, hundreds of public submissions were posted to our website. Hundreds of people attended our community forums, and many of them made well-prepared, interesting, and helpful submissions. I appreciate the courtesies extended to the Commission by many individuals, groups, and organizations during our site visits. It was encouraging to hear about and observe the passion with which members of the public displayed their sincere and serious interest in the issues under investigation by the Commission.

Finally, I wish to thank Chief Justice Robert Bauman, Associate Chief Justice Austin Cullen, and former Associate Chief Justice Anne MacKenzie for their constant support and encouragement to me throughout my participation in this undertaking. With their co-operation I have been able to take time away from my judicial duties to serve in my role as Commissioner, for which I am most grateful.

This Inquiry has been a long and daunting process, but at all times I have been rewarded with the knowledge that the issues investigated were fundamentally important to the future of a resource central to the identity of British Columbians. I consider it a privilege and an honour to have served as Commissioner. I file this Final Report with the hope that its recommendations will be useful in meeting the expectations held by all interested parties in the future sustainability of Fraser River sockeye and the sockeye fishery.

APPENDICES

Appendix A • Terms of Reference

CANADA

PRIVY COUNCIL • CONSEIL PRIVÉ

P. C. 2009-1860
November 5, 2009

Whereas the decline in sockeye salmon stocks in the Fraser River in British Columbia has necessitated the closure of the fishery for a third consecutive year, despite favourable pre-season estimates of the number of sockeye salmon expected to return to the Fraser River;

Whereas that decline has been attributed to the interplay of a wide range of factors, including environmental changes along the Fraser River, marine environmental conditions and fisheries management;

Whereas the Government of Canada wishes to take all feasible steps to identify the reasons for the decline and the long term prospects for Fraser River sockeye salmon stocks and to determine whether changes need to be made to fisheries management policies, practices and procedures — including establishing a commission of inquiry to investigate the matter;

And whereas the Government of Canada has committed to full cooperation with an inquiry;

Therefore, Her Excellency the Governor General in Council, on the recommendation of the Prime Minister, hereby

(a) directs that a Commission do issue under Part I of the *Inquiries Act* and under the Great Seal of Canada appointing the Honourable Bruce Cohen as Commissioner to conduct an inquiry into the decline of sockeye salmon in the Fraser River (the "Inquiry"), which Commission shall

.../2

P. C. 2009-1860

(i) direct the Commissioner

(A) to conduct the Inquiry without seeking to find fault on the part of any individual, community or organization, and with the overall aim of respecting conservation of the sockeye salmon stock and encouraging broad cooperation among stakeholders,

(B) to consider the policies and practices of the Department of Fisheries and Oceans (the "Department") with respect to the sockeye salmon fishery in the Fraser River — including the Department's scientific advice, its fisheries policies and programs, its risk management strategies, its allocation of Departmental resources and its fisheries management practices and procedures, including monitoring, counting of stocks, forecasting and enforcement,

(C) to investigate and make independent findings of fact regarding

(I) the causes for the decline of Fraser River sockeye salmon including, but not limited to, the impact of environmental changes along the Fraser River, marine environmental conditions, aquaculture, predators, diseases, water temperature and other factors that may have affected the ability of sockeye salmon to reach traditional spawning grounds or reach the ocean, and

(II) the current state of Fraser River sockeye salmon stocks and the long term projections for those stocks, and

(D) to develop recommendations for improving the future sustainability of the sockeye salmon fishery in the Fraser River including, as required, any changes to the policies, practices and procedures of the Department in relation to the management of the Fraser River sockeye salmon fishery,

.../3

P. C. 2009-1860

(ii) direct the Commissioner to conduct the Inquiry under the name of the Commission of Inquiry into the Decline of Sockeye Salmon in the Fraser River,

(iii) authorize the Commissioner to consider findings, as he considers appropriate, of previous examinations, investigations or reports that may have been conducted that he deems relevant to the Inquiry and to give them any weight, including accepting them as conclusive,

(iv) direct the Commissioner to supplement those previous examinations, investigations or reports with his own investigation and to consider the Government's response to previous recommendations,

(v) authorize the Commissioner to rent any space and facilities that may be required for the purposes of the Inquiry, in accordance with Treasury Board policies,

(vi) authorize the Commissioner to adopt any procedures and methods that he may consider expedient for the proper conduct of the Inquiry,, to sit at any times and in any places in Canada that he decides and to conduct consultations in relation to the Inquiry as he sees fit,

(vii) authorize the Commissioner to engage the services of any staff, experts and other persons referred to in section 11 of the Inquiries Act at rates of remuneration and reimbursement as approved by the Treasury Board,

.../4

P. C. 2009-1860

(viii) despite subparagraphs (v) and (vi), direct the Commissioner not to conduct any hearings during the periods beginning on February 12, 2010 and ending on February 28, 2010, and beginning on March 12, 2010 and ending on March 21, 2010, to minimize the costs of the Inquiry and the inconvenience to witnesses during the Vancouver 2010 Olympic and Paralympic Winter Games,

(ix) authorize the Commissioner to grant, to any person who satisfies him that they have a substantial and direct interest in the subject matter of the Inquiry, an opportunity for appropriate participation in it,

(x) authorize the Commissioner to recommend to the Clerk of the Privy Council that funding be provided, in accordance with terms and conditions approved by the Treasury Board, to ensure the appropriate participation of any person granted standing at the Inquiry under subparagraph (ix), to the extent of the person's interest, if the Commissioner is of the view that the person would not otherwise be able to participate in the Inquiry,

(xi) direct the Commissioner to use the automated documents management program specified by the Attorney General of Canada and to consult with records management officials within the Privy Council Office on the use of standards and systems that are specifically designed for the purpose of managing records,

(xii) direct the Commissioner, in respect of any portion of the Inquiry conducted in public, to ensure that members of the public can, simultaneously in both official languages, communicate with and obtain services from the Inquiry, including any transcripts of proceedings that have been made available to the public,

…/5

P. C. 2009-1860

(xiii) direct the Commissioner to follow established security procedures, including the requirements of the Policy on Government Security, with respect to persons engaged under section 11 of the Inquiries Act and the handling of information at all stages of the Inquiry,

(xiv) direct the Commissioner to perform his duties without expressing any conclusion or recommendation regarding the civil or criminal liability of any person or organization,

(xv) direct the Commissioner to submit, on or before August 1, 2010, an interim report, simultaneously in both official languages, to the Governor in Council, setting out the Commissioner's preliminary views on, and assessment of, any previous examinations, investigations or reports that he deemed relevant to the Inquiry and the Government's responses to those examinations, investigations and reports,

(xvi) direct the Commissioner to submit, on or before May 1, 2011, one or more reports, simultaneously in both official languages, to the Governor in Council, and

(xvii) direct the Commissioner to deposit the records and papers of the Inquiry with the Clerk of the Privy Council as soon after the conclusion of the Inquiry as is reasonably possible, and

(b) authorizes, pursuant to section 56 of the *Judges Act,* the Honourable Bruce Cohen of Vancouver, British Columbia, a judge of the Supreme Court of British Columbia, to act as Commissioner.

CERTIFIED TO BE A TRUE COPY–COPIE CERTIFIÉE CONFORME

CLERK OF THE PRIVY COUNCIL–LE GREFFIER DU CONSEIL PRIVÉ

CANADA

PRIVY COUNCIL • CONSEIL PRIVÉ

P. C. 2009-1861
November 5, 2009

Her Excellency the Governor General in Council, on the recommendation of the Prime Minister, hereby

(a) pursuant to paragraph *(b)* of the definition "department" in section 2 of the *Financial Administration Act*, designates the Commission of Inquiry into the Decline of Sockeye Salmon in the Fraser River as a department for the purposes of that Act; and

(b) pursuant to paragraph *(b)* of the definition "appropriate Minister" in section 2 of the *Financial Administration Act*, designates the Prime Minister as the appropriate Minister with respect to the Commission referred to in paragraph *(a)*.

CERTIFIED TO BE A TRUE COPY–COPIE CERTIFIÉE CONFORME

CLERK OF THE PRIVY COUNCIL–LE GREFFIER DU CONSEIL PRIVÉ

CANADA

PRIVY COUNCIL • CONSEIL PRIVÉ

P.C. 2010-954
July 23, 2010

Her Excellency the Governor General in Council, on the recommendation of the Prime Minister, hereby directs that a commission do issue under Part I of the *Inquiries Act* and under the Great Seal of Canada amending the commission in relation to the Commission of Inquiry into the Decline of Sockeye Salmon in the Fraser River, issued pursuant to Order in Council P.C. 2009-1860 of November 5, 2009, by replacing subparagraph (xv) with the following:

> (xv) direct the Commissioner to submit, on or before October 29, 2010, an interim report, simultaneously in both official languages, to the Governor in Council, setting out the Commissioner's preliminary views on, and assessment of, any previous examinations, investigations or reports that he deemed relevant to the Inquiry and the Government's responses to those examinations, investigations and reports.

CERTIFIED TO BE A TRUE COPY–COPIE CERTIFIÉE CONFORME

CLERK OF THE PRIVY COUNCIL–LE GREFFIER DU CONSEIL PRIVÉ

CANADA
PRIVY COUNCIL • CONSEIL PRIVÉ

P.C. 2011-23
January 24, 2011

His Excellency the Governor General in Council, on the recommendation of the Prime Minister, hereby directs that a commission do issue under Part I of the *Inquiries Act* and under the Great Seal of Canada amending the commission in relation to the Commission of Inquiry into the Decline of Sockeye Salmon in the Fraser River, issued pursuant to Order in Council P.C. 2009-1860 of November 5, 2009, as amended by Order in Council P.C. 2010-0954 of July 23, 2010, by replacing paragraph (*s*) with the following:

> (*s*) Our Commissioner to submit, on or before June 30, 2012, one or more reports, simultaneously in both official languages, to the Governor in Council;

CERTIFIED TO BE A TRUE COPY–COPIE CERTIFIÉE CONFORME

CLERK OF THE PRIVY COUNCIL–LE GREFFIER DU CONSEIL PRIVÉ

CANADA

PRIVY COUNCIL • CONSEIL PRIVÉ

P.C. 2012-340
March 27, 2012

His Excellency the Governor General in Council, on the recommendation of the Prime Minister, hereby directs that a commission do issue under Part I of the *Inquiries Act* and under the Great Seal of Canada amending the commission in relation to the Commission of Inquiry into the Decline of Sockeye Salmon in the Fraser River, issued pursuant to Order in Council P.C. 2009-1860 of November 5, 2009, as amended by Order in Council P.C. 2010-0954 of July 23, 2010 and by Order in Council P.C. 2011-23 of January 24, 2011, by replacing paragraph (*s*) with the following:

> (*s*) Our Commissioner to submit, on or before September 30, 2012, one or more reports, simultaneously in both official languages, to the Governor in Council;

CERTIFIED TO BE A TRUE COPY–COPIE CERTIFIÉE CONFORME

CLERK OF THE PRIVY COUNCIL–LE GREFFIER DU CONSEIL PRIVÉ

CANADA

PRIVY COUNCIL • CONSEIL PRIVÉ

P.C. 2012-1132
September 24 2012

His Excellency the Governor General in Council, on the recommendation of the Prime Minister, directs that a commission do issue under Part I of the *Inquiries Act* and under the Great Seal of Canada amending the commission in relation to the Commission of Inquiry into the Decline of Sockeye Salmon in the Fraser River, issued pursuant to Order in Council P.C. 2009-1860 of November 5, 2009, as amended by Order in Council P.C. 2010-954 of July 23, 2010, by Order in Council P.C. 2011-23 of January 24, 2011 and by Order in Council P.C. 2012-340 of March 26, 2012, by replacing paragraph (*s*) with the following:

(*s*) Our Commissioner to submit, on or before October 29, 2012, one or more reports, simultaneously in both official languages, to the Governor in Council;

CERTIFIED TO BE A TRUE COPY–COPIE CERTIFIÉE CONFORME

CLERK OF THE PRIVY COUNCIL–LE GREFFIER DU CONSEIL PRIVÉ

Appendix B • Commissioner and Commission staff

The Commission staff includes those listed below. Not all members of staff and counsel were involved in the Commission for the full duration.

The Honourable Bruce I. Cohen
Commissioner

Administration

Executive director	Dr. Leo Perra, OBC
Director, finance and administration	Cathy Stooshnov
Manager, documents and records	Christine Cheung
Manager, contribution program	Andrea Nash
Legal administrative assistant	Natasha Tam
Legal administrative assistant	Sarah Panchuk
Webmaster	Scott Kingdon
Hearings coordinator	John Lunn
Bilingual receptionist	Nicole Lavigne
Bilingual administrative assistant	Maude Poirier

Counsel

Senior commission counsel	Brian J. Wallace, QC
Policy counsel	Keith R. Hamilton, QC
Research counsel	Meg Gaily
	Sarah Levine
Associate commission counsel	Wendy Baker, QC
	Brock Martland
	Patrick McGowan
Junior commission counsel	Jennifer Chan
	Kathy L. Grant
	Lara Tessaro
	Dr. Maia Tsurumi
	Micah Carmody

Document reviewers / legal researchers

Allison Anderson
Micah Carmody
Line Christensen
Pierre Cloutier de Repentigny
Ashley Dresser
Bruno Godin
Patrick Hayes
Jennifer Hill
Jon Major
Michelle Zakrison

Fisheries research

Consultant	Dr. David Levy
Assistant	Patricia Woodruff

Communications

Director	Carla Shore, APR
Research assistant	Ben Bisset
Assistant	Alana Clement

Editorial Team

Shipton, McDougall Maude Associates	Dan Liebman
	Mary McDougall Maude
	Rosemary Shipton

Translation

Senior translator	Evelyna Radoslavova
	Ahmed Aroussi
	Pierre Cloutier
	Pierre Cremer
	Rodolphe Destombes
	Fabienne Garlatti
	Nathalie Lampron
	Lidia Maer
	Pascal Roussel
	Translation Bureau
	Sophie Boisvert
	Sarah Duchesne-Fisette
	Nathalie Lavallée
	Stéphanie Pageau

Proofreader

Christine Rowlands

Layout and Design

Tom Norman, Creative Design
Kathryn Ward

Appendix C • Public forum presenters

Lillooet

- Chief Art Adolph
- Norm Leech
- Michelle Edwards
- Kerry Coast Henselwood
- Kim North
- Grand Chief Saul Terry
- Mike Leach
- Colleen Jacob
- Chief Larry Casper
- Chief Perry Redan
- Carl Alexander

Campbell River

- Darren Blaney
- Chief Russell Kwakseestahla
- Leona Adams
- Kevin Onclin
- Brad Boyce
- Evan Loveless
- Greg Gibson
- Brian Gunn
- Rod Naknakim
- Dr. Barry Milligan
- Fred Speck

Prince Rupert

- Clarence Nelson
- Stan Denis
- Stan Denis Jr.
- Jack Mussallem
- Linda Hawkshaw
- Mabel Mazurek
- Gary Coons
- Joy Thorkelson
- Dr. Cristina Soto
- Des Nobels
- Lothar Schiese
- Randy Rifold
- Paul Pearson
- Bill White
- Chief Alec Campbell

Steveston

- Captain Robert Karliner
- Garry Biggar
- Vivian Krause
- Gary Williamson
- Eric Wickham

Nanaimo

- Dr. David Welch
- Darrell Campbell
- Dan Edwards

Victoria

- Chris Marks
- Eric Hobson
- Barbara Watson
- Calvin Sandborn
- Paddy O'Reilly
- Vicky Husband
- Jim McIsaac
- Daniel Lousier
- Chief Harold Sewid
- Holly Arntzen
- Rob Fleming
- Jack Etkin
- Rollie Rose

New Westminster

- Bob Rezansoff
- Don Staniford
- Rick Glumac
- Celia Brauer
- Michael Barkusky
- Lorne Jones
- Darrel McEachern
- Victor Guerin
- Rob Dainow
- Mike Forrest
- Terry Slack
- Laura Dupont
- Don Carter

- David Beach
- Dorothy Beach
- John Madden
- Erling Olsen
- Paul Dean
- Donna Sonnenberg
- Rod Marining

Prince George

- David Loewen
- Pete Erickson
- Tanis Reynolds
- Geraldine Thomas-Flurer
- Sharolise Baker
- Marcel Shepert (Upper Fraser Fisheries Conservation Alliance)
- Anne Ketto
- George M. George Senior

Chilliwack

- Glen Thompson
- Donald Costin
- Tim Tyler
- Gwen O'Mahoney
- Elena Edwards
- Sabra Woodworth
- Don Demill
- Verna Pigou
- Grant Warkentin
- Zvonko Bezvak
- Rick Quip

Kamloops

- Chief Judy Wilson
- Michelle Nickerson
- Bernadette Keenan
- Jim Prudhomme
- Warren Bell and Hugh Tyson
- Priscilla Judd
- Jerry Jensen
- Cliff Arnouse
- Calvin Wrench
- Ruth Madsen
- Wilfred Robbins
- Fred Fortier

Appendix D • Submitters*

** Submitters are those who made submissions through the Commission's web-based public submissions process.*

Submitter's Name	City
Adams, Leona	Campbell River
Adolph (Chief), Art	Lillooet
Agocs, Carol	London
Aharonian, Dave	Victoria
Akerly, Mike	West Vancouver
Albert, Darrell	Mission
Alcock, Roland	Sooke
Aleksich, Denise	Sointula
Alexandre, Eric	Courtenay
Allen, Huguette	Lumby
Alms, Ricardo	Winnipeg
Anderson, Andrea Carol	Heriot Bay
Anderson, David	Victoria
Anderson, Elizabeth	Cortes Bay
Anderson, Gillian	Merville
Anderson, Kim	Richmond
Anderson, Mitchell	Vancouver
Andres, Julie	Roberts Creek
Andrews, Bill	Vancouver
Arbess, Saul	Victoria
Ardis, Larissa	Vancouver
Arnold, William	Victoria
Arntzen, Holly	Crofton
Arsenault, Darlene	Sayward
Askgaard, Ivan	Powell River
Atkinson, Dierdre	Hornby Island
Babcock, Carla	Delta
Baile, L.	Pender Island
Bailey, Susan	Salt Spring Island
Baird, Jim	Nanaimo
Baker, Alexis	Vancouver
Ballard, Pamela	Campbell River
Banks, Deborah	Sparks
Barber, Hal	Bowen Island
Barkusky, Michael	Vancouver
Barnum, Jim	North Vancouver
Barter, Mark	Victoria
Barthel, Don	Vancouver

Submitter's Name	City
Bartlett, Jim	Vancouver
Bauer, Marcel	Victoria
Baxter, David	Chase
Baxter, David Gordoon	Lee Creek
Beaton, Trudy	Courtenay
Bednard, Margaret	North Vancouver
Behrhorst, Bruce	Surrey
Bell, Warren	Salmon Arm
Berghofer, Desmond	Vancouver
Bevilacqua, Brady	Burnaby
Bexson, Susan	Sooke
Biagi, Mark	Powell River
Biffert, Wayne	Williams Lake
Bilsker, Sheldon	Vancouver
Bjarnason, Brian	Surrey
Blackie, Les	White Rock
Blair, Robert	Surrey
Blaisdell, Jill	La Canada
Blanchette, Greg	Tofino
Bland, Charlie	Heriot Bay
Bockman, Neil	Denman Island
Boleen, Michelle	Whitehorse
Bolger, Jim	Vancouver
Bona, Byron	North Vancouver
Bonell, Kevin	Kamloops
Booth, Vic	Nanoose Bay
Borek, Elizabeth	Victoria
Bosch, Anne	North Vancouver
Bouchard, Teresa	Whistler
Bouillet, Dan	Surrey
Boyce, Brad	Campbell River
Braden, Les	Vancouver
Bradley, Neville	Coquitlam
Brauer, Celia	Vancouver
Bridge, Tyee	Vancouver
Brown, Herbert	Blind Bay
Brown, Laurence	Lumby
Brown, Neil	Whistler

Submitter's Name	City
Brown, Terry L.	Powell River
Bruce, T.	Squamish
Brummel, Debi	Courtenay
Bryla, Ken	Campbell River
Bucholtz, Stuart	Langley
Buck, Helen	Calgary
Buecker, Mark	Pitt Meadows
Burns, Christopher	Victoria
Butler, Amber	Squamish
Bye, Buffy	Quathiaski Cove
Bye, Buffy	Quadra Island
Cameron, Michael	Vancouver
Cameron, Robert	Madeira Park
Campbell, Cathy	Victoria
Campbell, John	Gabriola Island
Campbell, Marie	Victoria
Cardinal, Will	Nanaimo
Carey, Charlotte	Parksville
Carrington, Betty	North Vancouver
Carter, Chris	Courtenay
Casper Jr. (Chief), Larry	Shalalth
Cavers, Don	Chase
Cecill, B.	Gibsons
Chase, Richard	Vancouver
Chatterjee, Randy	Vancouver
Chidley, Cyndy And Frank	Campbell River
Choronzey Darryl	Owen Sound
Chouinard, Guy	Canmore
Clark, Dale	Mission
Clark, Jean	Enderby
Clarke, Christopher	Calgary
Claydon, Philip	Kamloops
Clayton, Geoff	Maple Ridge
Cliffe, Nadgelin	Campbell River
Clyne, Dave	Cultus Lake
Colberg, Edward	Calgary
Collins, Russ	Vernon
Commandeur, Colin	Abbotsford
Comparelli, John	Tisbury
Conley, David	Kanata
Cook, Jackie	Vancouver
Cook, Willard	Surrey
Cooley, Anneliese	Ladysmith

Submitter's Name	City
Coombes, Benjamin	Victoria
Coons, Gary	Prince Rupert
Corsiglia, John	Sooke
Costello, James	Ucluelet
Costin, Donald	Chilliwack
Cotgrave, Janet	Halfmoon Bay
Cotter, Gail	West Vancouver
Cowan, Al	Nanaimo
Cowley, Christian	Maple Ridge
Cox, J. David	Surge Narrows
Craik, Paul	Vancouver
Crampton, Erin	Winnipeg
Crawford, Mike	Penticton
Crawshaw, Jo-Ann	Quathiaski Cove
Creese, Robert	Victoria
Cressman, D.	Mayne Island
Crowe, Jean	Kamloops
Crowston, Amanda	Maple Ridge
Crozier, Nancy	Gabriola Island
Cruickshank, Katherine	Port Alberni
Dal Bello, Anthony	Hope
Dale, Norman	Prince George
Danlock, Tyrone	Port Alberni
Darwin, Karl	Lasqueti Island
Davey, Edward	Burnaby
Davis, Ryan	Vancouver
Davison, Randy	Edmonds
Dawson, Dan	North Vancouver
Dayton, Tim	Langley
De Haan, John	Salt Spring Island
Dean, Paul	Vancouver
Dean, Scott	Ladysmith
Degagne, Marc	Winnipeg
Denman, Ken	Victoria
Denning, Lorna	Victoria
Devereaux, Fiona	Victoria
Dicarlo, Nick	Mill Bay
Dickinson, Jay	100 Mile House
Doherty, Beau	Ottawa
Domovich, John	Qualicum Beach
Donnelly, Wayne	Edmonton
Doumenc, Ivan	Vancouver
Dovey, Shannon	Sidney

Submitter's Name	City
Draper, Susan	Victoria
Draper, William	Victoria
Driedger, Nicole	Abbotsford
Driedger, Rick	Smithers
Drumm, D.	Binbrook
Dubrulle, Phil	Squamish
Duchene, Gael	Tofino
Dufault, Denise	Vancouver
Dunaway, Rick	Cobble Hill
Dunbar, Joanna	Powell River
Dunham, Alan	Campbell River
Dupont, Laura	Port Coquitlam
Durand, Joel	Campbell River
Dwyer, Frank	Kamloops
Dyck, Terry	Vernon
Early, Erin	Whistler
Edwards, Dan	Ucluelet
Edwards, Elena	Mission
Edwards, Gary	Lone Butte
Edwards, Michelle	Lillooet
Elliott, W.J. (Jack)	Magrath
Ellis, Rev. Jordan	Nanaimo
Elwood, Hugh	Burnaby
Emberley, Jack	Maple Ridge
Emery, Maryann	Golden
Enevoldsen, David	San Jose
Erickson, Pete	Fort St. James
Erikson, Joanne	Campbell River
Erin, Lynn	Anglemont
Esteban, Nory	Invermere
Ethier, Mark	Burnaby
Evans , Jenn	Gold River
Everatt, Robert	Kelowna
Eyre, Susan	Yahk
Faculty of Law, Environmental Law Centre, UVIC	Victoria
Fall, Michael	Ladysmith
Farinha, Sheri	Parksville
Farmer, Kenneth	Dartmouth
Fearn, Robert	Restone
Fetterley, Shawn	North Vancouver
Field, Dorothy	Victoria
Finch, Laura	Mill Bay

Submitter's Name	City
Finch, Laura	Duncan
Finlay, Joy And Cam	Victoria
Fischer, Mike	Victoria
Fitzpatrick, Pamela	Vancouver
Flagel, Gary	Prince George
Fleming, Gail	Lasqueti Island
Flight, Jim	Vancouver
Floody, Eileen	Tofino
Fogel, Ken	Stone Mountain
Foot, Paula	Duncan
Ford, Colin	Vancouver
Forster, Jonathan	North Vancouver
Fortin, Paul	Toronto
Foster, Doris	Falkland
Foster, Jenny	Nanaimo
Foster, Ruth	Belcarra
Fox, Liz	Lantzville
Fox, Zol	Burnaby
Frake, Rita	Kelowna
Frank, Don	Prince Rupert
Franke, Myrna	Vancouver
Frazer, Neil	Honolulu
Frid, Alejandro	Bowen Island
Fudali, Josepj	Abbotsford
Fulton, Kim	Armstrong
Fussell, Roy	Comox
Gagne, Cherizar	North Vancouver
Galanos, Chris	Victoria
Gallant, Connie & J.D.	Quilcene
Gardner, Eddie	Chilliwack
Garnett, Stephen	Cowichan Bay
Gaudard, Donna	Victoria
Gendron, Damien	Burnaby
Gerhart, Geoff	Whistler
Gibbs, Dirk	Vancouver
Giberson, Richelle	Delta
Gibson, Greg	Comox
Gibson, Pat	Heriot Bay
Gilchrist, Lorne	Nanoose Bay
Gjerdalen, Greig	North Vancouver
Glambeck, Bonny	Tofino
Glumac, Rick	Port Moody
Goldstein, David	Vancouver

Submitter's Name	City
Good, Linnea	Summerland
Gosling, Neville	Surrey
Gower, Bill	Delta
Gower, Ronald	Victoria
Grant, S.	Vancouver
Green, Mary	Hagensborg
Green, William	Burlington
Gregr, Edward	Vancouver
Griffioen, Ward	Powell River
Gudmundson, Barbara	Vancouver
Guerin, Victor	Vancouver
Guild, Brenda	Salt Spring Island
Gulak, Randy	Chilliwack
Gunn, Brian	Campbell River
Gustaveson, Albert A.	Marcell
Gye, Kim	Brentwood Bay
Hack , Les	Chilliwack
Haig-Brown, Alan	New Westminster
Haigh, Nicky	Nanaimo
Halme, Lana	Chemainus
Hancock, Liz	Maple Ridge
Hannay, Bob	Errington
Hansen, Jens	Bellingham
Hansen, Karen	Prince Rupert
Hanson, Douglas	Hornby Island
Hardacker, Diana	Chemainus
Harlson, Ted	Brampton
Harper, Peter	Campbell River
Harris, Jim	Courtenay
Harris, Tammy	Courtenay
Harrison, Helene	Victoria
Hart, Rosemary	Vancouver
Hartman, Gordon	Nanaimo
Harvey, Renate	Surge Narrows
Harvey, Robert	Langley
Haskell, Fred	Bellingham
Hawkshaw, Fred and Linda	Terrace
Healey, Michael	Peachland
Heath, Darlene	Coquitlam
Heavenor, Michael	Campbell River
Heidrick, William	Courtenay
Helmer, Jeanette	Pemberton
Hemmings, Edward G.	Campbell River

Submitter's Name	City
Henderson, John	Salmon Arm
Henderson, Tom	Mill Bay
Henselwood, Kerry Coast	Lillooet
Hepler, Bill	Vancouver
Hepper, Katherine	Langley
Herbert, Carolyn	Victoria
Hill, Jonathan	Coquitlam
Hillis, Peter	Rossland
Hobson, Eric	Port McNeill
Hodges, Susan	Delta
Holland, Mark	150 Mile House
Holliday, Gordon	Port Sorell
Hollingsworth, Adele	Campbell River
Hollingsworth, John	Mansons Landing
Holliston, Jack	Lake Cowichan
Holmes, Richard	Likely
Holt, David	Sidney
Howard, Jeff	North Vancouver
Howell, Bill	Ottawa
Hromada, Monica	Vancouver
Husband, Vicky	Victoria
Hykin, Martin	Victoria
Ingersoll, Nancy	Vernon
Inman, Charlotte	Abbotsford
Irving, Bill	Ucluelet
Jacobs, Ken M.	Nanaimo
Jacobson, Russ	Langley
Jang, Richard	Burnaby
Janzen, Jan	Tofino
Jean, Nicole	Pemberton
Jensen, Leona	Pender Island
Jirava, Robert	Surrey
Johnson, James D.	Memphis
Johnson, Matt	Sooke
Johnson, Sonja and Robert	North Saanich
Johnstone, Myna Lee	Saltspring Island
Jones, Robert	Kelowna
Jones, Susan	Delta
Jongkind, Mia	Nanaimo
Jordan, Geoff	Vancouver
Jover, Henri	Vancouver
Judd, Gordon/Priscilla	Lumby
Judd, Priscilla	Lumby

Submitter's Name	City
Kaljur, Susanna	Courtenay
Karamessines, Susan	Duncan
Karliner, Capt Robert	Delta
Kearns, Elizabeth	White Rock
Keays, Chelsea	Vancouver
Keenan, Bernadette	Surrey
Keir, Andy	Thetis Island
Kemshaw, Matthew	Vancouver
Kendrick, Paul	Campbell River
Kendy, Nan	Prince George
Kerr, Gordon	Edmonton
Kerr, Hugh	Garibaldi Highlands
Ketchen, Marianne	North Vancouver
Kevis, Dora	Greenwood
Kincaid, Daryl	Whistler
Kinch, Ron	Victoria
Knezevich, Fred	Williams Lake
Knight, Robert	Vancouver
Knowles, Gary	Campbell River
Knowles, Tricia	Prince Rupert
Knutsen, Candis	Victoria
Koch, Angela	Oakville
Koch, Angela	Quathiaski Cove
Koenders, Lyle	Alert Bay
Kovacs, Barbara	Chilliwack
Krause, Vivian	North Vancouver
Kurahashi, Elina	Abbotsford
Kuusisto, Esa	Ladysmith
Kyle, Ron	Gold River
Lachlan, Tom	Port Moody
Lacuna, Joseph	Vancouver
Lansel, Toby	Vancouver
Larsen, Steen	Delta
Larson, David	Hazelton
Lawson, Michelle	Cumberland
Lawson, Steve	Tofino
Le Monnier, Sandy	Port Coquitlam
Leach, Mike	Lillooet
Ledbetter, Max	Kitchener
Leech, Norm	Lillooet
Leyward, Barbara	Nanaimo
Libera, Rob	Vancouver
Loewen, David	Prince George

Submitter's Name	City
Loiselle, Maureen	Thetis Island,
Lousier, Daniel	Cowichan Bay
Loveless, Evan	Cumberland
Lowery, Brennan	Burnaby
Macey, Matt	Comox
MacIntosh, Linda	Vancouver
MacIsaac, William	Canoe
MacIsaac, William	Salmon Arm
Mackay, Donna	Port McNeill
MacKeigan, Betty Lou	Pender Island
MacKenzie, Ian	Kamloops
MacKenzie, Kirsty	Vancouver
MacLeod, Bruce	Horsefly
MacLeod, Ken	Courtenay
Macnab, Magnus	Victoria
MacNeil, Pauline	Courtenay
Macneill, James	Vancouver
Madden, John	Vancouver
Magrill, Barry	Richmond
Malcolmson, Samuel	Toronto
Marcoux, Michael	Vancouver
Marko, Alexei	Vancouver
Marks, Chris	Victoria
Marliave, Jeff	Vancouver
Marquette, Jessica	Vancouver
Marr, Andrew	Vernon
Marshall, Gary	Malahat
Martin, Donna	Salt Spring Island
Martin, Ken	North Vancouver
Marty, Gary	Abbotsford
Mather, Allan	Salt Spring Island
Matheson, Cory	Vancouver
Matheson, Rod	Vancouver
Mattes, Jack	Gabriola Island
Maxwell, Gillian	Vancouver
Mazurek, Mabel	Prince Rupert
Mcalister, Hylton	Duncan
McBain, Ammon	Mission
McBride, Deb	Squamish
McCandless, Robert G.	Delta
McConnell, Amy	Parksville
McConnell, Joan	Salt Spring Island
McEachern, Darrel	Maple Ridge

Submitter's Name	City
McElgunn, Barbara	Toronto
McGuinness, Jen	Brackendale
McGuire, Pat	Victoria
McIsaac, Jim	Victoria
McKay, Gilbert	Coldstream
McKeachie, Shelley	Denman Island
McKechnie, Stephen	White Fox
McKinlay, Brian	Vancouver
McLaren, Peter	Langley
McMillen, Rachel	Ladysmith
Mcnab, Hugh	Surge Narrows
McNally, Diane	Victoria
McNamee, Sandy	White Rock
McPhee, David	Vancouver
McPhie, Linda	Qualicum Beach
McSorley, Mike	Victoria
Mellors, James	Vernon
Menard, Heather	West Vancouver
Mercer, Darlene	Pitt Meadows
Mercereau, Robert	Vancouver
Midgley, Rhiannon	Port Coquitlam
Mikkers, Willem	Vancouver
Milde, Heike	Hope
Milligan, Barry	Campbell River
Milligan, George	Bowen Island
Minard, Jack	Courtenay
Mitchell, Frank	Victoria
Mitchell, Melissa	North Vancouver
Mitchell, Willie	Vancouver
Mock, Laurice	Duncan
Morris, Helen	North Vancouver
Morris, Tammy	Westholme
Morrish, Robert	West Vancouver
Morrison, Michael	Nanaimo
Morrison, Stuart	Kelowna
Morry, Mike	Brentwood Bay
Mountain, Robert	Alert Bay
Muckle, Robert	Delta
Murdock, Ronda	Parksville
Nagle, Geraldine	Voorhees
Naknakim, Rod	Campbell River
Nanson, Kirsten	Gibsons
Neilson, Dorothy	Delta

Submitter's Name	City
Nelson, Cynthia	Burnaby
Nelson, Vic	Victoria
Nemec, John	Cleveland
Neumann, Kira	Black Creek
Newcomb, John	Victoria
Newman, Jeffrey	108 Mile Ranch
Nicholl, Ruth	Victoria
Nickel, Derek	Campbell River
Nickerson, Michelle	Mission
Nickerson, Michelle	Vancouver
Nicoli, Mishah	Spruce Grove
Nielsen, Terry	Courtenay
Noble, Richard	Vancouver
Nohr, Bill	Port Coquitlam
Nolan, Lisa	White Rock
Nord, Celia	Chase
North, Kim	Lillooet
Ochmanek, Edwin	Vancouver
Olney, Heather	Black Creek
Olsen, Dave	Lasqueti
Olson, Gayle	Richmond
Onclin, Kevin	Campbell River
Orchiston, George	Powell River
Orr, William	Surrey
Orr/Lansdowne, Heather	Sointula
Osborne, Chelsey	Port Alberni
Osborne, Philip	Vancouver
Oseen-Senda, Kathryn	Seattle
Ouellette, Dennis	Prince George
Ouelllette, H. Dirk	Cobble Hill
Overstall, Richard	Smithers
Paisley, Jeanette	Delta
Paradis, Richard	Vancouver
Parsons, Timothy R.	Brentwood Bay
Parton, Jaimie	Vancouver
Parton, Kathy	Sointula
Payne, Fern	Victoria
Paz, Tanya	Vancouver
Peachy, J.	Vancouver
Pearce, Kelly	Hope
Pearlman, Myra	Vancouver
Pearson, Margaret	Sechelt
Pedersen, David	Tofino

Submitter's Name	City
Penberthy, Eli	Seattle
Pepper, Katherine	Gabriola Island
Perrin, Lynn	Abbotsford
Perry, Doug	Burnaby
Perry, Lyle	Vancouver
Persson, R. G.	Victoria
Peters, Lyn	Maple Ridge
Petitclerc-Evans, Yolaine	Victoria
Phillippe, Lucille	Saanichton
Phillips, Jerry	Qualicum Beach
Phillips, Wilfred	Madeira Park
Piché, Aline	Cherryville
Piernitzki, Stephan	Nelson
Pieroni, Toni	Vancouver
Pihl, Eric	Arlington Heights
Pine, Jim	Victoria
Plant, Judith	Gabriola Island
Porter, Dave	Nanaimo
Powell, Christine	Saanich
Pratt, Sheila	Maple Ridge
Prentice, John	Richmond
Probert, F. Bruce	Aldergrove
Proctor, Billy	Simoom Sound
Prudhomme, Jim	Kelowna
Purvis, Russ	McBride
Putt, Annika	Burnaby
Quitzau, Mae	Pender Island
Qureshi, Joanna	Parksville
Rainwalker, Ellen	Cumberland
Rankin, Tom	Vancouver
Ray, Janet	Victoria
Raymond, James	Vancouver
Raynolds, Maria	Maple Ridge
Raynolds, Tracy	Maple Ridge
Rechtschaffner, Renee	West Vancouver
Reed, Anissa	Qualicum Beach
Reid, Dennis	Victoria
Reynolds, Tannis	Fraser Lake
Rezansoff, Bob	Delta
Rhodes, Kevin	Kamloops
Riley, Frances	Prince Rupert
Rimmer, Wilf	Slocan Park
Rinne, Eric	New Westminster

Submitter's Name	City
Ritchie, William J.S.	Gibbons
Roberts, Elise	North Vancouver
Robertson, Bruce	Powell River
Robertson, Randy	Nanaimo
Robichaud, Charles	Bowen Island
Robson, Brian	West Vancouver
Robson, Sandra	Qualicum Beach
Rogers, Scott	Simoom Sound
Ronback, James	Delta
Ronyecz, Rich	Qualicum Beach
Rose, Mark	West Vancouver
Rudden, Chris	North Vancouver
Russell, Mary	Port Hardy
Rutman, Deborah	Victoria
Ryan, Annie	Toronto
Sandborn, Calvin	Victoria
Sanders, Gillian	Kaslo
Sanford, Dianne	Roberts Creek
Saplairoles, Laurent	Burnaby
Sass, Donald	Campbell River
Sauer, Jaclyn	Vancouver
Saunders, Howard	Vancouver
Schellenberg, Donna	Penticton
Schorle, Peter	North Saanich
Schreiber, Catherine	Maple Ridge
Schroder, Jill	Vancouver
Schroder, Martin	New York
Schroeder, Diana	Courtenay
Schultz, Ron	Prince George
Schumacher, Garret	Squamish
Seaman, Ben	Victoria
Seaman, Ben	Vancouver
Secco, Dave	Victoria
Seier, Frank	Powell River
Sewid, Harold	Campbell River
Shafer, Howard	Coquitlam
Shannon, Patrick	West Vancouver
Shepert, Marcel	Prince George
Shepherd, Shannon	Nanaimo
Sheppard, Valerie and Kevin	Victoria
Sherwood, Robert and Deborah	Osoyoos
Shiels, Dolores	Sointula
Shira, Ahava	Salt Spring Island

Submitter's Name	City
Sigurgeirson, Pauline	Otautau
Silvercloud, David	Vancouver
Silverman, Deborah	Friday Harbor
Simmins, Marjorie	Halifax
Simmons, Greg	Surrey
Simon, Lana	North Vancouver
Simpson, Janet	Victoria
Simpson, Jay	Scotch Creek
Sinclair, Gary and Sharon	Victoria
Sinclair, Ross	Nanaimo
Sketchley, Keith H.	Victoria
Skipper, Peter	Nanaimo
Sklapsky, Bob	Williams Lake
Skrobot, Barry	Centreville
Slater, Dr. Catherine	Quadra Island
Slobodian, Mayana	Toronto
Slobodian, Sandy	Victoria
Slotnick, Lauryn	Douglaston
Smith, Kerri	Ottawa
Smith, Robert	Delta
Smythe, Eric	Victoria
Soanes, Sally	Parksville
Soto, Cristina	Prince Rupert
Spencer, Tony	Creston
Sprague, John B.	Salt Spring Island
St. Cyr, Kristin	Victoria
Stafford, Gwenda	Nelson
Stanger, Doug	Maple Ridge
Staniford, Don	North Vancouver
Stary, Lynn	Burnaby
Steer, Norma	Victoria
Stensrud, Glen	Kamloops
Stephen, Heather	Gillies Bay
Sterritt, Lisa	Armstrong
Stevens, John	Delta
Stevenson, David	Comox
Stewart, Charles	Penticton
Stieda, Sieglinde	Mission
Stirrett, Russell	Vancouver
Stobbart, Derek	Vancouver
Stock, Lloyd	Lillooet
Stoughton, Eric	Black Creek
Strachan, Daniel	Röschenz

Submitter's Name	City
Summers, Steve	Vancouver
Sun, Michelle	Vancouver
Sutherland, Kate	Vancouver
Swallow, Marilyn	Ladysmith
Swanston, Richard	Delta
Tasker, James	Sudbury
Taylor, Alison	Halfmoon Bay
Taylor, David	North Vancouver
Taylor, Lynn	Victoria
Tebbutt, Peter	Powell River
Temple, Keith	Terrace
Terlingen, Hans	Tofino
Terry, Saul	New Westminster
Thaysen, Max	Manson's Landing
Thomas, Alex	Vancouver
Thompson, Dennis	Victoria
Thorkelson, Joy	Prince Rupert
Thurgood, Virginia	Sechelt
Tidey, Alec	Lund
Tidswell, Brad	Vancouver
Tidswell, Brad	Winlaw
Timms, Glen	Victoria
Tolton, Larry	Richmond
Townsend, Dale	Salmon Arm
Traynor, Jim	Lillooet
Treiberg, Anders	Victoria
Turner, Toril	Comox
Tyler, Tim	Coquitlam
Uhrich, Lee	Abbotsford
Ulmer, Rick	Salmon Arm
Underwood, Colleen	Cowichan Bay
Vadeboncoeur, Nathan	Vancouver
Vansnick, Ann	Sayward
Vernon-Wood, Sonja	Lee Creek
Verren-Delbridge, Rosemary	Sooke
Vetsch, Judith	Squamish
Vienneau, Hubert J.	Port Hastings
Vipond, Don	Saanichton
Von Hahn, Raynard	Vancouver
Voth, Brian	Lund
Waddell, Heather	Sechelt
Wadden, Holly	South Surrey
Wadden, Richard	Sechelt

Submitter's Name	City
Wade, Gabriella	Penticton
Wadley, Gordon	Smithers
Wagner, Carol	Salt Spring Island
Wagner, Gloria	Salt Spring Island
Walker, Janet	Vancouver
Walker, Lynn	Sointula
Walters, James	Qualicum Beach
Walters, Patricia	Qualicum Beach
Wares, Roy	Vancouver
Watson, Barbara	Sidney
Watt, Laurie	New Westminster
Watts, Thomas	Bellvue
Weaver, Rose	Victoria
Weland, Marilyn	Duncan
Welch, David	Nanaimo
Westwood, Nancy	Parksville
Wheeler, Lynne	Fanny Bay
White, Cameron	Calgary
Wickham, Eric	Vancouver
Wiese, Shawn	Maple Ridge
Wilcox, C. William	Virginia Beach
Wilcox, James	Olympia
Wild, Ted	Campbell River

Submitter's Name	City
Wilkinson, Chris	West Vancouver
Williams, Lorraine	Sointula
Williams, Robert	Parksville
Wilson, Chief Judy	Chase
Wilton, Ron	Kelowna
Winter, John	Langley
Wold, Carolyn	Victoria
Wood, Lorraine	Vavenby
Woodley, Kathleen	Courtenay
Woods, Jacquie	Surrey
Woodworth, Sabra	North Vancouver
Wooldridge, David	Maple Ridge
Wootten, Elizabeth	West Vancouver
Woudstra, Kevin	Smithers
Wrench, Calvin	Sicamous
Wright, Jim	Richmond
Wyenberg, Jean	Gabriola Island
Yamanaka, Kenny	Richmond
Yeo, Margaret	Surrey
Yerex, Dawn	Prince George
Young, Cameron	Victoria
Zenger , Ruth	Victoria
Zilker, Wolfgang	Victoria

Appendix E • Witnesses

Where a witness's resumé or biography became an exhibit, the exhibit number is provided. An asterisk (*) in this column throughout the appendix indicates that the witness was qualified in the hearings as an expert.

Witness	Hearing	Date	Totals
Adams, Ms. Devona (recreational fisheries coordinator, Salmon Team, DFO) Curriculum vitae: Exhibit 511	Recreational Fishing: 2 days	March 2, 2011 March 3, 2011	Total days: 2 Total themes: 1
Alexis, Mr. Thomas (former chief, Tl'azt'en Nation) Witness summary: Exhibit 292	Aboriginal Worldview, Cultural Context, and Traditional Knowledge: 1 day	December 14, 2010	Total days: 1 Total themes: 1
Arnott, Mr. James (manager, Wastewater Section, Public and Resources Sectors Directorate, Environmental Stewardship Branch, Environment Canada) Curriculum vitae: Exhibit 1056	Effects on the Fraser River Watershed – Municipal Wastewater: 1 day	June 15, 2011	Total days: 1 Total themes: 1
***Ashley,** Dr. Ken (instructor, British Columbia Institute of Technology; adjunct professor, University of British Columbia; senior scientist, Northwest Hydraulic Consultants) Curriculum vitae: Exhibit 1045	Effects on the Fraser River Watershed – Municipal Wastewater: 1 day	June 14, 2011	Total days: 1 Total themes: 1
Ashton, Mr. Chris (executive director, Area B Harvest Committee) Biography: Exhibit 452	Commercial Fishing: 2 days	February 22, 2011 February 28, 2011	Total days: 2 Total themes: 1
Assu, Mr. Brian (councillor, We Wai Kai Nation; member, Fraser River Panel, Pacific Salmon Commission) Curriculum vitae: Exhibit 364	Harvest Management (Part 2): 3 days	January 31, 2011 February 1, 2011 February 11, 2011	Total days: 3 Total themes: 1
Atagi, Mr. Brian (area chief aquaculture, Conservation and Protection, DFO) Curriculum vitae: Exhibit 1705	Aquaculture: 1 day	September 1, 2011	Total days: 1 Total themes: 1
Backman, Mr. Clare (director of environmental compliance and community relations, Marine Harvest Canada) Curriculum vitae: Exhibit 1800	Aquaculture: 2 days	September 7, 2011 September 8, 2011	Total days: 2 Total themes: 1
Baird, Chief Kimberley (chief, Tsawwassen First Nation) Witness summary: Exhibit 281	Aboriginal Worldview, Cultural Context, and Traditional Knowledge: 1 day	December 13, 2010	Total days: 1 Total themes: 1
***Beamish,** Dr. Richard (former research scientist and head, Salmon Interactions group, Salmon and Freshwater Ecosystems, Pacific Biological Station, DFO) Curriculum vitae: Exhibit1285	Effects on Habitat in the Marine Environment: 2 days	July 6, 2011 July 7, 2011	Total days: 2 Total themes: 1
Becker, Mr. Joseph (member, Musqueam First Nation; commissioner, Musqueam Fisheries Commission) Witness summary: Exhibit 282	Aboriginal Worldview, Cultural Context, and Traditional Knowledge: 1 day	December 13, 2010	Total days: 1 Total themes: 1

Witness	Hearing	Date	Totals
Berardinucci, Ms. Julia (district manager, Metro Vancouver-Squamish District, BC Ministry of Forests, Lands and Natural Resources Operations) Curriculum vitae: Exhibit 1092	Effects on the Fraser River Watershed – Gravel Removal: 2 days	June 16, 2011 July 7, 2011	Total days: 2 Total themes: 1
Bevan, Mr. David (associate deputy minister, former senior assistant deputy minister, Ecosystems and Fisheries Management, DFO) Curriculum vitae: Exhibit1919	DFO's Organizational Structure: 4 days	November 1, 2010 November 2, 2010 November 3, 2010 November 4, 2010	Total days: 9 Total themes: 2
	DFO Priorities and Summary: 5 days	September 22, 2011 September 23, 2011 September 26, 2011 September 27, 2011 September 28, 2011	
Bombardier, Dr. Manon (national director, Environmental Enforcement Directorate, Environment Canada) Curriculum vitae: Exhibit 688	Habitat Management and Enforcement: 2 days	April 7, 2011 April 8, 2011	Total days: 2 Total themes: 1
Boyd, Ms. Janice (program scientist, Natural Resources Sector Unit, Environmental Protection Operations, Environment Canada) Curriculum vitae: Exhibit 1022	Effects on the Fraser River Watershed – Pulp and Paper Effluent, Mining Effluent: 1 day	June 13, 2011	Total days: 1 Total themes: 1
***Bradford,** Dr. Michael (research scientist, DFO; adjunct, School of Resource & Environmental Management, Simon Fraser University) Curriculum vitae: Exhibit 912	Cultus Lake – Recovery Efforts from 2005 Onwards: 2 days	May 31, 2011 June 1, 2011	Total days: 3 Total themes: 2
	*Hydro, Water, Temperature: 1 day	September 15, 2011	
Brown, Mr. Dennis (Area E Harvest Committee) Biography: Exhibit 453	Commercial Fishing: 2 days	February 22, 2011 February 28, 2011	Total days: 2 Total themes: 1
Brown, Mr. Robin (head, Ocean Sciences Division, Institute of Ocean Sciences, DFO) Curriculum vitae: Exhibit 1392	Effects on Habitat in the Marine Environment: 1 day	August 18, 2011	Total days: 1 Total themes: 1
Carey, Dr. John (former director general, Water Science and Technology, Environment Canada) Biography: Exhibit 986	Effects on the Fraser River Watershed – Urbanization: 2 days	June 6, 2011 June 7, 2011	Total days: 2 Total themes: 1
Carter, Mr. David (regional team leader, Habitat Monitoring, Oceans, Habitat and Enhancement Branch, DFO) Curriculum vitae: Exhibit 672	Habitat Management and Enforcement: 1 day	April 6, 2011	Total days: 1 Total themes: 1
Cass, Mr. Alan (former regional head, Centre for Science Advice Pacific, DFO) Resumé: Exhibit 394	DFO's Organizational Structure: 2 days	November 3, 2010 November 4, 2010	Total days: 4 Total themes: 2
	Harvest Management (Part 2): 2 days	February 7, 2011 February 8, 2011	
Cave, Mr. Jim (head, Stock Monitoring, Pacific Salmon Commission) Curriculum vitae: Exhibit 363	Harvest Management (Part 2): 2 days	January 31, 2011 February 1, 2011	Total days: 2 Total themes: 1
Chamut, Mr. Pat (former assistant deputy minister, Fisheries Management, DFO; former special advisor on the Wild Salmon Policy) Witness summary: Exhibit 100	Wild Salmon Policy (Part 1): 4 days	November 29, 2010 November 30, 2010 December 1, 2010 December 2, 2010	Total days: 4 Total themes: 1

Witness	Hearing	Date	Totals
Charlie, Chief William (chief, Chehalis Indian Band) Witness summary: Exhibit 279	Aboriginal Worldview, Cultural Context, and Traditional Knowledge: 1 day	December 13, 2010	Total days: 1 Total themes: 1
***Christensen,** Dr. Villy (professor and associate director, University of British Columbia Fisheries Centre) Curriculum vitae: Exhibit 782	Predation: 3 days	May 4, 2011 May 5, 2011 May 6, 2011	Total days: 3 Total themes: 1
***Close,** Dr. David (distinguished science professor of Aboriginal fisheries, University of British Columbia) Curriculum vitae: Exhibit 5	Conservation, Sustainability, and Stewardship: 2 days	October 28, 2010 October 29, 2010	Total days: 2 Total themes: 1
***Connors,** Dr. Brendan (postdoctoral fellow, School of Resource and Environmental Management, Simon Fraser University) Curriculum vitae: Exhibit 1541	Aquaculture: 3 days	August 25, 2011 August 26, 2011 August 29, 2011	Total days: 3 Total themes: 1
Coultish, Mr. Scott (regional chief, Intelligence and Investigation Services, Conservation and Protection, DFO) Resumé: Exhibit 865	Fisheries Monitoring and Enforcement: 2 days	May 17, 2011 May 18, 2011	Total days: 2 Total themes: 1
Crey, Mr. Ernie (member, Stó:lō Nation; fisheries and policy advisor, Stó:lō Tribal Council; member, Executive Committee, Fraser River Aboriginal Fisheries Secretariat) Biography: Exhibit 1247	Aboriginal Fishing: 2 days	July 4, 2011 July 5, 2011	Total days: 2 Total themes: 1
Cross, Ms. Carol (manager, Strategic Initiatives, Salmonid Enhancement Program, Oceans, Habitat and Enhancement Branch, DFO) Curriculum vitae: Exhibit 761	Habitat Enhancement and Restoration: 2 days	May 2, 2011 May 4, 2011	Total days: 2 Total themes: 1
Crowe, Mr. Michael (section head, Habitat Management Program, Oceans, Habitat and Enhancement Branch, BC Interior, DFO) Curriculum vitae: Exhibit 998	Effects on the Fraser River Watershed – Urbanization: 2 days	June 7, 2011 June 8, 2011	Total days: 2 Total themes: 1
Curry, Mr. Gordon (Aboriginal fisheries strategic planner, DFO, formerly worked with DFO Selective Fisheries Program) Curriculum vitae: Exhibit 431	Commercial Fishing: 1 day	February 21, 2011	Total days: 1 Total themes: 1
Dansereau, Ms. Claire (deputy minister, DFO) Biography: Exhibit 1920	DFO's Organizational Structure: 2 days	November 1, 2010 November 2, 2010	Total days: 7 Total themes: 2
	DFO Priorities and Summary: 5 days	September 22, 2011 September 23, 2011 September 26, 2011 September 27, 2011 September 28, 2011	
Davidson, Mr. Glen (director, Water Management Branch, BC Ministry of Forests, Lands and Natural Resource Operations [appointed comptroller of water rights]) Biography: Exhibit 1866	Hydro, Water, Temperature: 1 day	September 16, 2011	Total days: 1 Total themes: 1
Davis, Dr. John (former special advisor to the deputy minister, DFO, on species at risk) Curriculum vitae: Exhibit 884	Cultus Lake – SARA Listing Decision: 3 days	May 30, 2011 May 31, 2011 July 8, 2011	Total days: 3 Total themes: 1

Witness	Hearing	Date	Totals
Delaney, Mr. Peter (former chief, Habitat Policy Unit and Fish Habitat Unit, and former senior program advisor, Oceans, Habitat and Enhancement Branch, DFO) Curriculum vitae: Exhibit 1106	Effects on the Fraser River Watershed – Logging: 1 day	June 17, 2011	Total days: 1 Total themes: 1
Di Franco, Mr. Sergio (senior enforcement and prevention officer, Environmental Response Branch, Canadian Coast Guard, DFO) Curriculum vitae: Exhibit 1372	Effects on Habitat in the Marine Environment: 2 days	August 17, 2011 August 18, 2011	Total days: 2 Total themes: 1
***Dill,** Dr. Lawrence (professor, Department of Biological Sciences, Simon Fraser University) Curriculum vitae: Exhibit 1539	Aquaculture: 3 days	August 25, 2011 August 26, 2011 August 29, 2011	Total days: 3 Total themes: 1
***Dorner,** Dr. Brigitte (fisheries management consultant, Driftwood Cove Designs) Curriculum vitae: Exhibit 750	Examination on Technical Report 10, Production Dynamics: 2 days	April 20, 2011 April 21, 2011	Total days: 2 Total themes: 1
Ducommun, Captain Gary (director of natural resources, Métis Nation of BC) Witness summary: Exhibit 298	Aboriginal Worldview, Cultural Context, and Traditional Knowledge: 1 day	December 15, 2010	Total days: 1 Total themes: 1
Duncan, Mr. Bill (business agent, Native Brotherhood of British Columbia) Biography: Exhibit 499	Commercial Fishing: 2 days	March 1, 2011 March 15, 2011	Total days: 2 Total themes: 1
***English,** Mr. Karl (senior fisheries scientist and former president, LGL Research Associates Ltd.) Curriculum vitae: Exhibit 719	Examination on Technical Report 7, Fisheries Management: 2 days	April 14, 2011 April 15, 2011	Total days: 3 Total themes: 2
	Fraser River Sockeye Life Cycle: 1 day	October 25, 2010	
Farlinger, Ms. Susan (regional director general, Pacific Region, DFO) Curriculum vitae: Exhibit 227	DFO's Organizational Structure: 2 days	November 1, 2010 November 2, 2010	Total days: 10 Total themes: 4
	Wild Salmon Policy (Part 1): 2 days	December 9, 2010 December 16, 2010	
	Wild Salmon Policy – Regional Director General: 1 day	March 4, 2011	
	DFO Priorities and Summary: 5 days	September 22, 2011 September 23, 2011 September 26, 2011 September 27, 2011 September 28, 2011	
Fleming, Dr. Ian (professor, Ocean Sciences Centre, Memorial University of Newfoundland) Curriculum vitae: Exhibit 1587	Aquaculture: 1 day	August 30, 2011	Total days: 1 Total themes: 1
***Ford,** Dr. John (head, Cetacean Research Program, Pacific Biological Station, DFO) Curriculum vitae: Exhibit 784	Predation: 2 days	May 4, 2011 May 5, 2011	Total days: 2 Total themes: 1
***Gagné,** Ms. Nellie (molecular biology scientist and laboratory supervisor, Molecular Biology Unit, Gulf Fisheries Centre, DFO Moncton) Curriculum vitae: Exhibit 1994	Infectious Salmon Anemia virus (ISAv): 2 days	December 15, 2011 December 16, 2011	Total days: 2 Total themes: 1

Witness	Hearing	Date	Totals
***Garver,** Dr. Kyle (research scientist, Aquatic Animal Health, Pacific Biological Station, DFO) Curriculum vitae: Exhibit 1511	Diseases: 2 days	August 24, 2011 August 25, 2011	Total days: 2 Total themes: 1
***Gillespie,** Mr. Graham (head, Shellfish Section, Pacific Biological Station, DFO) Curriculum vitae: Exhibit 821	Predation: 1 day	May 6, 2011	Total days: 1 Total themes: 1
***Glavin,** Mr. Terry (author and journalist) Biography: Exhibit 6	Conservation, Sustainability, and Stewardship: 2 days	October 28, 2010 October 29, 2010	Total days: 2 Total themes: 1
Grace, Mr. Robert (environmental impact assessment biologist, Thompson-Nicola Subregion, Environmental Protection Division, BC Ministry of Environment) Curriculum vitae: Exhibit 1023	Effects on the Fraser River Watershed – Pulp and Paper Effluent, Mining Effluent: 1 day	June 13, 2011	Total days: 1 Total themes: 1
Grant, Ms. Sue (head, Sockeye and Pink Analytical Program, Stock Assessment Division, DFO) Curriculum vitae: Exhibit 350	Harvest Management (Part 2): 1 day	January 26, 2011	Total days: 1 Total themes: 1
Grout, Mr. Jeff (salmon resource manager, Salmon Team, DFO) Curriculum vitae: Exhibit 316	Harvest Management (Part 1): 4 days	January 17, 2011 January 21, 2011 January 24, 2011 January 25, 2011	Total days: 7 Total themes: 2
	Commercial Fishing: 3 days	February 23, 2011 February 24, 2011 February 28, 2011	
Guujaaw (president, Haida Nation) Witness summary: Exhibit 299	Aboriginal Worldview, Cultural Context, and Traditional Knowledge: 1 day	December 15, 2010	Total days: 1 Total themes: 1
Hagen, Mr. Michael (program scientist, Natural Resources Sectors Unit, Environmental Protection Operations, Environment Canada) Curriculum vitae: Exhibit 1021	Effects on the Fraser River Watershed – Pulp and Paper Effluent, Mining Effluent: 1 day	June 13, 2011	Total days: 1 Total themes: 1
Hargreaves, Dr. Brent (acting lead, Salmon Team, and research scientist, Pacific Biological Station, DFO) Resumé: Exhibit 430	Commercial Fishing: 1 day	February 21, 2011	Total days: 1 Total themes: 1
***Harris,** Dr. Douglas (associate dean, Graduate Studies and Research, Faculty of Law, University of British Columbia) Curriculum vitae: Exhibit 1134	Aboriginal Fishing: 1 day	June 27, 2011	Total days: 1 Total themes: 1
Higgins, Mr. Paul (former manager, Environmental Resources Department, BC Hydro) Curriculum vitae: Exhibit 1868	Hydro, Water, Temperature: 1 day	September 16, 2011	Total days: 1 Total themes: 1
Hill, Mr. Douglas (head, Environmental Management Section, Cariboo Region, Environmental Protection Division, BC Ministry of Environment) Curriculum vitae: Exhibit 1024	Effects on the Fraser River Watershed – Pulp and Paper Effluent, Mining Effluent: 1 day	June 13, 2011	Total days: 1 Total themes: 1

Witness	Hearing	Date	Totals
***Hinch,** Dr. Scott (professor, Department of Forest Sciences and Institute for Resources, Environment and Sustainability, University of British Columbia) Curriculum vitae: Exhibit 551	Examination on Technical Report 9, Climate Change: 2 days	March 8, 2011 March 9, 2011	Total days: 2 Total themes: 1
Holt, Dr. Carrie (research scientist, Pacific Biological Station, DFO) Curriculum vitae: Exhibit 178	Wild Salmon Policy (Part 1): 3 days	December 2, 2010 December 3, 2010 December 7, 2010	Total days: 3 Total themes: 1
Houtman, Dr. Robert (catch–monitoring biologist, Pacific Biological Station, DFO) Curriculum vitae: Exhibit 837	Fisheries Monitoring and Enforcement: 1 day	May 11, 2011	Total days: 1 Total themes: 1
Hoyseth, Ms. Kerra (senior aquaculture biologist, Aquaculture Environmental Operations, DFO) Curriculum vitae: Exhibit 1704	Aquaculture: 1 day	September 1, 2011	Total days: 1 Total themes: 1
Huber, Mr. Barry (Aboriginal affairs advisor, BC Interior, DFO) Curriculum vitae: Exhibit 1178	Aboriginal Fishing: 2 days	June 28, 2011 June 30, 2011	Total days: 2 Total themes: 1
***Hume,** Mr. Jeremy (research biologist, Lakes Research Program, DFO) Curriculum vitae: Exhibit 801	Predation: 2 days	May 5, 2011 May 6, 2011	Total days: 2 Total themes: 1
Hwang, Mr. Jason (area manager, Oceans, Habitat and Enhancement Branch, BC Interior, DFO) Curriculum vitae: Exhibit 647	Habitat Management and Enforcement: 2 days	April 4, 2011 April 5, 2011	Total days: 5 Total themes: 3
	Effects on the Fraser River Watershed – Gravel Removal: 2 days	June 16, 2011 July 7, 2011	
	Hydro, Water, Temperature: 1 day	September 16, 2011	
Hyatt, Dr. Kim (research scientist, Stock Assessment Division, Pacific Biological Station, DFO) Curriculum vitae: Exhibit 179	Wild Salmon Policy (Part 1): 4 days	December 2, 2010 December 3, 2010 December 7, 2010 December 8, 2010	Total days: 4 Total themes: 1
Ignace, Dr. Ronald (member, Secwepemc Nation; former chief, Skeetchestn Indian Band) Witness summary: Exhibit 294	Aboriginal Worldview, Cultural Context, and Traditional Knowledge: 1 day	December 14, 2010	Total days: 1 Total themes: 1
***Irvine,** Dr. Jim (research scientist, Salmon and Freshwater Ecosystems, Pacific Biological Station, DFO) Curriculum vitae: Exhibit 177	*Effects on Habitat in the Marine Environment: 1 day	July 8, 2011	Total days: 8 Total themes: 2
	Wild Salmon Policy (Part 1): 7 days	November 29, 2010 November 30, 2010 December 1, 2010 December 2, 2010 December 3, 2010 December 7, 2010 December 8, 2010	
Jantz, Mr. Lester (area chief, Resource Management, BC Interior, DFO) Curriculum vitae: Exhibit 839	Fisheries Monitoring and Enforcement: 1 day	May 11, 2011	Total days: 1 Total themes: 1
***Johannes,** Dr. Mark (senior environmental specialist, Golder Associates, Ltd.) Curriculum vitae: Exhibit 731	Examination on Technical Report 12, Lower Fraser Habitat: 2 days	April 18, 2011 April 19, 2011	Total days: 2 Total themes: 1

Witness	Hearing	Date	Totals
***Johnson,** Dr. Stewart (head, Aquatic Animal Health Section, Pacific Biological Station, DFO) Curriculum vitae: Exhibit 1451	Diseases: 2 days	August 22, 2011 August 23, 2011	Total days: 2 Total themes: 1
Jones, Mr. Russ (technical director / policy analyst / project manager, Haida Fisheries Program; member, First Nations Fisheries Council; alternate commissioner, Pacific Salmon Commission) Curriculum vitae: Exhibit 1183	Aboriginal Fishing: 2 days	June 28, 2011 June 30, 2011	Total days: 2 Total themes: 1
***Jones,** Dr. Simon (research scientist, Aquatic Animal Health Section, Pacific Biological Station, DFO) Curriculum vitae: Exhibit 1759	Aquaculture: 1 day	September 6, 2011	Total days: 3 Total themes: 2
	Infectious Salmon Anemia virus (ISAv): 2 days	December 16, 2011 December 19, 2011	
***Kent,** Dr. Michael (professor, Microbiology and Biomedical Sciences, Oregon State University) Curriculum vitae: Exhibit 1448	Diseases: 2 days	August 22, 2011 August 23, 2011	Total days: 2 Total themes: 1
***Kibenge,** Dr. Frederick (chairman, Department of Pathology and Microbiology, Atlantic Veterinary College, University of Prince Edward Island) Curriculum vitae: Exhibit 1995	Infectious Salmon Anemia virus (ISAv): 2 days	December 15, 2011 December 16, 2011	Total days: 2 Total themes: 1
Klotins, Dr. Kim (acting national manager, Disease Control Contingency Planning, Aquatic Animal Health Division, Canadian Food Inspection Agency) Curriculum vitae: Exhibit 1997	Infectious Salmon Anemia virus (ISAv): 2 days	December 16, 2011 December 19, 2011	Total days: 2 Total themes: 1
***Korman,** Dr. Josh (fish ecologist, Ecometric Research Inc.) Curriculum vitae: Exhibit 1534	Aquaculture: 3 days	August 25, 2011 August 26, 2011 August 29, 2011	Total days: 3 Total themes: 1
Kowal, Mr. Don (executive secretary, Pacific Salmon Commission)	Pacific Salmon Commission and Pacific Salmon Treaty: 2 days	November 8, 2010 November 9, 2010	Total days: 2 Total themes: 1
Kristianson, Dr. Gerry (chair, Sport Fishing Advisory Board; commissioner, Pacific Salmon Commission;) Biography: Exhibit 376	Harvest Management (Part 2): 3 days	February 1, 2011 February 3, 2011 February 11, 2011	Total days: 4 Total themes: 2
	Recreational Fishing: 1 day	March 7, 2011	
Kriwoken, Ms. Lynn (director, Water Protection and Sustainability Branch, Environmental Sustainability Division, BC Ministry of Environment) Curriculum vitae: Exhibit 1867	Hydro, Water, Temperature: 1 day	September 16, 2011	Total days: 1 Total themes: 1
Kwak, Mr. Frank (president, Fraser Valley Salmon Society; director, Sport Fishing Advisory Board) Biography: Exhibit 547	Recreational Fishing: 1 day	March 7, 2011	Total days: 1 Total themes: 1

Witness	Hearing	Date	Totals
***Lapointe,** Mr. Mike (chief biologist, Pacific Salmon Commission) Curriculum vitae: Exhibit 328	*Fraser River Sockeye Life Cycle: 1 day	October 25, 2010	Total days: 8 Total themes: 4
	Pacific Salmon Commission and Pacific Salmon Treaty: 2 days	November 8, 2010 November 9, 2010	
	Harvest Management (Part 1): 3 days	January 18, 2011 January 19, 2011 January 20, 2011	
	Harvest Management (Part 2): 2 days	January 26, 2011 January 27, 2011	
Last, Mr. Gavin (assistant director, Policy and Industry Competitiveness Branch, BC Ministry of Agriculture and Lands) Curriculum vitae: Exhibit 1586	Aquaculture: 1 day	August 30, 2011	Total days: 1 Total themes: 1
LeBlanc, Mr. Patrice (director, Habitat Management Policy Branch, Program Policy Sector, DFO) Curriculum vitae: Exhibit 645	Habitat Management and Enforcement: 2 days	April 4, 2011 April 5, 2011	Total days: 2 Total themes: 1
***MacDonald,** Mr. Don (aquatic biologist, MacDonald Environmental Sciences Ltd.) Curriculum vitae: Exhibit 828	Examination on Technical Report 2, Contaminants: 2 days	May 9, 2011 May 10, 2011	Total days: 2 Total themes: 1
Macdonald, Dr. Robie (head, Marine Environmental Quality Section, Institute of Ocean Sciences, DFO) Curriculum vitae: Exhibit 974	Effects on the Fraser River Watershed – Urbanization: 1 day	June 6, 2011	Total days: 1 Total themes: 1
***MacDonald,** Dr. Steve (head, Environmental and Aquaculture Research Section,, West Vancouver Laboratory, DFO) Curriculum vitae: Exhibit 1846	Hydro, Water, Temperature: 1 day	September 15, 2011	Total days: 1 Total themes: 1
Macgillivray, Mr. Paul (associate regional director general, DFO Pacific)	DFO's Organizational Structure: 2 days	November 1, 2010 November 2, 2010	Total days: 2 Total themes: 1
***MacWilliams,** Dr. Christine (fish health veterinarian, Aquatic Animal Health Section, Salmonid Enhancement Program, DFO) Curriculum vitae: Exhibit 1455	Diseases: 2 days	August 22, 2011 August 23, 2011	Total days: 2 Total themes: 1
Malloway, Grand Chief Ken (member, Stó:lō Tribal Council; chair, Fraser Valley Aboriginal Fisheries Society; member, ISDF Monitoring and Compliance Panel; member, Fraser River Panel, Pacific Salmon Commission) Biography: Exhibit 853	Fisheries Monitoring and Enforcement: 1 day	May 12, 2011	Total days: 1 Total themes: 1
***Marmorek,** Mr. David (president, ESSA Technologies Ltd.) Curriculum vitae: Exhibit 566	Cumulative Impact Assessment: 2 days	September 19, 2011 September 20, 2011	Total days: 2 Total themes: 1
***Martins,** Dr. Eduardo (postdoctoral fellow, Department of Forest Sciences, University of British Columbia) Curriculum vitae: Exhibit 552	Examination on Technical Report 9, Climate Change: t2 days	March 8, 2011 March 9, 2011	Total days: 2 Total themes: 1
***Marty,** Dr. Gary (fish pathologist, Animal Health Centre, BC Ministry of Agriculture) Curriculum vitae: Exhibit 1659	Aquaculture: 1 day	August 31, 2011	Total days: 1 Total themes: 1

Witness	Hearing	Date	Totals
Masson, Mr. Colin (element lead, Enhanced Accountability, Pacific Integrated Commercial Fisheries Initiative, DFO; member, ISDF Monitoring and Compliance Panel) Resumé: Exhibit 854	Fisheries Monitoring and Enforcement: 1 day	May 12, 2011	Total days: 1 Total themes: 1
Matthew, Mr. Pat (conservation and stewardship coordinator, Secwepemc Fisheries Commission) Resumé: Exhibit 378	Harvest Management (Part 2): 2 days	February 1, 2011 February 3, 2011	Total days: 2 Total themes: 1
Maynard, Mr. Jeremy (director, Sport Fishing Advisory Board) Resumé: Exhibit 546	Recreational Fishing: 1 day	March 7, 2011	Total days: 1 Total themes: 1
McEachern, Mr. Ryan (Area D Harvest Committee) Biography: Exhibit 451	Commercial Fishing: 2 days	February 22, 2011 February 28, 2011	Total days: 2 Total themes: 1
***McFarlane,** Mr. Gordon (scientist emeritus, Marine Ecosystems and Aquaculture Division, Pacific Biological Station, DFO) Curriculum vitae: Exhibit 800	Predation: 2 days	May 5, 2011 May 6, 2011	Total days: 2 Total themes: 1
McGivney, Ms. Kaarina (former regional director, Treaty and Aboriginal Policy, DFO) Curriculum vitae: Exhibit 1418	Aboriginal Fishing: 2 days	August 19, 2011 September 2, 2011	Total days: 2 Total themes: 1
***McKenzie,** Dr. Peter (veterinarian and fish health manager, Mainstream Canada) Curriculum vitae: Exhibit 1661	Aquaculture: 1 day	August 31, 2011	Total days: 1 Total themes: 1
***McKinnell,** Dr. Stewart (deputy executive secretary, North Pacific Marine Science Organization [PICES]) Curriculum vitae: Exhibit 1284	Effects on Habitat in the Marine Environment: 2 days	July 6, 2011 July 7, 2011	Total days: 2 Total themes: 1
Mijacika, Ms. Lisa (former acting manager, Business Client Services, Licensing and Allocation, Fisheries and Aquaculture Management Branch, DFO) Resumé: Exhibit 582	Commercial Fishing: 1 day	March 15, 2011	Total days: 1 Total themes: 1
Miller, Mr. Ian (manager, Sustainable Forest Management, BC Ministry of Forests, Lands and Natural Resource Operations) Curriculum vitae: Exhibit 1105	Effects on the Fraser River Watershed – Logging: 1 day	June 17, 2011	Total days: 1 Total themes: 1
***Miller,** Dr. Kristina (head, Molecular Genetics Section, Salmon and Freshwater Ecosystems Division, DFO) Curriculum vitae: Exhibit 1510	Diseases: 2 days	August 24, 2011 August 25, 2011	Total days: 3 Total themes: 2
	Infectious Salmon Anemia virus (ISAv): 1 day	December 15, 2011	
Mithani, Dr. Siddika (assistant deputy minister, Oceans and Science, DFO)	DFO's Organizational Structure: 2 days	November 3, 2010 November 4, 2010	Total days: 2 Total themes: 1

Witness	Hearing	Date	Totals
***Morley,** Mr. Rob (vice president, Canadian Fishing Company; director, BC Salmon Marketing Council; chairman, Fisheries Council of Canada; member, Fraser River Panel, Pacific Salmon Commission) Curriculum vitae: Exhibit 7	*Conservation, Sustainability, and Stewardship: 2 days	October 28, 2010 October 29, 2010	Total days: 8 Total themes: 4
	Harvest Management (Part 2): 2 days	February 7, 2011 February 8, 2011	
	Commercial Fishing: 2 days	March 1, 2011 March 15, 2011	
	Wild Salmon Policy (Part 2) – Strategy 4 and Integrated Planning: 2 days	June 2, 2011 June 3, 2011	
Morton, Ms. Alexandra (executive director, Raincoast Research Society) Curriculum vitae: Exhibit 1798	Aquaculture: 2 days	September 7, 2011 September 8, 2011	Total days: 2 Total themes: 1
Mountain, Chief Robert (councillor, Namgis First Nation; hereditary chief, Mamalilikula First Nation) Witness summary: Exhibit 301	Aboriginal Worldview, Cultural Context, and Traditional Knowledge: 1 day	December 15, 2010	Total days: 1 Total themes: 1
Naknakim, Mr. Rod (chief negotiator, Laich-Kwil-Tach Treaty Society) Witness summary: Exhibit 297	Aboriginal Worldview, Cultural Context, and Traditional Knowledge: 1 day	December 15, 2010	Total days: 1 Total themes: 1
***Nelitz,** Mr. Marc (systems ecologist, Environmental Management Team, ESSA Technologies) Curriculum vitae: Exhibit 563	Examination on Technical Report 3, Freshwater Ecology: 2 days	March 10, 2011 March 14, 2011	Total days: 2 Total themes: 1
Nelson, Mr. Randy (director, Conservation and Protection, Pacific Region, DFO) Curriculum vitae: Exhibit 687	Habitat Management and Enforcement: 2 days	April 7, 2011 April 8, 2011	Total days: 4 Total themes: 2
	Fisheries Monitoring and Enforcement: 2 days	May 17, 2011 May 18, 2011	
Newman, Chief Edwin (hereditary chief and elder, Heiltsuk Nation) Witness summary: Exhibit 300	Aboriginal Worldview, Cultural Context, and Traditional Knowledge: 1 day	December 15, 2010	Total days: 1 Total themes: 1
***Noakes,** Dr. Donald (professor, Department of Mathematics and Statistics, Thompson Rivers University) Curriculum vitae: Exhibit 1535	Aquaculture: 3 days	August 25, 2011 August 26, 2011 August 29, 2011	Total days: 3 Total themes: 1
***Nylund,** Dr. Are (professor, University of Bergen, Norway) ISA publications: Exhibit 1996	Infectious Salmon Anemia virus (ISAv): 1 day	December 15, 2011	Total days: 1 Total themes: 1
***Olesiuk,** Mr. Peter (head, Pinniped Research Program, Pacific Biological Station, DFO) Curriculum vitae: Exhibit 785	Predation: 2 days	May 4, 2011 May 5, 2011	Total days: 2 Total themes: 1
***Orr,** Dr. Craig (executive director, Watershed Watch Salmon Society) Curriculum vitae: Exhibit 1760	Aquaculture: 1 day	September 6, 2011	Total days: 2 Total themes: 2
	Hydro, Water, Temperature: 1 day	September 15, 2011	
Paradis, Dr. Sylvain (former director, Environment and Biodiversity Science; former director general, Ecosystem Science Directorate, DFO) Curriculum vitae: Exhibit 984	Effects on the Fraser River Watershed – Urbanization: 2 days	June 6, 2011 June 7, 2011	Total days: 2 Total themes: 1

Witness	Hearing	Date	Totals
Parker, Ms. Mia (former manager, Regulatory Affairs, Grieg Seafood BC Ltd.) Curriculum vitae: Exhibit 1801	Aquaculture: 2 days	September 7, 2011 September 8, 2011	Total days: 2 Total themes: 1
Parslow, Mr. Matthew (management biologist, Fisheries and Aquaculture Management Branch, DFO) Curriculum vitae: Exhibit 838	Fisheries Monitoring and Enforcement: 1 day	May 11, 2011	Total days: 1 Total themes: 1
***Parsons,** Dr. Timothy (professor emeritus, Department of Earth and Ocean Sciences, University of British Columbia; honorary research scientist, Institute of Ocean Sciences, DFO) Curriculum vitae: Exhibit 1349	Effects on Habitat in the Marine Environment: 1 day	July 8, 2011	Total days: 1 Total themes: 1
Patterson, Mr. David (habitat research biologist, Cooperative Resource Management Institute, DFO) Curriculum vitae: Exhibit 362	Harvest Management (Part 2): 2 days	January 27, 2011 February 8, 2011	Total days: 2 Total themes: 1
Pennier, Grand Chief Clarence (member, Scowlitz First Nation; chief, Stó:lō Tribal Council) Witness summary: Exhibit 280	Aboriginal Worldview, Cultural Context, and Traditional Knowledge: 1 day	December 13, 2010	Total days: 1 Total themes: 1
***Peterman,** Dr. Randall (professor, School of Resource & Environmental Management, Simon Fraser University, and Canada research chair in fisheries risk assessment and management) Curriculum vitae: Exhibit 749	Examination on Technical Report 10, Production Dynamics: 2 days	April 20, 2011 April 21, 2011	Total days: 4 Total themes: 2
	Habitat Enhancement and Restoration: 2 days	May 2, 2011 May 4, 2011	
***Price,** Mr. Michael (biologist, Raincoast Conservation Foundation) Curriculum vitae: Exhibit 1761	Aquaculture: 1 day	September 6, 2011	Total days: 1 Total themes: 1
Quipp, Councillor June (councillor, Cheam Indian Band) Witness summary: Exhibit 278	Aboriginal Worldview, Cultural Context, and Traditional Knowledge: 1 day	December 13, 2010	Total days: 1 Total themes: 1
Reid, Mr. Bruce (regional manager, Oceans Program, Oceans, Habitat and Enhancement Branch, DFO) Curriculum vitae: Exhibit 1373	Effects on Habitat in the Marine Environment: 2 days	August 17, 2011 August 18, 2011	Total days: 2 Total themes: 1
Reid, Ms. Rebecca (regional director, Fisheries and Aquaculture Management; former regional director, Oceans Habitat and Enhancement Branch, DFO) Curriculum vitae: Exhibit 646	Habitat Management and Enforcement: 2 days	April 4, 2011 April 5, 2011	Total days: 2 Total themes: 1
***Rempel,** Dr. Laura (habitat biologist, Habitat Protection and Sustainable Development, Oceans, Habitat and Enhancement Branch, DFO) Curriculum vitae: Exhibit 1068	Effects on the Fraser River Watershed – Gravel Removal: 2 days	June 15, 2011 June 16, 2011	Total days: 2 Total themes: 1
***Rensel,** Dr. Jack (aquatic science consultant, Rensel Associates Aquatic Science Consultants) Curriculum vitae: Exhibit 1363	Effects on Habitat in the Marine Environment: 1 day	August 17, 2011	Total days: 1 Total themes: 1

Witness	Hearing	Date	Totals
***Reynolds,** Dr. John (professor and Tom Buell leadership chair in salmon conservation, Simon Fraser University) Curriculum vitae: Exhibit 4	Conservation, Sustainability, and Stewardship: 2 days	October 28, 2010 October 29, 2010	Total days: 2 Total themes: 1
Richards, Dr. Laura (regional director, Science Branch, Pacific Region, DFO) Curriculum vitae: Exhibit 610	DFO's Organizational Structure: 2 days	November 3, 2010 November 4, 2010	Total days: 8 Total themes: 3
	Advice to the Minister regarding Sockeye Returns in 2009: 1 day	March 17, 2011	
	DFO Priorities and Summary: 5 days	September 22, 2011 September 23, 2011 September 26, 2011 September 27, 2011 September 28, 2011	
Riddell, Dr. Brian (chief executive officer, Pacific Salmon Foundation; former division head, Salmon and Freshwater Ecosystems, Pacific Biological Station, DFO) Curriculum vitae: Exhibit 108	Wild Salmon Policy (Part 1): 4 days	November 29, 2010 November 30, 2010 December 1, 2010 December 2, 2010	Total days: 11 Total themes: 3
	Harvest Management (Part 2): 5 days	January 26, 2011 February 2, 2011 February 3, 2011 February 9, 2011 February 10, 2011	
	Wild Salmon Policy (Part 1) – Expert Stakeholders: 2 days	June 1, 2011 June 2, 2011	
***Rosenau,** Dr. Marvin (instructor, Fish Wildlife and Recreation Technology, British Columbia Institute of Technology) Curriculum vitae: Exhibit 1069	Effects on the Fraser River Watershed – Gravel Removal: 1 day	June 15, 2011 June 16, 2011	Total days: 2 Total themes: 1
Rosenberger, Mr. Barry (area director, BC Interior, DFO; Canadian chair, Fraser River Panel, Pacific Salmon Commission) Curriculum vitae: Exhibit 323	Harvest Management (Part 1): 4 days	January 17, 2011 January 21, 2011 January 24, 2011 January 25, 2011	Total days: 6 Total themes: 2
	Aboriginal Fishing: 2 days	July 4, 2011 July 5, 2011	
***Ross,** Dr. Peter (research scientist, Marine Environmental Quality Section, Institute of Ocean Sciences, DFO) Curriculum vitae: Exhibit 1043	*Effects on the Fraser River Watershed – Municipal Wastewater: 1 day	June 14, 2011	Total days: 3 Total themes: 2
	Effects on Habitat in the Marine Environment: 2 days	August 17, 2011 August 18, 2011	
Ryall, Mr. Paul (former lead, Salmon Team, DFO; former chair, Fraser River Panel, Pacific Salmon Commission) Curriculum vitae: Exhibit 365	Harvest Management (Part 2): 3 days	January 31, 2011 February 1, 2011 March 16, 2011	Total days: 5 Total themes: 2
	Wild Salmon Policy (Part 2) – Strategy 4 and Integrated Planning: 2 days	June 2, 2011 June 3, 2011	
Saito, Mr. Wayne (fisheries management consultant; former chair, Fraser River Panel, Pacific Salmon Commission) Curriculum vitae: Exhibit 377	Harvest Management (Part 2): 3 days	February 1, 2011 February 3, 2011 February 11, 2011	Total days: 3 Total themes: 1

Witness	Hearing	Date	Totals
Sakich, Mr. Peter (co-chair, Commercial Salmon Advisory Board; chair, ISDF Monitoring and Compliance Panel; member, Area H Harvest Committee) Biography: Exhibit 422	Harvest Management (Part 2): 1 day	February 11, 2011	Total days: 4 Total themes: 3
	Commercial Fishing: 2 days	February 22, 2011 February 28, 2011	
	Fisheries Monitoring and Enforcement: 1 day	May 12, 2011	
***Saksida,** Dr. Sonja (executive director, Centre for Aquatic Health Sciences) Curriculum vitae: Exhibit 1762	Aquaculture: 1 day	September 6, 2011	Total days: 1 Total themes: 1
Salomi, Mr. Corino (area manager, Oceans, Habitat and Enhancement Branch, Lower Fraser, DFO) Curriculum vitae: Exhibit 999	Effects on the Fraser River Watershed – Urbanization: 2 days	June 7, 2011 June 8, 2011	Total days: 2 Total themes: 1
Sampson, Chief Fred (member, Nlha7apmx Nation; chief, Siska Indian Band) Witness summary: Exhibit 291	Aboriginal Worldview, Cultural Context, and Traditional Knowledge: 1 day	December 14, 2010	Total days: 1 Total themes: 1
Saunders, Mr. Mark (manager, Salmon and Freshwater Ecosystems, Pacific Biological Station, DFO; former coordinator, Wild Salmon Policy, DFO) Curriculum vitae: Exhibit 180	Wild Salmon Policy (Part 1): 7 days	November 29, 2010 November 30, 2010 December 1, 2010 December 2, 2010 December 3, 2010 December 7, 2010 December 8, 2010	Total days: 9 Total themes: 2
	Wild Salmon Policy (Part 2) – Strategy 4 and Integrated Planning: 2 days	June 2, 2011 June 3, 2011	
Savard, Mr. Greg (acting director, Oceans, Habitat and Enhancement Branch, Pacific Region, DFO; former director, Salmonid Enhancement Program, Oceans, Habitat and Enhancement Branch, DFO) Curriculum vitae: Exhibit 762	Habitat Enhancement and Restoration: 2 days	May 2, 2011 May 4, 2011	Total days: 2 Total themes: 1
Scarfo, Ms. Kathy (president, West Coast (Area G) Trollers Association) Biography: Exhibit 498	Commercial Fishing: 2 days	March 1, 2011 March 15, 2011	Total days: 2 Total themes: 1
Schubert, Mr. Neil (head, Freshwater Ecosystems Section, Science Branch, DFO) Curriculum vitae: Exhibit 911	Cultus Lake – Recovery Efforts from 2005 Onwards: 2 days	May 31, 2011 June 1, 2011	Total days: 2 Total themes: 1
Shepert, Mr. Marcel (coordinator, Upper Fraser Fisheries Conservation Alliance; alternate member, Fraser River Panel, Pacific Salmon Commission) Curriculum vitae: Exhibit 1251	Aboriginal Fishing: 2 days	July 4, 2011 July 5, 2011	Total days: 2 Total themes: 1
***Sheppard,** Dr. Mark (lead veterinarian, Aquaculture Environmental Operations, DFO) Curriculum vitae: Exhibit 1660	Aquaculture: 1 day	August 31, 2011	Total days: 1 Total themes: 1
Sneddon, Ms. Deborah (resource manager, Recreational Fisheries, Lower Fraser Area, DFO) Curriculum vitae: Exhibit 512	Recreational Fishing: 2 days	March 2, 2011 March 3, 2011	Total days: 2 Total themes: 1

Witness	Hearing	Date	Totals
Sprout, Mr. Paul (former regional director general, Pacific Region, DFO) Curriculum vitae: Exhibit 226	DFO's Organizational Structure: 4 days	November 1, 2010 November 2, 2010 November 3, 2010 November 4, 2010	Total days: 7 Total themes: 3
	Wild Salmon Policy (Part 1): 2 days	December 9, 2010 December 16, 2010	
	Wild Salmon Policy – Regional Director General: 1 day	March 4, 2011	
Stalberg, Ms. Heather (senior habitat management biologist, Oceans, Habitat and Enhancement Branch, DFO) Curriculum vitae: Exhibit 176	Wild Salmon Policy (Part 1): 4 days	December 2, 2010 December 3, 2010 December 7, 2010 December 8, 2010	Total days: 4 Total themes: 1
Staley, Mr. Michael (fisheries management consultant; member, Fraser River Panel Technical Committee) Resumé: Exhibit 401	Harvest Management (Part 2): 2 days	February 7, 2011 February 8, 2011	Total days: 2 Total themes: 1
Steele, Mr. Paul (director general, Conservation and Protection, DFO, Ottawa) Curriculum vitae: Exhibit 686	Habitat Management and Enforcement: 2 days	April 7, 2011 April 8, 2011	Total days: 2 Total themes: 1
***Stephen,** Dr. Craig (president, Centre for Coastal Health; professor, Faculty of Veterinary Medicine, University of Calgary) Curriculum vitae: Exhibit 1453	Diseases: 2 days	August 22, 2011 August 23, 2011	Total days: 2 Total themes: 1
Stephen, Mr. Stephen (director, Biotechnology and Aquatic Animal Health Sciences Branch, DFO) Curriculum vitae: Exhibit 1998	Infectious Salmon Anemia virus (ISAv): 2 days	December 16, 2011 December 19, 2011	Total days: 2 Total themes: 1
Sterritt, Mr. Gord (fisheries resource manager, Northern Shuswap Tribal Council) Resumé: Exhibit 389	Harvest Management (Part 2): 1 day	February 3, 2011	Total days: 1 Total themes: 1
Stewart, Ms. Catherine (salmon farming campaign manager, Living Oceans Society) Curriculum vitae: Exhibit 1799	Aquaculture: 2 days	September 7, 2011 September 8, 2011	Total days: 2 Total themes: 1
Stewart, Ms. Julie (director, Pacific Integrated Commercial Fisheries Initiative, DFO) Curriculum vitae: Exhibit 1420	Aboriginal Fishing: 2 days	August 19, 2011 September 2, 2011	Total days: 2 Total themes: 1
Swerdfager, Mr. Trevor (formerly director general, Aquaculture Management Directorate, DFO, Ottawa) Curriculum vitae: Exhibit 1578	Aquaculture: 2 days	August 30, 2011 August 31, 2011	Total days: 2 Total themes: 1
Tadey, Mr. Joe (biologist and program head, Chum, Pink, and Recreational Fisheries Program, DFO) Curriculum vitae: Exhibit 513	Recreational Fishing: 2 days	March 2, 2011 March 3, 2011	Total days: 2 Total themes: 1
Talbot, Dr. André (director, Aquatic Ecosystem Protection Research Division, Water Science and Technology, Environment Canada) Curriculum vitae: Exhibit 973	Effects on the Fraser River Watershed – Urbanization: 1 day	June 6, 2011	Total days: 1 Total themes: 1

Witness	Hearing	Date	Totals
Terry, Grand Chief Saul (member, St'at'imc Nation; chief executive officer, Intertribal Treaty Organization; commissioner, Pacific Salmon Commission) Biography: Exhibit 1179	Aboriginal Worldview, Cultural Context, and Traditional Knowledge: 1 day	December 14, 2010	Total days: 3 Total themes: 2
	Aboriginal Fishing: 2 days	June 28, 2011 June 30, 2011	
Thomson, Mr. Andrew (director, Aquaculture Management Directorate, Pacific Region, DFO) Curriculum vitae: Exhibit 1579	Aquaculture: 2 days	August 30, 2011 September 1, 2011	Total days: 2 Total themes: 1
Todd, Mr. Neil (operations manager, Fraser River Aboriginal Fisheries Secretariat; fisheries consultant, Nicola Tribal Association) Curriculum vitae: Exhibit 1180	Aboriginal Fishing: 2 days	June 28, 2011 June 30, 2011	Total days: 2 Total themes: 1
***Trites,** Dr. Andrew (professor and director, Marine Mammal Research Unit, University of British Columbia Fisheries Centre) Curriculum vitae: Exhibit 781	Predation: 2 days	May 4, 2011 May 5, 2011	Total days: 2 Total themes: 1
Tschaplinski, Dr. Peter (research scientist, Fish-Forestry Interactions and Watershed Research, BC Ministry of Environment) Curriculum vitae: Exhibit 1104	Effects on the Fraser River Watershed – Logging: 1 day	June 17, 2011	Total days: 1 Total themes: 1
***van Aggelen,** Mr. Graham (head, Environmental Toxicology Section, Pacific Environmental Science Centre, Environment Canada) Curriculum vitae: Exhibit 1044	Effects on the Fraser River Watershed – Municipal Wastewater: 1 day	June 14, 2011	Total days: 1 Total themes: 1
van Roodselaar, Dr. Albert (division manager, Utility Planning and Environmental Management, Metro Vancouver) Curriculum vitae: Exhibit 1057	Effects on the Fraser River Watershed – Municipal Wastewater: 1 day	June 15, 2011	Total days: 1 Total themes: 1
Walls, Ms. Lisa (former acting manager, Environmental Assessment and Marine Programs Section / Environmental Assessment Section, Environmental Protection Operations, Environment Canada) Curriculum vitae: Exhibit 985	Effects on the Fraser River Watershed – Urbanization: 2 days	June 6, 2011 June 7, 2011	Total days: 2 Total themes: 1
Walters, Dr. Carl (professor, University of British Columbia Fisheries Centre) Curriculum vitae: Exhibit 415	Harvest Management (Part 2): 2 days	February 9, 2011 February 10, 2011	Total days: 2 Total themes: 1
Watson-Wright, Dr. Wendy (former assistant deputy minister, Science, DFO)	DFO's Organizational Structure: 2 days	November 3, 2010 November 4, 2010	Total days: 2 Total themes: 1
***Welch,** Dr. David (president and CEO, Kintama Research Services Ltd.) Curriculum vitae: Exhibit 1286	Fraser River Sockeye Life Cycle: 1 day	October 25, 2010	Total days: 3 Total themes: 2
	Effects on Habitat in the Marine Environment: 2 days	July 6, 2011 July 7, 2011	
Whitehouse, Mr. Timber (area chief, Fraser River Salmon Stock Assessment, Lower Fraser River and BC Interior areas, DFO) Resumé: Exhibit 379	Harvest Management (Part 2): 2 days	February 2, 2011 February 3, 2011	Total days: 2 Total themes: 1

Witness	Hearing	Date	Totals
***Wieckowski,** Ms. Katherine (systems ecologist, Fisheries and Aquatic Sciences Team, ESSA Technologies) Curriculum vitae: Exhibit 570	Examination on Technical Report 3, Freshwater Ecology: 2 days	March 10, 2011 March 14, 2011	Total days: 2 Total themes: 1
Wilkerson, Ms. Stacey (riparian areas regulation coordinator, Ecosystems Branch, BC Ministry of Environment) Curriculum vitae: Exhibit 1000	Effects on the Fraser River Watershed – Urbanization: 2 days	June 7, 2011 June 8, 2011	Total days: 2 Total themes: 1
Wilson, Mr. Ken (fisheries biologist consultant) Resumé: Exhibit 402	Harvest Management (Part 2): 4 days	February 7, 2011 February 8, 2011 February 9, 2011 February 10, 2011	Total days: 4 Total themes: 1
Wilson, Mr. Ross (member, Heiltsuk Nation; director, Heiltsuk Integrated Resource Management Department) Biography: Exhibit 1246	Aboriginal Fishing: 2 days	July 4, 2011 July 5, 2011	Total days: 2 Total themes: 1
Woodey, Dr. Jim (former chief biologist, Pacific Salmon Commission) Resumé: Exhibit 414	Harvest Management (Part 2): 2 days	February 9, 2011 February 10, 2011	Total days: 2 Total themes: 1
Wright, Dr. Peter (national manager, National Aquatic Animal Health Laboratory System, DFO Moncton) Curriculum vitae: Exhibit 1999	Infectious Salmon Anemia virus (ISAv): 2 days	December 16, 2011 December 19, 2011	Total days: 2 Total themes: 1
Young, Mr. Jeffery (aquatic biologist, David Suzuki Foundation; member, Marine Conservation Caucus and the Canadian Caucus of the Fraser River Panel) Curriculum vitae: Exhibit 423	Harvest Management (Part 2): 1 day	February 11, 2011	Total days: 5 Total themes: 3
	Wild Salmon Policy (Part 1) – Expert Stakeholders: 2 days	June 1, 2011 June 2, 2011	
	Wild Salmon Policy (Part 2) – Strategy 4 and Integrated Planning: 2 days	June 2, 2011 June 3, 2011	

Appendix F • Hearings

Hearings, by date and theme

**Accepted as expert witness (specific theme occasionally)*

Date	Hearing	Witnesses
October 25, 2010	Fraser River Sockeye Life Cycle	*English, Mr. Karl *Lapointe, Mr. Mike *Welch, Dr. David
October 26, 2010	Perspectives on the Aboriginal and Treaty Rights Framework Underlying the Fraser River Sockeye Salmon Fishery	
October 28, 2010	Conservation, Sustainability, and Stewardship	*Close, Dr. David *Glavin, Mr. Terry *Morley, Mr. Rob *Reynolds, Dr. John
October 29, 2010	Conservation, Sustainability, and Stewardship	*Close, Dr. David *Glavin, Mr. Terry *Morley, Mr. Rob *Reynolds, Dr. John
November 1, 2010	DFO's Organizational Structure	Bevan, Mr. David Dansereau, Ms. Claire Farlinger, Ms. Susan Macgillivray, Mr. Paul Sprout, Mr. Paul
November 2, 2010	DFO's Organizational Structure	Bevan, Mr. David Dansereau, Ms. Claire Farlinger, Ms. Susan Macgillivray, Mr. Paul Sprout, Mr. Paul
November 3, 2010	DFO's Organizational Structure	Bevan, Mr. David Cass, Mr. Alan Mithani, Dr. Siddika Richards, Dr. Laura Sprout, Mr. Paul Watson-Wright, Dr. Wendy
November 4, 2010	DFO's Organizational Structure	Bevan, Mr. David Cass, Mr. Alan Mithani, Dr. Siddika Richards, Dr. Laura Sprout, Mr. Paul Watson-Wright, Dr. Wendy
November 8, 2010	Pacific Salmon Commission and Pacific Salmon Treaty	Kowal, Mr. Don Lapointe, Mr. Mike
November 9, 2010	Pacific Salmon Commission and Pacific Salmon Treaty	Kowal, Mr. Don Lapointe, Mr. Mike
November 16, 2010	Hearing opened and cancelled	
November 29, 2010	Wild Salmon Policy (Part 1)	Chamut, Mr. Pat Irvine, Dr. Jim Riddell, Dr. Brian Saunders, Mr. Mark

Date	Hearing	Witnesses
November 30, 2010	Wild Salmon Policy (Part 1)	Chamut, Mr. Pat Irvine, Dr. Jim Riddell, Dr. Brian Saunders, Mr. Mark
December 1, 2010	Wild Salmon Policy (Part 1)	Chamut, Mr. Pat Irvine, Dr. Jim Riddell, Dr. Brian Saunders, Mr. Mark
December 2, 2010	Wild Salmon Policy (Part 1)	Chamut, Mr. Pat Holt, Dr. Carrie Hyatt, Dr. Kim Irvine, Dr. Jim Riddell, Dr. Brian Saunders, Mr. Mark Stalberg, Ms. Heather
December 3, 2010	Wild Salmon Policy (Part 1)	Holt, Dr. Carrie Hyatt, Dr. Kim Irvine, Dr. Jim Saunders, Mr. Mark Stalberg, Ms. Heather
December 7, 2010	Wild Salmon Policy (Part 1)	Holt, Dr. Carrie Hyatt, Dr. Kim Irvine, Dr. Jim Saunders, Mr. Mark Stalberg, Ms. Heather
December 8, 2010	Wild Salmon Policy (Part 1)	Hyatt, Dr. Kim Irvine, Dr. Jim Saunders, Mr. Mark Stalberg, Ms. Heather
December 9, 2010	Wild Salmon Policy (Part 1)	Farlinger, Ms. Susan Sprout, Mr. Paul
December 13, 2010	Aboriginal Worldview, Cultural Context, and Traditional Knowledge	Baird, Chief Kimberley Becker, Mr. Joseph Charlie, Chief William Pennier, Grand Chief Clarence Quipp, Councillor June
December 14, 2010	Aboriginal Worldview, Cultural Context, and Traditional Knowledge	Alexis, Mr. Thomas Ignace, Dr. Ronald Sampson, Chief Fred Terry, Grand Chief Saul
December 15, 2010	Aboriginal Worldview, Cultural Context, and Traditional Knowledge	Ducommun, Captain Gary Guujaaw (president, Haida Nation) Mountain, Chief Robert Naknakim, Mr. Rod Newman, Chief Edwin
December 16, 2010	Wild Salmon Policy (Part 1)	Farlinger, Ms. Susan Sprout, Mr. Paul
January 17, 2011	Harvest Management (Part 1)	Grout, Mr. Jeff Rosenberger, Mr. Barry
January 18, 2011	Harvest Management (Part 1)	Lapointe, Mr. Mike
January 19, 2011	Harvest Management (Part 1)	Lapointe, Mr. Mike

Date	Hearing	Witnesses
January 20, 2011	Harvest Management (Part 1)	Lapointe, Mr. Mike
January 21, 2011	Harvest Management (Part 1)	Grout, Mr. Jeff Rosenberger, Mr. Barry
January 24, 2011	Harvest Management (Part 1)	Grout, Mr. Jeff Rosenberger, Mr. Barry
January 25, 2011	Harvest Management (Part 1)	Grout, Mr. Jeff Rosenberger, Mr. Barry
January 26, 2011	Harvest Management (Part 2)	Grant, Ms. Sue Lapointe, Mr. Mike Riddell, Dr. Brian
January 27, 2011	Harvest Management (Part 2)	Lapointe, Mr. Mike Patterson, Mr. David
January 31, 2011	Harvest Management (Part 2)	Assu, Mr. Brian Cave, Mr. Jim Ryall, Mr. Paul
February 1, 2011	Harvest Management (Part 2)	Assu, Mr. Brian Cave, Mr. Jim Kristianson, Dr. Gerry Matthew, Mr. Pat Ryall, Mr. Paul Saito, Mr. Wayne
February 2, 2011	Harvest Management (Part 2)	Riddell, Dr. Brian Whitehouse, Mr. Timber
February 3, 2011	Harvest Management (Part 2)	Kristianson, Dr. Gerry Matthew, Mr Pat Riddell, Dr. Brian Saito, Mr. Wayne Sterritt, Mr. Gord Whitehouse, Mr. Timber
February 7, 2011	Harvest Management (Part 2)	Cass, Mr. Alan Morley, Mr. Rob Staley, Mr. Michael Wilson, Mr. Ken
February 8, 2011	Harvest Management (Part 2)	Cass, Mr. Alan Morley, Mr. Rob Patterson, Mr. David Staley, Mr. Michael Wilson, Mr. Ken
February 9, 2011	Harvest Management (Part 2)	Riddell, Dr. Brian Walters, Dr. Carl Wilson, Mr. Ken Woodey, Dr. Jim
February 10, 2011	Harvest Management (Part 2)	Riddell, Dr. Brian Walters, Dr. Carl Wilson, Mr. Ken Woodey, Dr. Jim
February 11, 2011	Harvest Management (Part 2)	Assu, Mr. Brian Kristianson, Dr. Gerry Saito, Mr. Wayne Sakich, Mr. Peter Young, Mr. Jeffery
February 21, 2011	Commercial Fishing	Curry, Mr. Gordon Hargreaves, Dr. Brent

Date	Hearing	Witnesses
February 22, 2011	Commercial Fishing	Ashton, Mr. Chris Brown, Mr. Dennis McEachern, Mr. Ryan Sakich, Mr. Peter
February 23, 2011	Commercial Fishing	Grout, Mr. Jeff
February 24, 2011	Commercial Fishing	Grout, Mr. Jeff
February 28, 2011	Commercial Fishing	Ashton, Mr. Chris Brown, Mr. Dennis Grout, Mr. Jeff McEachern, Mr. Ryan Sakich, Mr. Peter
March 1, 2011	Commercial Fishing	Duncan, Mr. Bill Morley, Mr. Rob Scarfo, Ms. Kathy
March 2, 2011	Recreational Fishing	Adams, Ms. Devona Sneddon, Ms. Debra Tadey, Mr. Joe
March 3, 2011	Recreational Fishing	Adams, Ms. Devona Sneddon, Ms. Debra Tadey, Mr. Joe
March 4, 2011	Wild Salmon Policy – Regional Director General	Farlinger, Ms. Susan Sprout, Mr. Paul
March 7, 2011	Recreational Fishing	Kristianson, Dr. Gerry Kwak, Mr. Frank Maynard, Mr. Jeremy
March 8, 2011	Examination on Technical Report 9, Climate Change	*Hinch, Dr. Scott *Martins, Dr. Eduardo
March 9, 2011	Examination on Technical Report 9, Climate Change	*Hinch, Dr. Scott *Martins, Dr. Eduardo
March 10, 2011	Examination on Technical Report 3, Freshwater Ecology	*Nelitz, Mr. Marc *Wieckowski, Ms. Katherine
March 14, 2011	Examination on Technical Report 3, Freshwater Ecology	*Nelitz, Mr. Marc *Wieckowski, Ms. Katherine
March 15, 2011	Commercial Fishing	Duncan, Mr. Bill Mijacika, Ms. Lisa Morley, Mr. Rob Scarfo, Ms. Kathy
March 16, 2011	Harvest Management (Part 2)	Ryall, Mr. Paul
March 17, 2011	Advice to the Minister regarding Sockeye Returns in 2009	Richards, Dr. Laura
April 4, 2011	Habitat Management and Enforcement	Hwang, Mr. Jason LeBlanc, Mr. Patrice Reid, Ms. Rebecca
April 5, 2011	Habitat Management and Enforcement	Hwang, Mr. Jason LeBlanc, Mr. Patrice Reid, Ms. Rebecca
April 6, 2011	Habitat Management and Enforcement	Carter, Mr. David
April 7, 2011	Habitat Management and Enforcement	Bombardier, Dr. Manon Nelson, Mr. Randy Steele, Mr. Paul
April 8, 2011	Habitat Management and Enforcement	Bombardier, Dr. Manon Nelson, Mr. Randy Steele, Mr. Paul

Date	Hearing	Witnesses
April 14, 2011	Examination on Technical Report 7, Fisheries Management	*English, Mr. Karl
April 15, 2011	Examination on Technical Report 7, Fisheries Management	*English, Mr. Karl
April 18, 2011	Examination on Technical Report 12, Lower Fraser Habitat	*Johannes, Dr. Mark
April 19, 2011	Examination on Technical Report 12, Lower Fraser Habitat	*Johannes, Dr. Mark
April 20, 2011	Examination on Technical Report 10, Production Dynamics	*Dorner, Dr. Brigitte *Peterman, Dr. Randall
April 21, 2011	Examination on Technical Report 10, Production Dynamics	*Dorner, Dr. Brigitte *Peterman, Dr. Randall
May 2, 2011	Habitat Enhancement and Restoration	Cross, Ms. Carol *Peterman, Dr. Randall Savard, Mr. Greg
May 4, 2011	Habitat Enhancement and Restoration	Cross, Ms. Carol *Peterman, Dr. Randall Savard, Mr. Greg
	Predation	*Christensen, Dr. Villy *Ford, Dr. John *Olesiuk, Mr. Peter *Trites, Dr. Andrew
May 5, 2011	Predation	*Christensen, Dr. Villy *Ford, Dr. John *Hume, Mr. Jeremy *McFarlane, Mr. Gordon *Olesiuk, Mr. Peter *Trites, Dr. Andrew
May 6, 2011	Predation	*Christensen, Dr. Villy *Gillespie, Mr. Graham *Hume, Mr. Jeremy *McFarlane, Mr. Gordon
May 9, 2011	Examination on Technical Report 2, Contaminants	*MacDonald, Mr. Don
May 10, 2011	Examination on Technical Report 2, Contaminants	*MacDonald, Mr. Don
May 11, 2011	Fisheries Monitoring and Enforcement	Houtman, Dr. Robert Jantz, Mr. Lester Parslow, Mr. Matthew
May 12, 2011	Fisheries Monitoring and Enforcement	Malloway, Grand Chief Ken Masson, Mr. Colin Sakich, Mr. Peter
May 17, 2011	Fisheries Monitoring and Enforcement	Coultish, Mr. Scott Nelson, Mr. Randy
May 18, 2011	Fisheries Monitoring and Enforcement	Coultish, Mr. Scott Nelson, Mr. Randy
May 30, 2011	Cultus Lake – SARA Listing Decision	Davis, Dr. John
May 31, 2011	Cultus Lake – Recovery Efforts from 2005 Onwards	Bradford, Dr. Michael Schubert, Mr. Neil
	Cultus Lake – SARA Listing Decision	Davis, Dr. John
June 1, 2011	Cultus Lake – Recovery Efforts from 2005 Onwards	Bradford, Dr. Michael Schubert, Mr. Neil
	Wild Salmon Policy (Part 1) – Expert Stakeholders	Riddell, Dr. Brian Young, Mr. Jeffery
June 2, 2011	Wild Salmon Policy (Part 1) – Expert Stakeholders	Riddell, Dr. Brian Young, Mr. Jeffery

Date	Hearing	Witnesses
	Wild Salmon Policy (Part 2) – Strategy 4 and Integrated Planning	Morley, Mr. Rob Ryall, Mr. Paul Saunders, Mr. Mark Young, Mr. Jeffery
June 3, 2011	Wild Salmon Policy (Part 2) – Strategy 4 and Integrated Planning	Morley, Mr. Rob Ryall, Mr. Paul Saunders, Mr. Mark Young, Mr. Jeffery
June 6, 2011	Effects on the Fraser River Watershed – Urbanization	Carey, Dr. John Macdonald, Dr. Robie Paradis, Dr. Sylvain Talbot, Dr. André Walls, Ms. Lisa
June 7, 2011	Effects on the Fraser River Watershed – Urbanization	Carey, Dr. John Crowe, Mr. Michael Paradis, Dr. Sylvain SalomI, Mr. Corino Walls, Ms. Lisa Wilkerson, Ms. Stacey
June 8, 2011	Effects on the Fraser River Watershed – Urbanization	Crowe, Mr. Michael Salomi, Mr. Corino Wilkerson, Ms. Stacey
June 13, 2011	Effects on the Fraser River Watershed – Pulp and Paper Effluent, Mining Effluent	Boyd, Ms. Janice Grace, Mr. Robert Hagen, Mr. Michael Hill, Mr. Douglas
June 14, 2011	Effects on the Fraser River Watershed – Municipal Wastewater	*Ashley, Dr. Ken *Ross, Dr. Peter *van Aggelen, Mr. Graham
June 15, 2011	Effects on the Fraser River Watershed – Municipal Wastewater	Arnott, Mr. James van Roodselaar, Dr. Albert
June 16, 2011	Effects on the Fraser River Watershed – Gravel Removal	Berardinucci, Ms. Julia Hwang, Mr. Jason *Rempel, Dr. Laura *Rosenau, Dr. Marvin
June 17, 2011	Effects on the Fraser River Watershed – Logging	Delaney, Mr. Peter Miller, Mr. Ian Tschaplinski, Dr. Peter
June 27, 2011	Aboriginal Fishing	*Harris, Dr. Douglas
June 28, 2011	Aboriginal Fishing	Huber, Mr. Barry Jones, Mr. Russ Terry, Grand Chief Saul Todd, Mr. Neil
June 30, 2011	Aboriginal Fishing	Huber, Mr. Barry Jones, Mr. Russ Terry, Grand Chief Saul Todd, Mr. Neil
July 4, 2011	Aboriginal Fishing	Crey, Mr. Ernie Rosenberger, Mr. Barry Shepert, Mr. Marcel Wilson, Mr. Ross

Date	Hearing	Witnesses
July 5, 2011	Aboriginal Fishing	Crey, Mr. Ernie Rosenberger, Mr. Barry Shepert, Mr. Marcel Wilson, Mr. Ross
July 6, 2011	Effects on Habitat in the Marine Environment	*Beamish, Dr. Richard *McKinnell, Dr. Stewart *Welch, Dr. David
July 7, 2011	Effects on Habitat in the Marine Environment	*Beamish, Dr. Richard *McKinnell, Dr. Stewart *Welch, Dr. David
	Effects on the Fraser River Watershed – Gravel Removal	Berardinucci, Ms. Julia Hwang, Mr. Jason
July 8, 2011	Cultus Lake – SARA Listing Decision	Davis, Dr. John
	Effects on Habitat in the Marine Environment	*Irvine, Dr. Jim *Parsons, Dr. Timothy
August 17, 2011	Effects on Habitat in the Marine Environment	Di Franco, Mr. Sergio Reid, Mr. Bruce *Rensel, Dr. Jack Ross, Dr. Peter
August 18, 2011	Effects on Habitat in the Marine Environment	Brown, Mr. Robin Di Franco, Mr. Sergio Reid, Mr. Bruce Ross, Dr. Peter
August 19, 2011	Aboriginal Fishing	McGivney, Ms. Kaarina Stewart, Ms. Julie
August 22, 2011	Diseases	*Johnson, Dr. Stewart *Kent, Dr. Michael *MacWilliams, Dr. Christine *Stephen, Dr. Craig
August 23, 2011	Diseases	*Johnson, Dr. Stewart *Kent, Dr. Michael *MacWilliams, Dr. Christine *Stephen, Dr. Craig
August 24, 2011	Diseases	*Garver, Dr. Kyle *Miller, Dr. Kristina
August 25, 2011	Aquaculture	*Connors, Dr. Brendan *Dill, Dr. Lawrence *Korman, Dr. Josh *Noakes, Dr. Donald
	Diseases	*Garver, Dr. Kyle *Miller, Dr. Kristina
August 26, 2011	Aquaculture	*Connors, Dr. Brendan *Dill, Dr. Lawrence *Korman, Dr. Josh *Noakes, Dr. Donald
August 29, 2011	Aquaculture	*Connors, Dr. Brendan *Dill, Dr. Lawrence *Korman, Dr. Josh *Noakes, Dr. Donald

Date	Hearing	Witnesses
August 30, 2011	Aquaculture	Fleming, Dr. Ian Last, Mr. Gavin Swerdfager, Mr. Trevor Thomson, Mr. Andrew
August 31, 2011	Aquaculture	*Marty, Dr. Gary *McKenzie, Dr. Peter *Sheppard, Dr. Mark Swerdfager, Mr. Trevor
September 1, 2011	Aquaculture	Atagi, Mr. Brian Hoyseth, Ms. Kerra Thomson, Mr. Andrew
September 2, 2011	Aboriginal Fishing	McGivney, Ms. Kaarina Stewart, Ms. Julie
September 6, 2011	Aquaculture	*Jones, Dr. Simon *Orr, Dr. Craig *Price, Mr. Michael *Saksida, Dr. Sonja
September 7, 2011	Aquaculture	Backman, Mr. Clare Morton, Ms. Alexandra Parker, Ms. Mia Stewart, Ms. Catherine
September 8, 2011	Aquaculture	Backman, Mr. Clare Morton, Ms. Alexandra Parker, Ms. Mia Stewart, Ms. Catherine
September 15, 2011	Hydro, Water, Temperature	*Bradford, Dr. Michael *MacDonald, Dr. Steve *Orr, Dr. Craig
September 16, 2011	Hydro, Water, Temperature	Davidson, Mr. Glen Higgins, Mr. Paul Hwang, Mr. Jason Kriwoken, Ms. Lynn
September 19, 2011	Cumulative Impact Assessment	*Marmorek, Mr. David
September 20, 2011	Cumulative Impact Assessment	*Marmorek, Mr. David
September 22, 2011	DFO Priorities and Summary	Bevan, Mr. David Dansereau, Ms. Claire Farlinger, Ms. Susan Richards, Dr. Laura
September 23, 2011	DFO Priorities and Summary	Bevan, Mr. David Dansereau, Ms. Claire Farlinger, Ms. Susan Richards, Dr. Laura
September 26, 2011	DFO Priorities and Summary	Bevan, Mr. David Dansereau, Ms. Claire Farlinger, Ms. Susan Richards, Dr. Laura
September 27, 2011	DFO Priorities and Summary	Bevan, Mr. David Dansereau, Ms. Claire Farlinger, Ms. Susan Richards, Dr. Laura

Date	Hearing	Witnesses
September 28, 2011	DFO Priorities and Summary	Bevan, Mr. David Dansereau, Ms. Claire Farlinger, Ms. Susan Richards, Dr. Laura
December 15, 2011	Infectious Salmon Anemia virus (ISAv)	*Gagné, Ms. Nellie *Kibenge, Dr. Frederick *Miller, Dr. Kristina *Nylund, Dr. Are
December 16, 2011	Infectious Salmon Anemia virus (ISAv)	*Gagné, Ms. Nellie *Jones, Dr. Simon *Kibenge, Dr. Frederick Klotins, Dr. Kim Stephen, Mr. Stephen Wright, Dr. Peter
December 19, 2011	Infectious Salmon Anemia virus (ISAv)	*Jones, Dr. Simon Klotins, Dr. Kim Stephen, Mr. Stephen Wright, Dr. Peter

Appendix G • Hearing Counsel

Commission

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Wendy Baker, QC
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Patrick McGowan
Meg Gaily
Jennifer Chan
Kathy L. Grant
Lara Tessaro
Dr. Maia Tsurumi
Micah Carmody
Patrick Hayes
Jennifer Hill
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Jon Major, Law Student

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Mitchell Taylor, QC
Mark East
Charles Fugère
Geneva Grande-McNeill
Hugh MacAulay
Jonah Spiegelman
Tim Timberg
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D. Clifton Prowse, QC
Boris Tyzuk, QC
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Tara Callan
Heidi Hughes
Elizabeth Rowbotham

Pacific Salmon Commission

John J. L. Hunter, QC
Tam Boyar
Brent Johnston

B.C. Public Service Alliance of Canada; Union of Environment Workers B.C.

Chris Buchanan

Rio Tinto Alcan Inc.

David Bursey
Ryan Dalziel
Charlene Hiller
Matthew Keen

B.C. Salmon Farmers Association

Alan Blair
Shane Hopkins-Utter

Seafood Producers Association of B.C.

Michael Walden
Christopher Sporer, participant's representative

Aquaculture Coalition:
Alexandra Morton; Raincoast Research Society; Pacific Coast Wild Salmon Society

Gregory McDade, QC
Lisa Glowacki

Conservation Coalition:
Coastal Alliance for Aquaculture Reform Fraser Riverkeeper Society; Georgia Strait Alliance; Raincoast Conservation Foundation; Watershed Watch Salmon Society; Mr. Otto Langer; David Suzuki Foundation

Tim Leadem, QC
Karen Campbell
Judah Harrison
Margot Venton

Area D Salmon Gillnet Association; Area B Harvest Committee (Seine)

Don Rosenbloom
Katrina Pacey
Lyndsay Smith

Southern Area E Gillnetters Association; B.C. Fisheries Survival Coalition

Philip Eidsvik, participant's representative
David Butcher, QC
Anila Srivastava

West Coast Trollers Area G Association; United Fishermen and Allied Workers' Union

Christopher Harvey, QC
Christopher Watson

B.C. Wildlife Federation; B.C. Federation of Drift Fishers

Keith Lowes
Brad Caldwell

Maa-nulth Treaty Society; Musqueam First Nation; Tsawwassen First Nation

Tina Dion
Joseph Arvay
James Reynolds
Derek Christ

Western Central Coast Salish First Nations: Cowichan Tribes; Chemainus First Nation; Hwlitsum First Nation; Penelakut Tribe; Te'mexw Treaty Association

John Gailus
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Leah DeForrest
Sarah Sharp
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Robert Clifford, Articled Student

First Nations Coalition: First Nations Fisheries Council; Aboriginal Caucus of the Fraser River; Aboriginal Fisheries Secretariat; Fraser Valley Aboriginal Fisheries Society; Northern Shuswap Tribal Council; Chehalis Indian Band; Secwepemc Fisheries Commission of the Shuswap Nation Tribal Council; Upper Fraser Fisheries Conservation Alliance; other Douglas Treaty First Nations who applied together (the Snuneymuxw, Tsartlip, and Tsawout); Adams Lake Indian Band; Carrier Sekani Tribal Council; Council of the Haida Nation

Brenda Gaertner
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Tim Dickson
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**Laich-kwil-tach Treaty Society;
Chief Harold Sewid;
Aboriginal Aquaculture Association**

Allan Donovan
James Hickling
Steven Kelliher

**Musgamagw Tsawataineuk Tribal
Council**

Krista Robertson
Lee Schmidt

Heiltsuk Tribal Council

Lisa Fong
Ming Song
Christian Morey
Benjamin Ralston

Metro Vancouver

Emily Mak

For Dr. Frederick Kibenge

Jonathan Coady

Appendix H • Participants

1 Government of Canada

2 Province of British Columbia

3 Pacific Salmon Commission

4 B.C. Public Service Alliance of Canada
Union of Environment Workers B.C.

5 Rio Tinto Alcan Inc.

6 B.C. Salmon Farmers Association

7 Seafood Producers Association of B.C.

8 Aquaculture Coalition:
- Alexandra Morton
- Raincoast Research Society
- Pacific Coast Wild Salmon Society

9 Conservation Coalition:
- Coastal Alliance for Aquaculture Reform
- Fraser Riverkeeper Society
- Georgia Strait Alliance
- Raincoast Conservation Foundation
- Watershed Watch Salmon Society
- Mr. Otto Langer
- David Suzuki Foundation

10 Area D Salmon Gillnet Association
Area B Harvest Committee (Seine)

11 Southern Area E Gillnetters Association
B.C. Fisheries Survival Coalition

12 West Coast Trollers Area G Association
United Fishermen and Allied Workers' Union

13 B.C. Wildlife Federation
B.C. Federation of Drift Fishers

14 Maa-nulth Treaty Society
Musqueam First Nation
Tsawwassen First Nation

15 Western Central Coast Salish First Nations:
- Cowichan Tribes
- Chemainus First Nation
- Hwlitsum First Nation
- Penelakut Tribe
- Te'mexw Treaty Association

16 First Nations Coalition:
- First Nations Fisheries Council
- Aboriginal Caucus of the Fraser River
- Aboriginal Fisheries Secretariat
- Fraser Valley Aboriginal Fisheries Society
- Northern Shuswap Tribal Council
- Chehalis Indian Band
- Secwepemc Fisheries Commission of the Shuswap Nation Tribal Council
- Upper Fraser Fisheries Conservation Alliance
- Adams Lake Indian Band
- Carrier Sekani Tribal Council
- Council of the Haida Nation
- Other Douglas Treaty First Nations who applied together (the Snuneymuxw, Tsartlip, and Tsawout)

17 Métis Nation British Columbia

18 Stó:lō Tribal Council
Cheam Indian Band

19 Laich-kwil-tach Treaty Society
Chief Harold Sewid
Aboriginal Aquaculture Association

20 Musgamagw Tsawataineuk Tribal Council

21 Heiltsuk Tribal Council

Appendix I • Rulings

14 April, 2010	Ruling on Standing
10 May, 2010	Ruling on Application to Vary Standing Brought by Heiltsuk Tribal Council
11 May, 2010	Ruling on Application to Vary Standing Brought by Douglas Treaty First Nations
31 May, 2010	Clarification of Heiltsuk Standing Variation Ruling
9 June, 2010	Summary of Commissioner's Recommendations to Privy Council Office Concerning Participant Funding
9 June, 2010	Order to DOJ regarding documents
23 August, 2010	Ruling on Application to Vary Standing Brought by Lach-kwil-tach Treaty Society and Heiltsuk Tribal Council
27 August, 2010	Request and response to vary funding for participants: Musgamagw Tsawataineuk Tribal Council and Heiltsuk Tribal Council
15 September, 2010	Ruling on Interpretation of Terms of Reference
28 September, 2010	Ruling on Application Seeking Exceptional Circumstances
6 October, 2010	Request and response to vary funding for participants: Laich-kwil-tach Treaty Society, Aboriginal Aquaculture Association, Chief Harold Sewid; First Nations Coalition
20 October, 2010	Interim Ruling Regarding Rule 19 Application For Production of Aquaculture Health Records
24 November, 2010	Ruling Re: Objection to Cross-Examination of Dr. Laura Richards
8 December, 2010	Ruling Re: Rule 19 Application For Production of Aquaculture Health Records
16 December, 2010	Further Changes to Participant Funding Arrangements under Contribution Program for Cohen Commission
10 March, 2011	Ruling on Application for Standing Brought by the Matsqui First Nation
17 March, 2011	Ruling Re: Clarification Of December 8, 2010 Final Ruling: Production of Fish Health Records
28 March, 2011	Deadline for Participants Responses to r. 19 Application for Production of Mandate Information
8 April, 2011	Order re: Deadline for Heiltsuk Tribal Council's Reply Submissions to r. 19 Application for Production of Mandate Information
20 April, 2011	Recommendations for Supplementary Funding
27 May, 2011	Ruling Re: Written Cross-Examination Questions of Karl English Posed by Representative of B.C. Fisheries Survival Coalition and Southern Area E Gillnetters Association
2 June, 2011	Ruling Re: Leave for Two Cross-Examinations From Members of The Western Central Coast Salish First Nations of Professor Douglas Harris
23 June, 2011	Ruling on Undertakings of Confidentiality
18 July, 2011	Ruling on Application for Standing on Aquaculture and Seeking Extraordinary Circumstances
10 August, 2011	Confidentiality of Material Filed in the Heiltsuk Tribal Council's Application for Production of Documents
31 August, 2011	Recommendations for Supplementary Funding
12 September, 2011	Ruling Re: Rules 52 and 53 Application By Conservation Coalition
14 September, 2011	Aquaculture Coalition Additional Funding

20 September, 2011	Letter from PCO and Ruling re: Heiltsuk Tribal Council's Application for Production of FSC "Mandate Documents" and the Coastwide Framework Documents
7 October, 2011	Ruling on Admissibility of Revised Affidavit
11 October, 2011	Ruling on Disposition of Documents Marked For Identification
10 November, 2011	Canada's Motion to Withdraw Questions Put to Mr. Otto Langer for Cross-Examination
21 November, 2011	Ruling On Application For Two Counsel to Attend Final Submissions
24 November, 2011	Ruling Re: Application Pursuant to Rule 18 for the Production of Documents Relating to ISAV
1 December, 2011	Ruling Re: Application for a Stay of November 24, 2011 Ruling and Application for Directions
7 December, 2011	Ruling On Disclosure of Documents by Canada and British Columbia Under Claims of Privilege
9 December, 2011	Ruling Re: Further Privileged Documents
12 December, 2011	Ruling Re: FNC's Application Pursuant to Rule 65 for Relief From Undertaking in Respect of its Client
19 December, 2011	Ruling Re: Further Privileged Documents
22 December, 2011	Recommendations for Supplementary Funding
24 January, 2012	Application Pursuant to Rule 65 to have the Conservation Coalition's Status Revoked
7 February, 2012	Ruling on the Admissibility of Documents ISAv Hearings – December 2011
28 February, 2012	Recommendations for Supplementary Funding for ISAv Hearings
16 May, 2012	Ruling Regarding Re-Opening Hearings

Abbreviations and acronyms

AAA	Aboriginal Aquaculture Association
AAROM	Aboriginal Aquatic Resource and Oceans Management
ACFLR	*Aboriginal Communal Fishing Licences Regulations*
ACRDP	Aquaculture Collaborative Research and Development Program
ADM	assistant deputy minister
AEO	Aquaculture Environmental Operations (DFO)
AFE	Aboriginal Fisheries Exemption
AFS	Aboriginal Fisheries Strategy
AHC	Area Harvest Committee
AICFI	Atlantic Integrated Commercial Fisheries Initiative
AIMAP	Aquaculture Innovation and Market Access Program
AMD	Aquaculture Management Directorate (DFO)
ARIMS	Aquaculture Resource Information Management System
ASWP	Atlantic Salmon Watch Program
ATK	Aboriginal traditional knowledge
ATP	Allocation Transfer Program
AVC	Atlantic Veterinary College
BAMP	Broughton Archipelago Monitoring Program
BC	British Columbia
BC Lab	Animal Health Centre, Abbotsford, BC
BCSFA	B.C. Salmon Farmers Association
BKD	bacterial kidney disease
C&E	Compliance and Enforcement
C&P	Conservation and Protection Directorate (DFO)
CAAR	Coastal Alliance for Aquaculture Reform
CAIA	Canadian Aquaculture Industry Alliance
Caligus	*Caligus clemensi* (the herring louse)
CCME	Canadian Council of Ministers of the Environment
CEAA	*Canadian Environmental Assessment Act*
CEDP	Community Economic Development Program
CEPA	*Canadian Environmental Protection Act*
CESD	Commissioner of the Environment and Sustainable Development
CFAR	Canadian Fisheries Adjustment and Restructuring

CFIA	Canadian Food Inspection Agency
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CPUE	catch per unit effort
CREST	catch and release estimation tool
CSA	*Canada Shipping Act*
CSAB	Commercial Salmon Advisory Board
CSAP	Centre for Science Advice (Pacific)
CSAS	Canadian Science Advisory Secretariat
CSO	combined sewer overflow
CTAC	Canadian total allowable catch
CU	Conservation Unit
CWL	Commonwealth Legal
DBEs	differences between in-season and post-season estimates of escapement
DDT	dichlorodiphenyltrichloroethane
DEPOMOD	depositional modelling
DFO	Department of Fisheries and Oceans
DIDSON	Dual-Frequency Identification SONAR
DMC	Departmental Management Committee (DFO)
DND	Department of National Defence
DOE	Department of the Environment (Environment Canada)
DOJ	Department of Justice Canada
Draft RMAF	Wild Salmon Policy Implementation Workplan – Results-based Management and Accountability Framework
DVS	Departmental Violation System
EAA	BC *Environmental Assessment Act*
EED	Environmental Enforcement Directorate
EEM	environmental effects monitoring
eLog	electronic logbook
EMA	BC *Environmental Management Act*
ENGO	environmental non-governmental organization
EPMP	Environmental Process Modernization Plan
ESSR	excess salmon to spawning requirements
ESSRF	Environmental Science Strategic Research Fund
EWatch	Environmental Watch Program (DFO)
FAM	Fisheries and Aquaculture Management
FAO	Food and Agriculture Organization of the United Nations
FAWCR	BC *Finfish Aquaculture Waste Control Regulation*
FEATS	Fisheries Enforcement Activity Tracking System
FFSBC	Freshwater Fisheries Society of BC
FHASP	BC Fish Health Audit and Surveillance Program
FHE	fish health event
FHMP	Fish Health Management Plan
FHPR	*Fish Health Protection Regulations*
FHV	fish health veterinarian
FM&CR	fisheries monitoring and catch reporting
FN	First Nations
FNC	First Nations Coalition
FNFC	First Nations Fisheries Council
FPA	BC *Fish Protection Act*
FPCA	*Forest Practices Code of British Columbia Act*
FPPR	*Forest Planning and Practices Regulation*
FRAFS	Fraser River Aboriginal Fisheries Secretariat
FREP	Forest and Range Evaluation Program
FRIMT	Fraser River Sockeye and Pink Salmon Integrated Management Team
FRP	Fraser River Panel
FRPA	BC *Forest and Range Practices Act*
FRSSI	Fraser River Sockeye Spawning Initiative
FSC	food, social, and ceremonial
FSWP	Fraser River Salmon and Watersheds Program
FTE	full-time equivalent
FVAFS	Fraser Valley Aboriginal Fisheries Society
GB	gigabyte
GDP	gross domestic product
GFC	Gulf Fisheries Centre
HAB	harmful algal bloom
HADD	harmful alteration, disruption or destruction of habitat (*Fisheries Act*, s. 35)
HAMP	Harmful Algae Monitoring Program
HWG	Habitat Working Group
HMU	Habitat Monitoring Unit
HSMI	heart and skeletal muscle inflammation
IAPF	Integrated Aboriginal Policy Framework

IFMP	Integrated Fisheries Management Plan
IHN	infectious hematopoietic necrosis
IHNv	infectious hematopoietic necrosis virus
IHPC	Integrated Harvest Planning Committee
IMAP	Integrated Management of Aquaculture Plan
IPCC	Intergovernmental Panel on Climate Change
IPMA	BC *Integrated Pest Management Act*
IPN	infectious pancreatic necrosis
IPNv	infectious pancreatic necrosis virus
IPP	independent power project
IPSFC	International Pacific Salmon Fisheries Commission
IQ	individual quota
ISA	infectious salmon anemia
ISAv	infectious salmon anemia virus
ISDF	Integrated Salmon Dialogue Forum
ITQ	individual transferable quota
JTG	joint task group (report of Pearse and McRae)
Leps	*Lepeophtheirus salmonis* (the salmon louse)
LKTS	Lach-Kwil-Tach Treaty Society
LRP	limit reference point
M&C Panel	Monitoring and Compliance Panel
MA	management adjustment
MAL	BC Ministry of Agriculture and Lands
MARPAC	Maritime Forces Pacific (DND)
MFLNRO	BC Ministry of Forests, Lands and Natural Resource Operations
MMER	*Metal Mining Effluent Regulations*
MOE	BC Ministry of Environment
MOU	memorandum of understanding
MPB	mountain pine beetle
MPIRS	Marine Pollution Incident Reporting System
MRS	mortality-related signature
MSC	Marine Stewardship Council
MSY	maximum sustainable yield
NAAHLS	National Aquatic Animal Health Laboratory System
NAAHP	National Aquatic Animal Health Program
NEMISIS	National Emergencies and Enforcement Management Information System and Intelligence System
NGO	non-governmental organization
NHQ	national headquarters
NNFC	Northern Native Fishing Corporation
NOAA	US National Oceanic and Atmospheric Administration
NPAFC	North Pacific Anadromous Fish Commission
NPRI	National Pollutant Release Inventory
NSERC	National Sciences and Engineering Council of Canada
NWPA	*Navigable Waters Protection Act*
OHEB	Oceans, Habitat and Enhancement Branch (DFO)
OIE	World Organisation for Animal Health
ONA	Okanagan Nation Alliance
PA	precautionary approach
PacFish	Pacific Fisheries Data Initiative
PAH	polycyclic aromatic hydrocarbon
PAR	*Pacific Aquaculture Regulations*
PARP	Pacific Aquaculture Regulatory Program
PARR	Program for Aquaculture Regulatory Research
PATH	Program Activity Tracking for Habitat database
PBDE	polybrominated diphenyl ether
PBS	Pacific Biological Station (DFO), Nanaimo
PBT	persistent, bioaccumulative, and toxic
PCB	polychlorinated biphenyl
PCO	Privy Council Office
PCPA	*Pest Control Products Act* (federal)
PCR	polymerase chain reaction
PDO	Pacific decadal oscillation
PFAR	Pacific Fisheries Adjustment and Restructuring Program
PFRCC	Pacific Fisheries Resource Conservation Council
PICES	North Pacific Marine Science Organization
PICFI	Pacific Integrated Commercial Fisheries Initiative
PIP	Public Involvement Projects
PMRA	Pest Management Regulatory Agency (Health Canada)
PNCIMA	Pacific North Coast Integrated Management Area
PPER	*Pulp and Paper Effluent Regulations*
PPM	pulp and paper mill
PPR	Policy and Practice Report

Pre-amp	pre-amplification step (used in RT-PCR)
PSAC	Public Service Alliance of Canada
PSARC	Pacific Scientific Advice Review Committee
PSC	Pacific Salmon Commission
PWGSC	Public Works and Government Services Canada
Q and A	questions and answers
QEP	qualified environmental professional
qRT-PCR	quantitative reverse transcriptase polymerase chain reaction
R/EFS	recruits per effective female spawners
R/smolt	recruits per smolt
RACO	Regional Aquaculture Coordination Office
RAR	BC *Riparian Areas Regulation*
RAS	Recirculating Aquaculture System
RDG	regional director general
REET	Regional Environmental Emergency Team
RIAS	regulatory impact analysis statement
RISS	Regulatory Information Submission System
RMA	Riparian Management Area
RMAF	Results-based Management and Accountability Framework
RMC	Regional Management Committee
RSSEPS	Rivers and Smith Salmon Ecosystems Planning Society
RT	reverse transcriptase
RT-PCR	reverse transcriptase polymerase chain reaction
RWA	Regional Working Agreement
S-R	stock-recruitment
SAFE	Salmon and Freshwater Ecosystems Division of DFO Science
SAFF	Sustainable Aquaculture Fisheries Framework
SAP	Sustainable Aquaculture Program (2008)
SAR	1997 Salmon Aquaculture Review (by BC Environmental Assessment Office)
SARA	*Species at Risk Act*
SARCEP	Species at Risk Coordination / Espèces en péril
SBM	share-based management
SCORE	Sub-Committee on Options for Review and Evaluation (CSAB)
SDC	Strategic Directions Committee
SEP	Salmonid Enhancement Program
SFAB	Sport Fishing Advisory Board
SFC	Secwepemc Fisheries Commission
SFF	Sustainable Fisheries Framework
SFU	Simon Fraser University, Burnaby, BC
SLICE	trade name of in-feed therapeutant used to treat fish for sea lice; with active ingredient emamectin benzoate
SLIPP	Shuswap Lake Integrated Planning Process
SOP	standard operating procedures
SST	sea surface temperature
TAC	total allowable catch
TAM	total allowable mortality
TAPGD	Treaty and Aboriginal Policy and Governance Directorate
TEK	traditional ecological knowledge
TR	Technical Report
TRP	target reference point
UBC	University of British Columbia, Vancouver
UBCM	Union of BC Municipalities
UEWBC	Union of Environment Workers British Columbia
UFAWU	United Fishermen & Allied Workers Union
UFFCA	Upper Fraser Fisheries Conservation Alliance
UN	United Nations
UNCLOS	*United Nations Convention on the Law of the Sea*
UNFSA	United Nations Fish Stock Agreement (also UNFA)
USTAC	US total allowable catch
VEC	valued ecosystem components
VHS	viral hemorrhagic septicemia
VPN	virtual private network
VSCs	Valued Social Components
WCCSFN	Western Central Coast Salish First Nations
WSER	Wastewater Systems Effluent Regulations
WSP	Wild Salmon Policy
WUP	Water Use Plan

Glossary

Cross-references are given in italic type.

abundance: the number of fish; the size of the stock.[1]

Aboriginal fishery guardian: fishery guardians employed by First Nations who engage in enforcement activities in accordance with Aboriginal fishing agreements.[2]

acute: in reference to infections, marked by a sudden onset of detectable symptoms that are usually followed by complete or apparent recovery.[3]

adult: *mature* (includes life stages 4 and 5). See *life cycle*.

aerobic scope: level of oxygen available for activities between basal (resting) and maximal metabolic rates; a characteristic describing the fish's ability to allocate energy to essential tissues.[4]

age class: *ecotype* designation based on the number of winters in freshwater after hatching and the number of winters in saltwater.[5]

alevin: sockeye *life stage* that occurs just after hatching from the egg, with *yolk sac* still present; alevins live in gravel until they emerge as *fry*.[6]

amphipod: group of small, mostly planktonic crustaceans belonging to the order Amphipoda.[7]

anadromous: fish that spend most of the growing phase of their *life cycle* in the sea, but return to freshwater to breed.[8]

anthropogenic: caused by humans.

aquaculture: farming of aquatic organisms in the marine environment or freshwater;[9] unless otherwise stated, in this Report the term "aquaculture" refers specifically to marine salmon aquaculture, or "salmon farms."

Atlantic salmon: species of salmon originating from the northern Atlantic Ocean; commonly used in *aquaculture*.[10]

back eddies: places where water flows past an obstacle, which can create a reverse current or cause the water to move in an otherwise different direction or at a different speed.[11]

benthic areas: areas of the seafloor.[12]

bioassay: controlled experiment for the quantitative estimation of a substance by measuring its effect in a living organism.[13]

biodiversity: full range of variety and variability within and among living organisms and the ecological complexes in which they occur; encompasses diversity at the *ecosystem*, community, species, and genetic levels as well as in the interaction of these components.[14]

biota: all the organisms living in a particular region, including plants, animals, and micro-organisms.[15]

bloodwater: wastewater from facilities where fish are processed.[16]

brailing: using a long-handled "net" scoop to take fish out of the *seine* net.

brood year: year when salmon eggs are laid.[17]

brood-year returns: See *total returns*.

bycatch: refers to non-target species (e.g., sockeye salmon when fishing for pink salmon) that become entangled or caught in fishing gear.[18]

caligid copepod: parasitic *copepod* crustacean of the family Caligidae.[19]

caudal: pertaining to the tail or tail region.[20]

chlorophyll bloom: areas in the ocean with high, sustained chlorophyll-α values in the surface waters.[21]

chronic: *disease* that may persist for many months or years and may not directly kill the host.[22]

ciliate: single-celled organism that uses a number of short cell appendages for locomotion.[23]

closed containment facility: facilities that use a range of technologies which attempt to restrict and control interactions between farmed fish and the external aquatic environment, with the goal of minimizing impact and creating greater control over factors in *aquaculture* production.[24]

compass orientation: ability to move in a fixed direction without reference to local landmarks.[25]

conservation: protection, maintenance, and rehabilitation of genetic diversity, species, and *ecosystem*s to sustain *biodiversity* and the continuance of evolutionary and natural production processes.[26]

conservation (of habitats): planned management of human activities that might affect fish habitats in order to prevent destruction and the subsequent loss of fisheries.[27]

Conservation Unit: group of *wild salmon* sufficiently isolated from other groups that, if *extirpated*, is very unlikely to recolonize naturally within an acceptable time frame.[28]

continental shelf: gently sloping offshore zone that usually extends to approximately 200 m in depth.[29]

copepods: small marine and freshwater crustaceans of the subclass Copepoda; sea lice are parasitic members of this group.[30]

counting fences: high-precision method for fish enumeration used at spawning channels and at some rivers and lakes; fish are counted as they pass the fence.[31]

cyclic dominance: pattern of persistent large *abundance* every four years, followed by a slightly smaller subdominant year, with two extremely low abundances in off-cycle years.[32]

degree days: measurement of thermal exposure; accumulated degree days are calculated by multiplying the number of days that a fish is exposed to water of a certain temperature.[33]

density dependence: feedback mechanism whereby a large *escapement* is thought to create a negative effect on productivity such that subsequent *total returns* of adults could be reduced[34] (simple density dependence and delayed density dependence are described in Volume 2 of this Report).

diatoms: single-cellular algae in the phylum Bacillariophyta that are capable of forming filamentous colonies.[35]

DIDSON: Dual-frequency IDentification SONar, which provides high-definition sonar images.[36]

dip net: fishing technique used in the Fraser River canyon to catch large numbers of chinook and sockeye salmon; while standing above the current in the river narrows, the fisher dips a large net attached to the end of a pole into the water, traps fish inside, and hauls them out.[37]

disease: a host fish is diseased if it is behaviourally or physiologically compromised.[38]

diversion rate: percentage of returning sockeye approaching the Fraser River via the north coast of Vancouver Island and Johnstone Strait (also called the northern diversion rate).[39]

dual fishing: fishing for two purposes at the same time; for example, fishing commercially and also retaining fish for *food, social, and ceremonial* purposes.[40]

Early Stuart run: one of the four *run-timing groups* of Fraser River sockeye; this stock group spawns in the Takla–Trembleur Lake system and arrives in the Lower Fraser River from late June to late July.[41]

Early summer run: one of the four *run-timing groups* of Fraser River sockeye; this stock group spawns throughout the Fraser system and arrives in the Lower Fraser River from mid-July to mid-August; this run includes Bowron, Fennell, Gates, Nadina, Pitt, Raft, Scotch, Seymour, and Early Summer Miscellaneous (Early Shuswap, South Thompson, North Thompson tributaries, North Thompson River, Nahatlach River and Lake, Chilliwack Lake, and Dolly Varden Creek).[42]

economic opportunity fishery: separates commercial fishing allocations from allocations for *food, social, and ceremonial* purposes for First Nations.[43]

ecosystem: community of organisms and their physical environment interacting as an ecological unit.[44]

ecosystem approach: approach to the management of human activity that considers all the components of an *ecosystem* that may be affected by the activity, including populations, communities, and habitat, and their linkages, as well as the impact of the ecosystem on the state of the living resource.[45]

ecotype: distinguishes individuals that spend varying numbers of years in freshwater and in saltwater.[46]

effective female spawner: estimate of female spawner *abundance*, which is further adjusted downward by the

proportion of eggs that were not spawned, as determined by sampling on the spawning grounds.[47]

El Niño Southern Oscillation: inter-annual climate variability event that occurs every two to seven years and persists up to 1.5 years, characterized by coupled variations in sea surface temperature and sea level pressure in the tropical Pacific Ocean.[48]

emergence: developmental stage where *juvenile* salmon emerge from their gravel nest.[49]

en route loss (en route mortality): estimate of the number of upstream-migrating adults that die in the river en route to their spawning grounds.[50]

endemic: referring to a pathogen or disease that is constantly present in low numbers in a *population*.[51]

enhancement: application of biological and technical knowledge and capabilities to increase the productivity of fish stocks; this increase may be achieved by altering habitat attributes (e.g., habitat restoration) or by using fish culture techniques (e.g., hatcheries, spawning channels).[52]

enterococci: genus of lactic acid bacteria commonly found in the gastrointestinal tract of fish.

epilimnion: warm upper layer of water in a lake.[53]

escapement: number of *mature* salmon that pass through (or escape) fisheries and return to freshwater to spawn.[54]

estuarine: of or related to the border zone between freshwater and marine environments.[55]

exploitation rate: portion of all *adult* fish returning to their natal streams which are captured in a fishery.[56]

extirpation: local extinction of a species.[57]

fallow: in relation to *aquaculture*, the period of a few weeks between harvesting cycles when fish are absent from a site after harvesting and before the next restocking; also, the practice of site rotation where a site may be left empty for one or more years to allow the sediments to recover.[58]

finfish: freshwater and marine fish species that include salmon and non–salmonid species such as trout and sablefish;[59] also called "true fish," having a backbone, gills, and limbs in the shape of fins.

fish habitat: spawning grounds and nursery, rearing, food supply, and migration areas on which fish depend directly or indirectly to carry out their life processes.[60]

fish ladder: structure designed to permit fish passage – for example, by providing access to spawning grounds upstream of a dam.[61]

fisheries resources: fish stocks or *populations* that sustain commercial, recreational, or Aboriginal fishing activities of benefit to Canadians.[62]

flagellate: single-celled organism that uses a long cellular appendage for locomotion.[63]

flood plain: flat or nearly flat land adjacent to a stream or river which experiences flood during periods of high water discharge.

food, social, and ceremonial: a fishing allocation for First Nations to fish for consumption for subsistence, social, and ceremonial purposes according to their distinctive culture.[64]

Fraser River Panel: panel created under the Pacific Salmon Treaty which manages the commercial harvest of Fraser River sockeye and pink salmon in Fraser *Panel Area Waters*.[65]

fry: life stage at which sockeye have emerged from gravel into freshwater streams, completed yolk absorption, and are less than a few months old.[66] See *life cycle*.

furunculosis: bacterial disease arising from an infection by the bacterium *Aeromonas salmonicida*.[67]

gear: various equipment used for fishing.

genomic signature: characteristic pattern of gene expression, revealed on a micro-array.[68]

gillnet: rectangular net that hangs in the water and is set from the stern or bow of a fishing vessel; when fish swim headfirst into the net, their gills get entangled in the mesh.[69]

gonadal: referring to the gonads (the organs in an animal that produce eggs and sperm).

***Heterosigma* blooms:** blooms of the fish-killing algae *Heterosigma akashiwo*.

histological analysis: analysis of the microscopic anatomy of cells and tissues.

histopathology: microscopic examination of cells and tissues to study the manifestations of a *disease*; used in diagnosis.

homeostasis: tendency of an organism to maintain a steady state or equilibrium with respect to specific functions and processes.[70]

horizontal transmission: direct transfer of an infection from fish to fish.[71]

hydroacoustics: technology involving vessel and shore-based acoustic transducers to detect fish that are swimming.[72]

hydrograph changes: changes in the rate of water discharge or flow.

immature: sockeye that are older than *postsmolt* but will not *mature* in the current calendar year[73] (includes life stages 2 and 3).

immunocompetence: ability of the body to produce a normal immune response.

immunogenetics: study of the relationship between the immune system and genetics.

immunosuppression: reduction in the ability of the immune system to deal with infection, increasing the susceptibility of the host to other pathogens.[74]

indicator stocks: set of 19 Fraser River sockeye stocks for which a time series of *abundance* estimates has been maintained since 1952.[75]

infectious hematopoietic necrosis (IHN): severe, acute, systemic viral *disease* found in *fry* and *juvenile salmonids*.[76]

in-season management: management of the fishery as fish return to spawn; includes *run size* assessments, managing for *escapement* targets, and setting fishery opening and closing dates.[77]

inter-annual variability: differences that occur from year to year.

inter-decadal variability: differences that are recorded over decades; for example, inter-decadal climate variability in the North Pacific Ocean can be observed as atmospheric and oceanic trends that last for 20–30 years (e.g., *Pacific Decadal Oscillation*).[78]

intergenerational effects: cumulative effects that occur among generations of fish; for example, female sockeye experiencing warm water during egg development may produce offspring with lower fitness.[79]

jacks: male *anadromous* sockeye salmon that mature after one year at sea.[80]

jills: female *anadromous* sockeye salmon that mature after one year at sea.[81]

juveniles: the two sockeye salmon *life stages* at which *abundance* is estimated annually in freshwater – *fry* and *smolts*.[82]

kokanee: *population*s of sockeye salmon that are non-*anadromous* and remain as freshwater residents throughout their *life cycle*.[83]

La Niña: inter-annual climate variability event characterized by anomalous cool sea surface temperature and low sea level pressure; typically La Niña events lead to cool sea surface temperature in the waters off the west coast of North America.[85]

landed value: price paid to the commercial fisher or salmon farmer for the whole fish before processing; in aquaculture, an alternative term is "farmgate value."[84]

Late run: one of the four *run-timing groups* of Fraser River sockeye; the Late run arrives in the Lower Fraser from late August to mid-October and spawns in the Lower Fraser, Harrison-Lillooet, Thompson, and Seton-Anderson systems; this run–timing group includes Cultus, Harrison, Late Shuswap, Portage, Weaver, Birkenhead, Miscellaneous Shuswap, and Late Miscellaneous non-Shuswap sockeye.[86]

leachate: liquid that, in passing through matter, extracts solutes, suspended solids, or any other component of the material through which it has passed.

life cycle: salmon have discrete life phases: life stage 1 – eggs and incubation, *alevin*, *fry*; life stage 2 – *smolt* (downstream migration); life stage 3 – *sub-adult*, transition to marine environment; life stage 4 – *adult* (marine growth); and life stage 5 – adult (return migration, spawning, and death).[87]

life stage: See *life cycle*.

limited entry fishery: fishery where no new licences are created, and the only way to acquire a licence is to purchase one from a current licence holder.[88]

Lower Fraser Area: for the purpose of fisheries management, the Lower Fraser Area includes the mouth of the Fraser River up to Sawmill Creek.[89]

mainstem: primary downstream segment of a river, as distinguished from its tributaries.

mariculture: cultivation, management, and harvesting of marine organisms in their natural habitat or in specially constructed rearing units; the end product is cultivated in seawater.[90]

marine productivity: *productivity* in the marine environment.

mark-recapture: high-precision method for enumeration of *escapement*; a method commonly used in ecology to estimate the size of an animal *population*.[91]

mature: *adult* (includes *life stages* 4 and 5).

maximum sustainable yield (MSY): largest catch (yield) that can be taken on average from a *population* under existing environmental conditions without depleting the population; catch will vary annually because of variation in the survival rate of the population.[92]

meta-analysis: statistical procedure for combining the results of several studies testing the same hypothesis.[93]

metabolites: various compounds that take part in or are formed by metabolic reactions.[94]

metabolism: sum of the chemical reactions that occur within a living organism.[95]

micro-array: arrayed series of thousands of microscopic spots, each containing tiny amounts of a specific DNA sequence used as a probe to screen large numbers of samples.[96]

mixed-stock fishery: fishery in which multiple stocks may be passing through an area in which the fishery is operating; the Fraser River sockeye fishery is generally considered a mixed-stock fishery.[97]

morphology: study of the structure and form of organisms.[98]

mortality: death of fish, or the number of fish killed through harvest or through the act of releasing species that cannot be retained in a fishery.[99]

moult: act of casting off the outer layers of an animal's covering (e.g., hair, scales, feathers).

myxobacteriosis: infection caused by bacteria of the order Myxococcales.

myxozoa: diverse group of microscopic parasites of aquatic origin.

negative phase of the PDO: phase of *Pacific Decadal Oscillation* (a type of *inter-decadal* climate variability) characterized by warm and cool sea surface temperatures over the western and eastern North Pacific Ocean, respectively.[100]

nest: depression dug in the gravel substrate by a spawning female sockeye salmon in which her eggs are deposited.[101]

net-pen facility: *aquaculture* facility that uses a net to contain fish, allowing water to pass through (as distinguished from a *closed containment facility*).

nitrate: ion consisting of one atom of nitrogen and three atoms of oxygen.[102]

No Net Loss: principle by which the Department of Fisheries and Oceans strives to balance unavoidable habitat losses with habitat replacement on a project-by-project basis so that further reductions to Canada's fisheries resources due to habitat loss or damage may be prevented.[104]

non–point source: discharges from a diffuse source; non–point sources include runoff from forest management areas, agricultural operations, municipal stormwater, or linear developments.[103]

northern diversion route: return migration route through Johnstone Strait and the Strait of Georgia to the Fraser River.[105]

nursery lake: See *rearing lake*.

ocean-entry year: the year in which a class of sockeye enters the ocean.

orthomyxovirus: RNA virus from the family Orthomyxoviridae.

osmoregulation: regulation of the levels of water and mineral salts in the blood to maintain *homeostasis*.

outlier: measurement or experimental result outside the expected range.

over-escapement: spawning *population* size that is larger than the optimal *escapement* goal;[106] also referred to as under-fishing.

overflights: aerial surveillance of fishing areas used as a technique to monitor fishing activity.[107]

Pacific Decadal Oscillation: atmospheric and oceanic index used to describe the *inter-decadal* variability in the climate of the North Pacific Ocean.[108]

Pacific salmon: salmon of the Pacific Ocean regions, of which 11 species are currently recognized in the genus *Oncorhynchus*.[109]

Pacific Salmon Commission: commission formed under the *Pacific Salmon Treaty* which is directly involved in managing Fraser River sockeye.[110]

Pacific Salmon Treaty: bilateral agreement between Canada and the United States addressing the allocation and *conservation* of Pacific salmon.[111]

Panel Area Waters: geographical area designated under the *Pacific Salmon Treaty* in which Fraser River sockeye and pink salmon management is subject to provisions of that treaty.[112]

parvovirus: one of a group of viruses with small, single-stranded DNA genomes.[113]

pathogen: agent (such as a virus, bacteria, or sea louse) that causes *disease*.[114]

pathogenicity: ability to cause *disease*.[115]

pelagic: of or relating to the open ocean, as opposed to the ocean bottom.[116]

phenological: an organism's biological response to climatic conditions.

phenols: class of organic compound with a hydroxyl functional group.

phytoplankton: small planktonic organisms, mostly single-celled algae, that manufacture their own food by turning sunlight into chemical energy; this process is called autotrophy.[117]

pilot sales fishery: Aboriginal communal economic fishery licensed under the *Aboriginal Communal Fishing Licenses Regulations*.[118]

placer mining: exploitation of placer mineral deposits (formed by gravity separation during sedimentation processes) for their valuable heavy metals.[119]

plasmacytoid: innate immune cells that circulate in the blood ready to respond to pathogens, but not specific to any particular type.[120]

population: group of interbreeding organisms that is relatively isolated (i.e., demographically uncoupled) from other such groups and is likely adapted to the local habitat.[121]

positive phase of the PDO: phase of *Pacific Decadal Oscillation* (a type of *inter-decadal* climate variability) characterized by cool and warm sea surface temperatures over the western and eastern North Pacific Ocean, respectively.[122]

postsmolt: *juvenile* salmon that has undergone the physiological changes necessary to live at sea, emigrated from freshwater, and in its first calendar year at sea.[123]

pre-spawn mortality: females that have arrived on spawning grounds but die with most of their eggs retained in their body.[124]

prevalence: percentage of individuals of a host species infected with a particular parasite species.[125]

productive capacity: maximum natural capability of habitats to produce healthy fish, safe for human consumption, or to support or produce aquatic organisms on which fish depend.[126]

productivity: numbers of returns per *spawner* by *brood year*.[127]

protozoan: There is no exact definition, but the term often refers to unicellular heterotrophic, usually microscopic, eukaryotic organisms such as amoebas and ciliates.

purse-seine fishery: type of fishery involving the use of *seine* nets that are gathered at the bottom to form a "purse."

rearing lake: freshwater lake used by sockeye *fry* to feed and grow before developing into the *smolt* stage.

recreational fishing (sport fishing): non-commercial fishing to provide food for personal use or as a leisure activity.[128]

recruitment: See *recruits*.

recruits: also referred to as "returns"; the *abundance* of adults of a given sockeye *population*, usually estimated by summing the estimated number of *spawners* with abundances of fish that were caught in various fisheries.[129]

redd: sequential series of *nests* dug by a single female *salmonid*.[130]

refugia: places of refuge for salmon;[131] for example, groundwater upwelling that augments stream flow in dry summer months provides localized cooling or "thermal refugia" for migrating *adults* and rearing *juvenile*s.[132]

resource management: departmental actions, policies, and programs affecting Pacific *wild salmon* directly or indirectly through their habitats and *ecosystems*.[133]

retrovirus: any of a family of single-stranded RNA viruses containing an enzyme that allows for a reversal of genetic transcription, from RNA to DNA (rather than the usual DNA to RNA).[134]

returns: catch plus *escapement*, by *ecotype*.[135]

Ricker and Larkin models: two stock-recruitment models that are frequently used to describe Fraser River sockeye population dynamics.[136]

riparian zone: area of vegetation near streams.[137]

run size: one or more stocks of the same species that survive natural *mortality* agents and return to a given freshwater system in a given year.[138]

run-timing groups: groups of fish characterized by the timing of their return migration: Early Stuart, Early Summer, Summer, and Late-run.

salmonid: a group of fish that includes salmon, trout, and char, belonging to the taxonomic family Salmonidae.[139]

scare permit: permit issued by Environment Canada's Wildlife Service that authorizes the scaring away of migratory birds; used by *aquaculture* operators.[140]

scouring: physical disruption of eggs due to high stream flows generated by rainfall; a factor potentially decreasing the survival of eggs.[141]

sector: DFO sectors are national headquarters organizational divisions based on program activities;[142] fishing sectors refer to and distinguish commercial, *recreational*, and Aboriginal fishers.

seine: fishing net that hangs vertically in the water with its bottom edge held down by weights and its top edge buoyed by floats; seine nets can be deployed from the shore as a beach seine or from a boat.

selective fishing: *conservation*-based management approach that allows for the harvest of surplus target species or *Conservation Units* while aiming to release *bycatch* unharmed or to minimize or avoid the harvest of species or stocks for which there is conservation concern.[143]

senescence: deteriorating changes in a cell or organism with aging.[144]

set net: *gillnet* anchored in position rather than drifted or manipulated by hand.

smolt: *juvenile* salmon that has completed rearing in freshwater and migrated into the marine environment. A smolt becomes physiologically capable of balancing salt and water in the estuary and ocean waters. Smolts vary in size and age depending on the species of salmon.[145]

somatic: the body and its cells (as distinguished from reproductive cells).[146]

spawner success: successful reproduction by *spawners*.

spawners: males and females that reach the spawning grounds.[147]

stewardship: acting responsibly to conserve fish and their habitat for present and future generations.[148]

stock: aggregate of *populations* of a single species that are grouped for management purposes. Stock generally have similar migration patterns and *run timing*.[149]

stock assessment: use of various statistical and mathematical calculations to make quantitative predictions about the reactions of fish *populations* to alternative management choices.[150]

stream walks: method of estimating salmon *spawner abundance* by walking along the banks of a stream and counting the number of fish.[151]

sub-adult: not yet *adult* or *mature*.

Summer run: one of the four *run-timing groups* of Fraser River sockeye; the Summer-run stock group spawns in the Chilko, Quesnel, Stellako, and Stuart systems and arrives in the Lower Fraser River from mid-July to early September; the run includes Chilko, Late Stuart, Stellako, and Quesnel sockeye.[152]

superimposition of eggs: placement of eggs on or over other eggs.

surfactant: compounds that lower the surface tension of a liquid; or the interfacial tension between two liquids, or between a liquid and a solid.

systemic: in relation to disease, pertaining to the body as a whole.[153]

tagging program: program that involves tagging of fish or other animals.

telemetry: science and technology of automatic measurement and transmission of data by wire, radio, or other means from a distance.[154]

thermal stratification: change in temperature at different depths of a lake.

Tier 1, Tier 2, Tier 3: part of a three-tier process, involving discussions and organizational relationships among, respectively, First Nations only; First Nations and the federal government; and First Nations, the federal and provincial governments, and third parties.[155]

total allowable catch: estimated quantity of fish that may be harvested or used in the development of fishing plans.[156]

total return: sum of the estimated numbers of *adult* salmon of a population taken in the catch plus the estimate of the number of *spawners* in that *population*, computed across all life-history types; sometimes called *brood-year* returns.[157]

troll: to fish by trolling; trolling is a method of fishing where one or more fishing lines, baited with lures or bait fish, are drawn through the water.

upwelling: oceanographic phenomenon that involves wind-driven motion of dense, colder, and usually nutrient-rich water toward the ocean surface.

vectors: organisms that carry *disease*-causing micro-organisms from one host to another.[158]

vibriosis: *disease* caused by infection with bacteria of the genus *Vibrio*.

virulence: measure of the severity of a *disease* or parasite's impact on its host's fitness.[159]

visceral: pertaining to organs located in the chest and abdomen.[160]

water mass: identifiable body of water with chemical and/or physical properties distinct from surrounding water.

weak stocks: fish stocks identified as having low *productivity*.[161]

wild salmon: Salmon are considered "wild" if they have spent their entire *life cycle* in the wild and originate from parents that were also produced by natural spawning and continuously lived in the wild.[162]

yolk sac: sac containing yolk (nutritious material contained in an egg) that is attached to an embryo.[163]

zooplankton: weakly swimming and drifting planktonic organisms, mostly *protozoa* and small animals such as crustaceans, which must consume *phytoplankton* (or detritus) to survive in a process called heterotrophy.[164]

Notes

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Prince George
McBride
Wells
Quesnel
Valemount
Williams Lake
100 Mile House
Clinton
Cache Creek
Chase
Sicamous
Salmon Arm
Lillooet
Ashcroft
Kamloops
Enderby
Logan Lake
Pemberton
Lytton
Lumby
Whistler
Merritt
VANCOUVER
ISLAND
Hope
Vancouver
Richmond
Chilliwack
Surrey
Abbotsford
Victoria
WASHINGTON
IDAHO
MONTANA
Fraser River Basin
Indian Reserve
Municipality
0 50 100 200 300
km


Fraser River Basin
Fraser River Basin
Indian Reserve
Municipality
0 25 50 100 150
km
N
Driftwood River
Takla Lake
Middle R.
Trembleur Lake
Tachie R.
Stuart Lake
Fort St. James
Stuart River
Burns Lake
Francois Lake
Fraser Lake
Fraser Lake
Stellako R.
Nechako River
Nadina R.
Vanderhoof
Prince George
Fraser River
Bowron River
McBride
ALBERTA
Bowron Lake
Wells
Quesnel
Quesnel River
Valemount
Mitchell River
Quesnel Lake
Fraser River
Horsefly River
Williams Lake
Chilcotin River
Chilko River
Taseko River
Taseko Lakes
Chilko Lake
100 Mile House
Raft River
North Thompson River
U. Adams River
Momich R.
N. Barriere Lake
Fennell Cr.
Adams Lake
Seymour River
Shuswap Lake
Sicamous
Mara Lake
Clinton
L. Adams River
Scotch Cr.
Cache Creek
Kamloops Lake
Chase
Salmon Arm
Enderby
Marble Lake
L. Shuswap R.
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Lillooet
Portage Cr.
Anderson L.
Ashcroft
Kamloops
South Thompson R.
Birkenhead R.
Gates Cr.
Seton L.
Seton Cr.
Logan Lake
Thompson River
Nicola River
Lillooet
Pemberton
Lillooet Lake
Whistler
Lytton
Merritt
M. Shuswap R.
Lumby
VANCOUVER ISLAND
Strait of Georgia
Nahatlatch R.
U. Pitt R.
Pitt River
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