

Chapter 11 • Cultus Lake case history

■ Introduction

My Terms of Reference direct me to investigate the causes for the decline of Fraser River sockeye salmon stocks and their current state as well as the long-term projections for those stocks. In doing so, and in developing recommendations for improving the future sustainability of the fishery, I am cognizant of the fact that Fraser River sockeye salmon are not a single entity but a collection of many different populations, or, in the language of the Wild Salmon Policy (WSP), Conservation Units. Accordingly, where lessons can be drawn from examining in detail the evidence related to management of a specific population by the Department of Fisheries and Oceans (DFO), I am prepared to do so.

The Cultus Lake sockeye salmon population is perhaps the most studied sockeye population in British Columbia. DFO possesses data dating back to the early 1900s; the Soowahlie First Nation has information from much earlier times.¹ Cultus Lake sockeye are genetically differentiated from other sockeye

and exhibit a distinctive life history. For example, they are one of the few sockeye salmon populations to spawn in a lake rather than a stream or a river. The failure of previous attempts to transplant sockeye to Cultus Lake suggests that the population, if lost, may not be replaceable.² This particular sockeye is also significant to the Soowahlie, whose claimed traditional territory includes Cultus Lake.³

Cultus Lake sockeye are a relatively small population of sockeye which inhabit a small lake. Even historical escapements at Cultus Lake of more than 70,000 spawners are dwarfed by those of larger, more productive lakes in the Fraser River basin.⁴ The recent generational (four-year) average is about 1,000 spawners – a small fraction of the population’s productive capacity.⁵ DFO scientists have observed declines in both abundance and productivity (the number of adult returns per spawner), and in a 2011 paper they assessed the Cultus Lake sockeye Conservation Unit as having WSP “red zone” status (see Chapter 10, Wild Salmon Policy) for all trends in abundance metrics.⁶ The Commission’s Technical

Report 3, Freshwater Ecology, confirmed that the population remained at the highest severity of risk in 2010.⁷ Cultus Lake sockeye are also less productive than other populations grouped into the Late-run timing group.⁸ This decline presents challenges in managing the mixed-stock fishery, as I describe in Chapter 5, Sockeye fishery management.⁹

Over-exploitation, including directed and incidental catches, has been identified as one of the leading causes of the collapse of the Cultus Lake population.¹⁰ According to DFO, exploitation rates exceeded estimated maximum sustainable yield* in most years between 1952 and 1995, frequently by 80 percent and sometimes by 90 percent.¹¹ There is also evidence of other likely contributors,[†] especially in light of reduced harvests in recent years: marine conditions; unusually early adult migration and pre-spawning mortality since 1995; and *Parvicapsula minibicornis* parasite infestation.¹² At our public forum in Chilliwack and through submissions by mail and through our website, I heard many concerns about increasing recreational, residential, and agricultural uses in and around Cultus Lake.¹³ In addition, invasive Eurasian watermilfoil has encroached on the spawning and rearing habitat that sockeye share with a number of natural predators.¹⁴

In this chapter, rather than considering any evidence regarding the causes of the decline, I examine Cultus Lake sockeye as a case study of DFO's practices and procedures relating to the management of a vulnerable Fraser River sockeye salmon population. Cultus Lake sockeye are one of two sockeye populations (the other being Sakinaw Lake sockeye) that have been considered for legal protection under the *Species at Risk Act* (SARA). Ultimately, concerns related to the socio-economic impact of such protection on the Fraser River sockeye fishery prevented their listing. I heard evidence on the issues facing the government during the listing decision process, including questions about whether and how to manage weak stocks, and how to weigh the economic impact of harvest restrictions against the benefits of biodiversity. The SARA listing decision was under consideration while DFO was finalizing the WSP.

I heard evidence on a number of conservation actions that DFO and other dedicated groups and individuals have taken in an attempt to bring Cultus Lake sockeye back from what appeared to be imminent extinction. From these recovery efforts, witnesses told me, we can learn lessons to help our understanding of how DFO, by implementing the WSP, might focus its effort and invest resources to maximize the long-term sustainability of other Conservation Units.¹⁵ The WSP is designed to facilitate taking management actions in advance of biological listing by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and legal listing under SARA, and to prevent salmon species from being extirpated or becoming extinct.¹⁶ It also envisions a process through which the impacts of various biological, social, and economic factors are weighed.¹⁷

Many witnesses mentioned Cultus Lake sockeye in their evidence, which I considered. However, three witnesses from DFO were particularly knowledgeable about the department's management of Cultus Lake sockeye: Neil Schubert, head of the Freshwater Ecosystems Section within the Salmon and Freshwater Ecosystems (SAFE) Division of DFO Science, has been involved with Cultus Lake sockeye recovery activities since 2000 and remains involved today, though his roles and titles have changed over the years; Dr. Michael Bradford, research scientist in SAFE and adjunct professor at Simon Fraser University, has worked in Cultus Lake sockeye recovery since 2003; and Dr. John Davis is the former special advisor to the deputy minister on species at risk, having joined DFO as a research scientist in 1971.[‡]

■ DFO's advice not to list Cultus Lake sockeye under SARA

Background

In the late 1990s, DFO staff working near Cultus Lake became aware that Cultus sockeye had

* Maximum sustainable yield is the maximum production of recruits per spawner. See Chapter 5, Sockeye fishery management.

† I make findings related to the causes of the long-term decline and the 2009 collapse of sockeye salmon in Volume 2, Causes of the Decline.

‡ More information about these witnesses' backgrounds can be found in Exhibits 911, 912, and 884, respectively.

declined to a critical point and were experiencing high pre-spawning mortality. A joint effort between the Stó:lō Nation and DFO to repair an enumeration fence on the Sweltzer Creek migratory corridor brought increased attention to the Cultus Lake sockeye population. As Mr. Schubert summarized in his testimony, “starting in the 2000s there was a growing awareness that we had a major conservation issue.”¹⁸ DFO staff took preliminary actions to address the problem, as I describe later in this chapter.

In September 2002, biologist Ken Wilson and Chief Doug Kelly of the Soowahlie First Nation wrote to COSEWIC to request an emergency assessment* of Cultus Lake sockeye salmon.¹⁹ They based their request in part on a 2002 Canadian Science Advisory Secretariat (CSAS) paper authored by Mr. Schubert and others reporting on the status of Cultus Lake sockeye salmon.²⁰

COSEWIC was created in 1977 to provide a scientifically sound, national listing of wildlife species at risk. The committee of experts determines the national status of wild species, subspecies, varieties, and populations that are considered to be at risk in Canada.²¹

In late 2002, COSEWIC asked Mr. Schubert to write the assessment and status report on the Cultus Lake population (the COSEWIC Status Report), which he completed in May 2003. It is, apparently, not unusual for COSEWIC to collaborate with DFO scientists.²² The report observed declines from 1991 to 2002 in adult spawner population (36 percent) and in total reproductive potential (92 percent).²³ It also confirmed the “endangered” status of the Cultus Lake population – in other words, that the population faced imminent extirpation or extinction.²⁴ The COSEWIC Status Report referred to what could result from the WSP, which was then in draft form, anticipating that, “[a]fter implementation, it will provide additional protection to genetically distinct populations or groups of populations designated as conservation units.”²⁵

Dr. Davis testified that DFO did not disagree with COSEWIC’s assessment, which was based on the work of DFO scientists. Similarly, Mr. Schubert

told me he did not encounter disagreement from senior managers at DFO.²⁶ On April 21, 2004, the Government of Canada released a statement outlining its response to and summarizing the COSEWIC assessment:

The Cultus population has unique genetic and biological characteristics (migratory delay of adults at the Fraser estuary, protracted lake residency before spawning, exclusive lake spawning, late spawning date, deepwater life of fry). The lack of success with previous attempts to transplant sockeye to Cultus Lake and other lakes, suggests that Cultus sockeye are irreplaceable. The Cultus population has collapsed primarily due to overexploitation, including directed and incidental catches in mixed-stock fisheries at levels above those that can be sustained. An additional key source of impact on spawning adults since 1995 has been very high pre-spawn mortality, associated with unusually early migration into freshwater and with *Parvicapsula* parasite infestation. There are also ecological impacts to the lake habitat from colonization by Eurasian Watermilfoil, land development, stream channelization, nutrient input, and recreational use. Under present conditions, there is a high probability of extinction of the Cultus sockeye.²⁷

In late May 2003, shortly after the release of the COSEWIC assessment, the regional director general of DFO’s Pacific Region approved the formation of the Salmon Recovery Steering Committee.²⁸ Because it predated the full coming into force of SARA, the committee was authorized to form what Mr. Schubert described as “a kind of pre-SARA” recovery team for Cultus Lake sockeye as well as separate recovery teams for Sakinaw Lake sockeye and Interior Region coho.²⁹

Mr. Schubert agreed to chair the Cultus Sockeye Recovery Team (the recovery team), which first met in November 2003. He explained that the recovery team was multi-sectoral, with members from the commercial and sport

* Section 28(1) of SARA provides that any person who considers that there is an imminent threat to the survival of a wildlife species may apply to COSEWIC for an assessment of the threat for the purpose of having the species listed on an emergency basis under s. 29(1) as an endangered species.

fisheries, First Nations, the Pacific Salmon Commission, environmental groups, provincial and local governments, and a core group of DFO staff.³⁰ Its major objective was to draft a recovery strategy* that would be compliant with SARA.³¹ Mr. Schubert testified that the process was challenging because of the short time frame and the diversity of interests and backgrounds represented on the recovery team. He was initially apprehensive about the process but now believes the consensus approach was essential to their success: “You can’t have ... an effective recovery team if everyone doesn’t buy into the conclusions and decisions of the team ... And I think there was a mutual respect ... that came from working in the consensus-based environment and realizing that other team members are wanting to make compromises in order to come to agreement.”³² Mr. Schubert and Dr. Bradford agreed that both local knowledge, including Aboriginal traditional knowledge, and regional awareness are critical parts of the planning process (see also the discussion of DFO’s use of Aboriginal traditional knowledge in Chapter 4, DFO overview³³). The recovery team met several times in 2004 and produced a draft recovery strategy.³⁴

DFO advises against emergency SARA listing

SARA provides Canada’s legal framework for the protection of wildlife species at risk (see also Chapter 3, Legal framework). It came into force in large part on June 5, 2003, and fully on June 1, 2004.³⁵ SARA specifies the process for designating wildlife species “at risk” by listing them on the List of Wildlife Species at Risk set out in Schedule 1 (the list).†

SARA was recognized by DFO as providing stronger protection for wildlife species at risk as well as a degree of transparency and accountability not included in the *Fisheries Act* or other existing

legislation.³⁶ It has also been recognized by the Federal Court as providing listed species with compulsory legal protection not subject to dilution through discretionary ministerial action.³⁷ For listed aquatic species, SARA requires the minister of fisheries and oceans to develop recovery strategies, management plans, and action plans within specified timelines to identify and protect the critical habitat of listed endangered, threatened, and in some cases extirpated species being reintroduced. The minister must also satisfy various co-operation, consultation, and reporting requirements within specified timelines.

Any recommendation to the Governor in Council to list or not list a species assessed by COSEWIC must come from the minister of environment. Before making such a recommendation, the minister must consult certain other ministers. For aquatic species, the minister of fisheries and oceans must be consulted.³⁸

Under normal circumstances, after receiving a status assessment from COSEWIC, the Governor in Council has nine months to review it and to make a decision.³⁹ However, if the minister of environment believes there is an “imminent threat” to the survival of a wildlife species, the minister must, after consultation with other ministers, recommend to the Governor in Council that the species in question be added to the list on an emergency basis.⁴⁰

In December 2003, COSEWIC requested an emergency listing for the Cultus and Sakinaw sockeye populations.⁴¹ This request was the first for an emergency listing, and the first sockeye salmon populations proposed for listing.⁴²

DFO’s opposition to the emergency listing request is shown in a draft memorandum for the minister of fisheries and oceans⁴³ and in a briefing deck presented to the minister of environment.⁴⁴ The draft memorandum advises that the minister of environment may consider only biological factors, and not socio-economic factors, in deciding whether to recommend to cabinet that a species be listed on an emergency basis. DFO told the minister of

* A recovery strategy is a species-specific document that meets a number of specifications set out in SARA, including identification of the species’ critical habitat to the extent possible. *Species at Risk Act*, SC 2002, c. 29, s. 41(1).

† “Wildlife species” under SARA means, in simple terms, a species, subspecies, or geographically or genetically distinct population. COSEWIC deemed Cultus Lake sockeye a genetically distinct population (Exhibit 913, p. 6). DFO considers Cultus Lake sockeye a distinct Conservation Unit under the WSP. Salmon Conservation Units are, as much as practicable, aligned with wildlife species under SARA (Jim Irvine, Transcript, November 30, 2010, pp. 18–19).

environment that it would put mitigation measures in place to remove the imminent threat of extirpation and thus avoid an emergency listing.⁴⁵ Once that was done, the normal listing process would continue. There would then be the opportunity to consult further, for the minister of environment to factor socio-economic considerations into a recommendation, and “ultimately for him to consider a recommendation not to list.”⁴⁶

On or about April 21, 2004, the minister of environment announced his decision not to recommend the listing of Cultus and Sakinaw sockeye under SARA on an emergency basis. Rather, the two populations would go through the normal listing process.⁴⁷ In the meantime, DFO would address any “imminent threats” to the populations through fisheries management, habitat restoration, broodstock recapture, and enhancement.⁴⁸ Specifically, the harvest rate would be limited to 10–12 percent; Eurasian watermilfoil would be removed; predator control would be considered; and further evaluation of habitat restoration needs would be undertaken.⁴⁹ DFO reiterated these commitments in a question-and-answer sheet.⁵⁰ I discuss the department’s implementation of recovery measures later in this chapter.

Consultations on listing Cultus Lake sockeye

Under the normal, non-emergency listing process, SARA allows nine months after the Governor in Council receives the COSEWIC assessment before the council must decide whether to list the species, not list the species, or refer the matter back to COSEWIC.⁵¹ During this nine-month period for Cultus Lake sockeye, over the spring and early summer of 2004, DFO held a number of consultations throughout the Pacific Region to seek input from First Nations, governments, and various interest groups on the proposed SARA listings.⁵² Recovery team members attended these consultations and provided presentations on their draft recovery strategy and on their conclusions and recommendations.⁵³ Only one meeting took place near Cultus Lake, in Chilliwack.⁵⁴

Referring to the recovery team meeting minutes, which Mr. Schubert said accurately reflected members’ experiences, “[M]ost of the comments were negative. Very few First Nations people attended the sessions. Few participants had read the recovery strategies, so a lot of the feedback ... wasn’t informed by the recovery strategy.”⁵⁵ Mr. Schubert noted that, because the consultations involved not only the salmon species but also a number of other species proposed for listing, the impact was diluted. He offered his opinion that, although these consultation sessions were necessary, the most useful discussions had taken place near Cultus Lake and had focused on Cultus Lake sockeye.⁵⁶

A summary of consultations with First Nations prepared by DFO staff shows that the people at these meetings expressed a variety of concerns about the process, including how the impact of various socio-economic effects would be assessed.⁵⁷

Socio-economic analysis

One of the key questions facing DFO during the consultation period was, “What would be the implications of listing from the standpoint of weak stocks that are part of mixed stock fisheries?”⁵⁸ In other words, what were the potential social and economic costs and benefits of listing Cultus and Sakinaw sockeye? To address this question, DFO’s Policy Branch, Pacific Region and external consultants produced a number of socio-economic reports and presentations that became evidence for this Commission.*

One of the main conclusions to come out of these reports was an anticipated cost of listing of \$125 million in lost revenue over four years, reflecting the fact that DFO anticipated “no marine commercial fishery on Fraser River sockeye salmon” in three of the four years from 2004 to 2007.⁵⁹ The \$125 million figure included the First Nations’ harvest for food, social, or ceremonial (FSC) purposes, the commercial harvest, recreational fishing, and the fish-processing value.⁶⁰

DFO accepted the conclusions of the socio-economic reports and reiterated them in a number of memoranda. For example, a September 13, 2004, memorandum to the minister cites the \$125 million

* See Exhibits 891, 892, 892A, 892B, 892C, 892D, 892E, and 892F. I note that some of these documents appear to be draft versions and “framework” documents.

figure and concludes that “[t]he socioeconomic impact threatens the viability of the entire salmon industry in southern BC.”⁶¹ This memorandum recommends against SARA listing for both Cultus and Sakinaw sockeye.

I heard extensive testimony on the shortcomings of the socio-economic analysis, and I reviewed documentary evidence summarizing the views of the recovery team, economists, and environmental non-governmental organizations (ENGOs). To highlight areas where DFO might improve future attempts at socio-economic analysis for Fraser River sockeye stocks, I catalogue the criticisms here, beginning with those that were more substantive in nature and concluding with those that were more procedural.

Assumption that listing equated to a complete closure of the fishery. In contrast to the September 13, 2004, memorandum, which suggested that exploitation rates would need to be “essentially zero” and that this goal would result in widespread closures in the South Coast commercial sockeye fisheries, Dr. Bradford took the view that listing did not necessarily mean a prohibition of fishing. Mr. Schubert concurred, stating:

[From d]iscussions amongst the team, we had felt that a listing would not necessarily require complete fisheries closures but that some level of harvest could be allowed through recovery provided we met the minimum population goal and the population growth objectives. So we felt that was more draconian than it should have been.⁶²

An analysis conducted by Sierra Club Canada supports the witnesses’ views that the potential remained for a limited harvest of Cultus Lake sockeye, noting that SARA provides for incidental harm permits as well as harvests consistent with recovery strategies.⁶³ In addition, the analysis argues that there are opportunities for more selective fishing.

Failure to consider cycle-specific issues and the unpredictability of the Fraser River sockeye fishery. Mr. Schubert explained that Fraser River sockeye salmon generally follow a four-year cycle of abundance and that, in two of every four years, the Adams Lake and other Late-run sockeye stocks

are relatively weak and have to be harvested at reduced levels. As a result, the Cultus Lake sockeye, which traditionally migrate late, would likely have benefited from harvest restrictions in two out of every four years whether they were listed or not. For this reason, the socio-economic analysis should not have attributed the costs for those two years to the listing of Cultus Lake sockeye.⁶⁴ Mr. Schubert testified that, in his and the recovery team’s opinion, if the analysis had considered cycle-specific issues, the estimated forgone revenue would have been reduced.⁶⁵

Mr. Schubert also said that, in 2004, the Late-run timing group of sockeye salmon collapsed, meaning that harvest targets would have had to be reduced regardless of the Cultus Lake population:

I don’t think it was until about 2004 that separate exploitation rate targets were established for a Late Run versus Cultus, but when that had occurred, in at least a couple of those years, the difference between what was required for the Late Run and what was required for Cultus were quite trivial; they were 3 percent. So the reduction of exploitation rates from what they used to be at a level of 40, 50 percent or greater down to 12 percent, was being attributed to Cultus when, in fact, the reduction to 15 percent was what was required for those Late Run populations and the impact of Cultus was a further 3 percent on that. So we felt it inappropriate that all of those costs be attributed to the recovery of Cultus.⁶⁶

Some of the socio-economic analysis preceded DFO’s awareness of the 2004 cycle Fraser River sockeye collapse, which may not have developed until September of that year.⁶⁷ However, the collapse and recent variability in returns serves to illustrate how the uncertainty inherent in biological predictions can compound the uncertainty in economic projections for industries exploiting biological systems.

Conflating the impact of Sakinaw and Cultus sockeye listings. For the most part, the socio-economic analysis grouped Sakinaw and Cultus sockeye together, as if listing one population and not the other was not an option. Mr. Schubert explained that “Sakinaw had declined to a virtually extinct level already, and the decision regarding Sakinaw

might have been different [from] the decision regarding Cultus which, at that point, appeared to be imminently recoverable.”⁶⁸

Failure to extend the analysis beyond a four-year period. Mr. Schubert explained that he and the recovery team felt that most of the significant costs of listing would occur in the first four years, whereas the benefits from recovery actions would not begin to accrue until the end of that period. Predator removal, captive breeding, and hatchery supplementation would not be expected to show any benefit “until four or five years in the future, and then building rapidly beyond that.”⁶⁹ Instead, Dr. Bradford agreed, a longer outlook is required. He cautioned, however, that the further one tries to forecast, the more unreliable the prediction becomes.⁷⁰ Who, in 2004, would have predicted the social and economic benefits of the record 2010 return of sockeye salmon?

Failure to consider benefits adequately.

Dr. Bradford, in a 2004 email, identified a failure of the socio-economic analysis to consider the benefits of reduced fishing rates, noting, “The analysis does not account for the potential for rebuilding runs that will occur if restrictions are imposed, which could lead to larger catches in the future.”⁷¹ Those runs would include not only Cultus Lake sockeye but co-migrating populations as well.* Some documents show that DFO was, in fact, aware of the potential for reduced exploitation to rebuild runs.⁷² I also heard and reviewed opinions that the analysis did not sufficiently consider benefits to local First Nations whose cultures and livelihoods depend on sockeye salmon, benefits derived from the contribution that Cultus Lake sockeye bring to the ecosystem, and benefits derived from continued scientific study of this unique sockeye population.⁷³

The recovery team also criticized the analysis for failing to consider the potential for listing to increase in-river escapements, allowing more harvest for upstream First Nations that had not been able to harvest their FSC allotment in recent years.⁷⁴ One external report went as far as to say that the socio-economic analysis was not a true cost-benefit analysis because it did not consider the benefits: “Since all projects are costly, if we consider only costs, all projects must fail.”⁷⁵

A draft memorandum from the associate deputy minister to the SARA Secretariat lists a number of potential benefits associated with listing Cultus Lake sockeye, including some of those cited above. It appears, then, that DFO officials were at least aware that listing could bring benefits beyond protection of the Cultus Lake population.⁷⁶

Failure to consider non-traditional fishing options. Mr. Schubert explained that the socio-economic analysis did not identify non-traditional fishing opportunities, such as harvesting in isolation of Cultus Lake sockeye by fishing farther up the Fraser River or harvesting earlier in the season.⁷⁷ As a result, Mr. Schubert and colleagues suggest the impact on the various fisheries is overstated.⁷⁸

Failure to consider the social impact adequately. I heard evidence that, although the analysis was referred to as a socio-economic analysis, it became largely “financial” in nature and did not adequately consider the social implications. Dr. Davis briefly testified on the difficulty in quantifying the value of fish used for food, social, and ceremonial purposes.⁷⁹

In addition to the more substantive criticisms above, I also heard evidence on the process through which DFO conducted, shared, and used the socio-economic analyses. The evidence suggests a number of procedural shortcomings.

Documents were not brought to the attention of the recovery team members until requested. Some witnesses expressed concerns with the transparency of the process and the responsiveness of DFO Policy and Fisheries Management staff. When Mr. Schubert requested an opportunity for members of the recovery team to review the socio-economic analyses, DFO obliged, but allowed only the DFO members, rather than the full team, to review certain documents. He was never informed of the reasons why certain documents had to be kept confidential.⁸⁰ Mr. Schubert said that he received permission to give the recovery team the socio-economic information on November 15, 2004, after the minister of fisheries and oceans had concurred on October 20 to recommend against

* Other witnesses suggested that this approach does not work. See Chapter 5, Sockeye fishery management.

listing and after pre-publication of the recommendation from the minister of environment in the *Canada Gazette*, Part I, on October 23.⁸¹ In fact, the record of a Regional Management Committee meeting attended by Dr. Davis shows that DFO officials had decided to recommend against listing Cultus and Sakinaw sockeye by August 17, 2004.⁸² Mr. Schubert testified that it would have been preferable for DFO to have shared the reports with the full recovery team as soon as they were prepared.⁸³

Because the recovery team was not given an opportunity to review the socio-economic analyses early in the process, the uncertainties inherent in biological predictions that underpin the socio-economic analysis were not taken into account. As a result, the economic uncertainties in terms of expected catch and revenues were magnified. Dr. Bradford explained: “[T]he economic analysis didn’t consider uncertainties in its analysis; it ... just ... came up with a single number, if you like, for all of our biological work that carried that uncertainty forward.”⁸⁴

A letter from Mr. Schubert on behalf of the recovery team and addressed to Paul Macgillivray, acting regional director general, Pacific Region, summarized their concerns:

The Team has concerns about how biological modelling was used to estimate the economic impacts of listing Cultus sockeye. This is an obvious area of competence of the Team given its scientific and technical expertise on this species, as well as its detailed knowledge of the recovery goals and objectives and the actions that are planned or underway to achieve them. The Team has developed a peer reviewed biological model designed to evaluate the response of the population under differing recovery options that include a full spectrum of environmental and management scenarios. In our view, the failure to engage the expertise of the Team in the biological modelling has resulted in significant shortcomings in the socio-economic analysis.⁸⁵

No peer review. The scientific analysis of the status and recovery potential of Cultus Lake sockeye was peer reviewed by both the Pacific Scientific Advice Review Committee (PSARC) and

COSEWIC and then made public. In contrast, the socio-economic analysis documents were not peer reviewed.⁸⁶

Documents were not brought to the attention of First Nations in a timely manner. According to an email from Dr. Davis summarizing a meeting he had with local First Nations, they took the position that the failure to share information was an infringement of their Aboriginal rights.⁸⁷

I heard from participants and witnesses alike that DFO must find a way to conduct socio-economic impact analysis earlier; share the analysis more broadly, especially with First Nations; seek feedback; and consider the results along with COSEWIC advice.⁸⁸

The recovery team made the following recommendation in its letter to Mr. Macgillivray:

[T]he process for providing socio-economic advice for the recovery of COSEWIC-designated species needs to be reconsidered. Carefully considered action plans need first to be developed before an informed socio-economic analysis can be completed. Recovery teams and their implementation groups should be engaged early to ensure consistency with strategy goals and objectives and with recovery actions that are planned or underway. Socio-economic analyses should also undergo the same level of oversight as recovery strategies and action plans, with full peer review and public consultation processes that provide adequate time for sober consideration and written feedback.⁸⁹

David Bevan, associate deputy minister, testified that, at the time, DFO expected these criticisms. He said that, in order to allow the minister of environment to come to a reasonable determination, it was important for the socio-economic analysis to provide a ballpark estimate of the impact that listing Cultus and Sakinaw sockeye would have on the economics of the fishery and on other activities in British Columbia.⁹⁰ Susan Farlinger, regional director general, Pacific Region, added that DFO has recently expanded its capacity to conduct economic analysis by increasing the number of economists within its Regional Policy Branch, although it still lacks capacity to conduct the social components of the analysis.⁹¹

DFO advises against SARA listing

Over the summer of 2004, DFO regional and national headquarters officials met to reach agreement and to brief the minister on DFO's position with respect to listing Cultus and Sakinaw sockeye.⁹² A series of memoranda prepared by DFO regional staff tracks what appears to be the evolution of DFO's view on the proposed SARA listings.⁹³ The June 30, 2004, draft memorandum recommends that Cultus Lake sockeye should be listed under SARA.⁹⁴ The July 20, 2004, draft memorandum leaves the listing recommendation "[t]o be determined."⁹⁵ The August 18, 2004, draft memorandum, which is the most comprehensive, recommends against listing.⁹⁶

A final memorandum for the minister of fisheries and oceans, dated September 13, 2004, and signed by Minister Geoff Regan on October 20, 2004, shows the minister's intention to recommend against SARA listing of Cultus and Sakinaw sockeye and to raise the matter with the minister of environment.⁹⁷ When this memorandum was written, the WSP was in draft. Annex 1 of the memorandum notes that a primary goal of the WSP is to provide guidance "on the tradeoffs between protecting small components of salmon diversity and maintaining a viable mixed-stock fishery."⁹⁸ This policy, according to the annex, will assist in making strategic decisions on listing of small populations under SARA. Another memorandum from Mr. Bevan to Mr. Macgillivray and dated September 17, 2004, states that, when the decision not to list Cultus Lake sockeye under SARA is announced, DFO "will need to set out a plan for the management ... in line with an exploitation rate of 10–12%. One of the underpinnings of our non-listing rationale and our communication strategy is the department's commitment to continue efforts to protect the two populations."⁹⁹

Canada's decision not to list Cultus Lake sockeye under SARA was published in the *Canada Gazette*, Part II, on January 26, 2005.¹⁰⁰ The decision notes that it takes into account public input from more than 50 responses, including submissions from the Sierra Club, British Columbia Aboriginal Fisheries Commission, Soowahlie First Nation, and many individuals and associations from the fishing industry.¹⁰¹

The regulatory impact analysis statement (RIAS) explains the decision:

The Cultus and Sakinaw populations of Pacific sockeye salmon are not added to Schedule 1 because of the unacceptably high social and economic costs that the commercial fishing and recreational fishing sectors, some Aboriginal peoples, coastal communities and others would face if these species were added to Schedule 1. Although the overall health and resiliency of Pacific sockeye salmon is dependent on its overall genetic diversity, of which these two populations are a component, these two populations represent a small fraction of one percent of all BC sockeye salmon populations.¹⁰²

Canada published a separate order giving notice of its decision not to list certain species, including Cultus and Sakinaw sockeye.¹⁰³ The order relied on the DFO financial analysis, citing the \$125 million figure and stating that, if the populations were listed, "there would likely be no marine commercial fishery on Fraser River sockeye salmon in three of [the] four years" and that the food, social, and ceremonial fishing requirements of many First Nations that harvest in marine areas would likely not be achieved.¹⁰⁴

The RIAS expressly committed DFO to ongoing and future actions:

Recognizing that harvesting by the fisheries has been identified as one of the key threats to these populations, and given their precarious status, continued fishing will pose an ongoing threat to these two populations. However, Fisheries and Oceans Canada will continue to implement a departmental action plan for the protection and recovery of these populations, including a continuation of stringent fishery restrictions and habitat restoration and broodstock protection programs. Recovery strategies for the two populations are under development. These will be completed in 2005, and will be used to guide future recovery efforts.¹⁰⁵

DFO's opinion, expressed in a 2005 memorandum with which Paul Sprout, then the regional director general, concurred that completion of the Cultus Sockeye Recovery Strategy did "not constitute a commitment to implement all of the recovery strategies nor are there any legal requirements as there would have been for a SARA recovery strategy."¹⁰⁶

Recovery team is disbanded

Mr. Schubert explained that the recovery strategy was, over time, transformed into a conservation strategy and released in late 2009. The recovery team, chaired by Mr. Schubert and established in late 2003, developed a recovery strategy that set goals and objectives consistent with SARA, as directed by its terms of reference.¹⁰⁷ By December 2004, the draft recovery strategy had gone through public consultation and was undergoing a final edit. However, when Canada made the decision not to list Cultus Lake sockeye, the recovery team was required to remove all references to SARA from the recovery strategy. The recovery team submitted a revised recovery strategy, which Don Radford, acting director, Fisheries Management, acknowledged in the summer of 2005.¹⁰⁸ In April 2006, the regional director general approved the recovery strategy and sent it to Ottawa for review and approval. DFO officials in Ottawa required further changes, such as removing the terms “recovery” and “critical habitat” and renaming the document a “Conservation Strategy.”¹⁰⁹ By mid-2008 it was posted online but was found to contain formatting and other errors. Finally, around November 2009, more than four years after the drafting process began, the document was reformatted as a citable work – a fisheries and aquatic sciences technical series report.¹¹⁰ The substantive content, including the goals, objectives, and approaches, remained largely unchanged from the 2005 version.¹¹¹

A number of events occurred between the completion of the first draft of the recovery strategy and the posting of the conservation strategy. In April 2005, Mr. Schubert received a letter, along with other materials, from Mr. Radford’s office responding to the recovery team’s letter raising concerns about the socio-economic analysis.¹¹² The materials announced the disbanding of the recovery team.¹¹³

The April 2005 package also committed ongoing funding for recovery efforts and set out a process to replace the work of the recovery team. A note from Mr. Radford’s office confirmed DFO’s commitment to implement recovery actions and to fund recovery work in 2005/6 at a level similar

to that during the previous two years.¹¹⁴ The Integrated Fisheries Management Plan (IFMP) was to be informed by the recovery strategy (see Chapter 5, Sockeye fishery management, for details). The area offices were to appoint coordinators and develop project timelines.¹¹⁵ However, Mr. Schubert testified that no subsequent action occurred at the area level.¹¹⁶

In an April 19, 2006, letter, the Marine Conservation Caucus expressed concerns to the Integrated Harvest Planning Committee (IHPC) over the disbanding of the recovery team and the lack of either an action plan or an implementation team.¹¹⁷ Specifically, the letter suggests that the disbanding of the recovery team means the loss of the expertise and independence necessary to assist the IHPC in evaluating alternative harvest strategies or enhancement measures.¹¹⁸

A Regional Management Committee decision paper prepared for a July 25, 2006, meeting illustrates that DFO was grappling with lingering questions related to SARA implementation and protection of non-listed species (see Chapter 4, DFO overview).¹¹⁹ It notes the lack of any process for species not listed for socio-economic reasons, and it questions whether recovery strategies and action plans should be completed in advance of a final listing decision, or at all, and whether recovery teams should remain in place. It also observes issues stemming from a lack of coordination where recovery teams have disbanded after a decision not to list a species or population under SARA:

In some cases, there seems to be a continued need for species leads as well as a need to develop SARA-like action plans to clearly identify the way forward; to show regional commitment to conservation, protection and recovery; to identify priorities; to provide direction for staff; and to ensure consistency in regional approaches to recovery.¹²⁰

The 2006 decision paper recommends, among other things, developing SARA-like action plans for Sakinaw and Cultus sockeye salmon.* “These plans

* SARA requires ministers responsible for a recovery strategy to prepare an action plan based on the recovery strategy. It sets out a number of content requirements, including the identification of critical habitat to the extent possible and a statement of the measures proposed to protect the species’ critical habitat. It also calls for evaluation of the socio-economic costs of the action plan and the benefits to be derived from its implementation. *Species at Risk Act*, SC 2002, c. 29, ss. 47, 49.

would include prioritized activities for implementation, start dates and estimated costs. They would not include other SARA requirements such as critical habitat identification and [socio-economic] evaluations due to workload and resource capacity considerations.”¹²¹

In 2007, Mr. Schubert agreed to chair a Cultus Sockeye Conservation Team (conservation team) formed “to fill a void which had become obvious in recovery planning for Cultus sockeye, three or four years after the Recovery Team had disbanded.”¹²² He explained that the main difference between this team and the recovery team was its exclusion of non-DFO members.

Mr. Sprout concurred with a May 2008 memorandum stating that a process to implement the Cultus Lake sockeye conservation strategy and other conservation strategies had not been formalized.¹²³ Further, a regional strategy for implementing recovery activities for non-listed species remained outstanding. By this time, DFO had established the conservation team.¹²⁴ Mr. Schubert testified that part of its mandate was to develop an implementation plan for the conservation strategy, although, at the time he testified before the Commission, no such plan had been developed because the conservation team had not received the resources to do so.¹²⁵

■ Cultus Lake sockeye recovery measures

Mr. Schubert agreed that the conservation strategy is, in essence, a biological document. It does not engage in any socio-economic analysis or trade-offs between conservation and socio-economics.¹²⁶ While the conservation strategy itself was not peer reviewed, Dr. Bradford and Mr. Schubert testified that the scientific bases for its goals and objectives were the subject of a detailed technical review by Dr. Bradford and a colleague. The results of this technical review were published in a peer reviewed paper.¹²⁷ The conservation strategy’s overarching goal is “to halt the decline of the Cultus sockeye population and return it to the status of a viable, self-sustaining and genetically robust wild population that will contribute

to its ecosystems and have the potential to support sustainable use.”¹²⁸ Dr. Bradford testified that, when the precursor recovery strategy was under development, the population was nowhere near that goal. He explained that the recovery team therefore “developed a sequential or hierarchical set of objectives ... kind of like taking the patient from the ambulance to the emergency room, to the hospital ward, and finally being discharged.”¹²⁹

There are four sequential objectives under the conservation strategy’s overarching conservation goal. They are to

- 1 ensure the genetic integrity of the population by exceeding a four-year arithmetic mean of 1,000 successful adult spawners with no fewer than 500 successful adult spawners on any one cycle;
- 2 ensure growth of the successful adult spawner population for each generation and each cycle for not less than three out of four consecutive years;
- 3 rebuild the population to the level of abundance at which it can be delisted by COSEWIC; and
- 4 rebuild the population to a level of abundance that will support ecosystem function and sustainable use.¹³⁰

I heard evidence on a number of DFO-led or -supported activities that were intended to promote Cultus Lake sockeye recovery. These recovery activities could be described generally as aimed at meeting the conservation objectives in the conservation strategy. However, no implementation plan or action plan exists that sets out the measures to be taken to implement the recovery strategy and achieve its objectives, and that provides an indication of when the measures should take place.¹³¹ Had Cultus Lake sockeye been listed under SARA, development of an action plan would have been mandatory. Instead, recovery efforts have been sporadic. I summarize below the evidence relating to harvest restrictions and enhancement efforts, and also to activities that address the three primary freshwater threats: predation by pikeminnow, watermilfoil encroachment, and anthropogenic (or human) impact.

Harvest restrictions

Mr. Schubert was asked whether harvest control measures fall within the suite of recovery programs for Cultus Lake sockeye. He testified that exploitation rate control is one of the approaches to recovering a sockeye population, but that the conservation team does not advise fisheries management:

We don't directly advise fisheries management on explicit exploitation rates in any given year, but we do, I guess, expect them to be set within the terms of the objectives of the Recovery Team, which will allow the minimum escapement and cycle over cycle growth, and in the future I think the achievement of the lower and upper benchmarks that have been set out provisionally under Wild Salmon Policy.*

In October 2005, Mr. Sprout directed that the advice from the recovery strategies for Cultus and Sakinaw sockeye be incorporated into the IFMP for salmon.¹³² Mr. Radford similarly advised the recovery team, following the decision not to protect Cultus Lake sockeye under SARA, that recovery “is expected to be implemented through the [IFMP] process. The development of the IFMP will be informed by the recovery strategy.”¹³³

The draft 2011–12 IFMP for salmon in southern British Columbia is the first instance of an IFMP explicitly including the conservation objectives from the Cultus Sockeye Conservation Strategy.[†] Paul Ryall, former lead, Salmon Team, in DFO's Fisheries and Aquaculture Management Branch, testified that exploitation limits for Cultus Lake sockeye have been in place in IFMPs since around 2004, although the management actions have not been consistent. He also explained, referring to the draft 2011–12 IFMP for salmon, that in-season adjustments to the exploitation rate need to be consistent with the conservation objectives in the conservation strategy.¹³⁴ I heard similar evidence from Barry Rosenberger, area director, BC Interior, DFO, and Canadian chair

of the Fraser River Panel of the Pacific Salmon Commission, who testified that fishing rules for the Late-run stocks are set for what Cultus Lake sockeye can sustain.¹³⁵

Dr. Bradford and Mr. Schubert testified that the recovery team and the conservation team have never identified to fisheries managers the number of spawners or the escapement level necessary to avoid COSEWIC endangered status (corresponding to objective three of the recovery strategy, and similar to a WSP lower benchmark). Nor have they provided a long-term sustainable use plan (corresponding to objective four, similar to a WSP upper benchmark, which is explained below). The team members felt that, with their divergent interests, they would not be able to arrive at a definitive number, so they did not attempt to do so or to recommend any particular method to achieve that end.¹³⁶ A recent paper by DFO scientists calculates a lower benchmark estimate of 12,000 spawners and a range of 9,000–17,000.¹³⁷ The Fraser River Sockeye Spawning Initiative (FRSSI) process uses a lower benchmark of 7,300 spawners (for an explanation of FRSSI, see Chapter 5, Sockeye fishery management).¹³⁸

In 2010, Dr. Bradford and colleagues published a CSAS research document entitled “Status of Cultus Lake Sockeye Salmon” (the Bradford paper).¹³⁹ It reviews the efficacy of some of the recovery measures that have been implemented. Dr. Bradford agreed in testimony that this document primarily assesses the effectiveness of the enhancement and predator control programs rather than harvest management decisions.¹⁴⁰ Cultus Lake sockeye exploitation rates have decreased in the last decade. Recent allowable and actual exploitation rates are shown in Table 1.11.1.

The Bradford paper notes that the average exploitation rate from 2003 to 2009 was estimated at 17 percent, compared to the historical estimated average of 67 percent.¹⁴¹ The reductions have not been as great as DFO initially proposed: in every year since 2006, the allowable Cultus Lake exploitation rate has exceeded DFO's initial intended limit

* Transcript, May 31, 2011, p. 56. For further explanation of how WSP benchmarks are intended to inform fisheries management decisions, see Chapter 10, Wild Salmon Policy.

† Exhibit 946, pp. 48–49; Paul Ryall, Transcript, June 2, 2011, p. 96, and June 3, pp. 103–4. The 2010–11 IFMP (Exhibit 445) provides a URL for the Cultus Sockeye Conservation Strategy and mentions ongoing recovery measures.

of 10–12 percent.¹⁴² The actual exploitation rate has exceeded 12 percent in all but two years since 2004 (on actual and allowable exploitation rates, see Table 1.11.1, note a).¹⁴³ Overall, however, Cultus Lake sockeye exploitation rates have been considerably reduced from pre-2004 levels.

Table 1.11.1 Cultus Lake sockeye exploitation rates, 2004–10

Year	Allowable rate ^a (%)	Actual rate ^b (%)
2004	10–12	26
2005	10–12	12
2006	30	24
2007	20	16
2008	20	13 (71) ^c
2009	20	7
2010	20–30	50

Notes: ^aDifferences between the actual and allowable exploitation rate may reflect the fact that complexities involved in predicting the number of returning fish can make it difficult to achieve the allowable rate with precision. For further explanation, see Chapter 5, Sockeye fishery management.

^bAccording to Exhibit 1218, actual exploitation rates are preliminary.

^cThe second exploitation rate in 2008 (71) is data from the Pacific Salmon Commission. The discrepancy reflects differences in how DFO and the PSC account for fish taken for hatchery operations. In other years, the exploitation rates are the same.

Sources: Compiled using data from Exhibit 1218, p. 6; Exhibit 445, p. 28; Exhibit 804A, p. 5; and Transcript, January 21, 2011, pp. 60–61.

In 2010, in light of the unprecedented high return of sockeye salmon, the Cultus Lake sockeye exploitation rate was increased from the 20–30 percent maximum set out in the IFMP.¹⁴⁴ The vast majority of these Cultus Lake sockeye were from the hatchery program.¹⁴⁵ Dr. Bradford and colleagues caution that, if smolt-recruit survival increases for Late-run stocks (as it did for the 2010 harvest) including Cultus Lake, and harvest rates are concordantly increased, recovery to the

estimated lower WSP benchmark is unlikely.¹⁴⁶ The exploitation rate for Cultus Lake in 2010 was approximately 50 percent, the highest since 1997.¹⁴⁷ However, escapement was also the highest since 1999–2000, approximately 10,000 fish.¹⁴⁸ Rob Morley, vice-president of the Canadian Fishing Company and an economist with a fishing industry background and experience with DFO, explained:

[W]e expected to see, based on the size of the runs coming back and the forecast for Cultus, a run of ten to fifteen thousand, that if we had held to the preseason exploitation rate ... we would have given up somewhere in the range of two to three million sockeye in the catch for all user groups for the Late runs.¹⁴⁹

Testifying along with Mr. Morley, Michael Staley, a fisheries advisor to various Aboriginal groups, added that discussions took place with “some of the First Nations who have direct interest in Cultus” before DFO staff took their recommended exploitation rate to the minister.¹⁵⁰ When questioned about the 2010 exploitation rate, Ms. Farlinger and Jeff Grout, salmon resource manager, Salmon Team, DFO, both testified that the harvest rate went above 30 percent only at the time that DFO was confident that the escapement for Cultus Lake would meet the first two rebuilding goals of the recovery strategy.¹⁵¹

When asked whether there is a “real disconnect” between his work and the work of “any other level of DFO” as it relates to Cultus Lake sockeye, Mr. Schubert agreed that there is. Formalizing the conservation activities through a WSP response team was one way he suggested to address the disconnect.¹⁵²

Enhancement program

DFO staff have been carrying out enhancement work at Cultus Lake since 2000 (see Chapter 6, Habitat management, for a general description of salmon enhancement). This work consists of a captive-breeding program as well as fry and smolt supplementation. The primary purpose of enhancement work at Cultus Lake is, through the captive breeding program, to preserve the genetic diversity of the Cultus population in the event of catastrophic losses in the wild

population. Fry and smolt supplementation is an important but secondary objective.¹⁵³ DFO decided to begin phasing out the captive breeding program around 2010; the supplementation program will be re-evaluated in 2013.¹⁵⁴

The captive breeding program involved rearing to maturity a parallel population of fish in captivity. For every brood year since 2000, DFO attempted to collect a genetically diverse sample of the Cultus Lake sockeye population for breeding.¹⁵⁵ Dr. Bradford described the captive breeding program as “very scientifically rigorous.”¹⁵⁶ He testified that captive breeding “has been successful in the insurance policy aspect of it. It was designed to provide a living gene bank of fish in case there was a catastrophic loss of spawners in the lake due to disease issues. And so that was successful. They were able to keep adults reared in captivity.”¹⁵⁷

As the captive breeding process created more eggs than were needed to keep the program going, excess eggs were used for supplementation. The eggs were incubated and fish were reared to the fry or smolt stage, then released to Cultus Lake or Sweltzer Creek. Hatchery fish were typically marked by adipose fin clips to distinguish them from wild fish on their return as adults. Dr. Bradford testified that hatchery fry have been a major contributor to the number of adults returning to Cultus Lake.¹⁵⁸ In 2008 and 2009, two weak cycles, hatchery fish made up more than 85 percent of the returns.¹⁵⁹ He further stated that the hatchery fry that survived to be smolts had roughly the same marine survival as wild smolts. However, DFO has not yet established the reproductive success of hatchery fry that return as adults. This determination, Dr. Bradford said, is complex and cannot yet be completed.¹⁶⁰

The Bradford paper recommends that the captive breeding program be phased out because the severe pre-spawn mortality of 1999–2000 has not reoccurred and because of the risks “from both a genetic and fish culture perspective.”¹⁶¹ Mr. Schubert recalled that the conservation team, at a meeting around December 2010, decided to terminate captive breeding but to continue supplementations until the 2013 brood year.¹⁶² At that point, the last captive-bred fry would be released, and the team would conduct a full review of enhancement to determine whether it is still required

to achieve the goal of a self-sustaining, genetically robust population in the wild – a situation that implies no enhancement activities.¹⁶³ Dr. Bradford and colleagues acknowledge the potential for an ongoing hatchery program, meaning that some wild fish would be taken as they came to the lake and that they would spawn in a hatchery, depending on the relative reproductive success of hatchery fish in the wild.¹⁶⁴ In his testimony, Dr. Bradford described this program as “a fairly low level of enhancement but it could provide, again, an insurance policy if there was a catastrophic event.”¹⁶⁵

Measures to improve freshwater survival

Pikeminnow removal

The northern pikeminnow is a large cyprinid common in British Columbia and native to Cultus Lake. Although there are many predators of juvenile sockeye in Cultus Lake, including other salmonids and sculpins, the sheer number of pikeminnows made them the greatest threat to the population, according to DFO, at least in 2005 before regular pikeminnow removals began (see the discussion of predator removal in Volume 2, Chapter 4, Decline-related evidence).¹⁶⁶

The original predator removal program in Cultus Lake was conducted in the 1930s. Dr. Bradford explained that the program at that time “gillnetted every fish out of the lake,” including trout, pikeminnows, suckers, and other fish.¹⁶⁷ Modern predator removal efforts in Cultus Lake are more refined, targeting pikeminnows exclusively.

In 2004 and 2005, DFO undertook preliminary studies to determine how many pikeminnow were in Cultus Lake. They also removed about 6,000 pikeminnow. From 2006 to 2009, members of the commercial fishing industry, after discussions with DFO staff, removed about 42,000 adult and 17,000 juvenile pikeminnow.¹⁶⁸ Dr. Bradford testified that the commercial fishing industry’s pikeminnow removal efforts were funded by the Pacific Salmon Commission (PSC) Southern Endowment Fund for three to four years. Although that funding has since been lost, the commercial fishing sector has continued with the program. I heard from many

witnesses how the Commercial Salmon Advisory Board uses funds from the sale of sockeye salmon to reinvest in Cultus Lake sockeye conservation efforts.¹⁶⁹ Dr. Bradford testified that DFO recognized the expertise and equipment of the commercial fishing sector and helped it to obtain PSC funding, when available, and to collect and analyze data. He considered it “a good partnership in which the strengths of each group are brought to bear.”¹⁷⁰

The Bradford paper observes “a consistent positive trend in the survival of juvenile sockeye coincident with the removal of predators.”¹⁷¹

Dr. Bradford testified that, based on recent data as well as the work done in the 1930s and early 1990s, pikeminnow removal appears to have increased the survival of juvenile salmon in the lake, especially for very small broods of salmon.¹⁷² Although there is no proof of causation, he testified that an inference of causation is warranted because the data from the three different time spans are consistent: “[I]f it was a coincidence,” he said, “I don’t think we’d see it over and over in time.”¹⁷³

When asked about the lack of a predator removal program from 1992 until the mid-2000s, despite DFO becoming aware that the Cultus Lake population was in trouble around 2000, Dr. Bradford could not provide an explanation.¹⁷⁴ However, he did explain that the northern pikeminnow is a native species to British Columbia that has inhabited Cultus Lake as long as sockeye salmon have; it is not an invasive or introduced species.¹⁷⁵ Although pikeminnow removal has been successful in Cultus Lake, the witnesses I heard from did not see pikeminnow removal as something that should necessarily be pursued in other sockeye lakes. Dr. Bradford cautioned that predator removal carries inherent risks and warned that, when we manipulate predator-prey relationships, things can go awry.¹⁷⁶ In his 2010 status paper he also warned that “[t]here is uncertainty whether the predator control program can be maintained at decadal scales, or if a ‘surprise’ outcome may result from this long term manipulation of the ecosystem.”¹⁷⁷ He emphasized that Cultus Lake sockeye are a unique circumstance.¹⁷⁸ Jeremy Hume, one of the co-authors of the Bradford paper and qualified as an expert at the hearings on freshwater predation on sockeye salmon, explained that predators have a stronger effect on survival at low densities, so predator control is more effective for low-density populations than for high-density populations.¹⁷⁹

As well, sockeye are found in large amounts in the stomachs of other fish species, such as trout.¹⁸⁰ He stated that, for weak populations, predator removal may be a way to help rebuild the population by increasing their survival, but he warned that Cultus is a small lake and that it is not known whether the technique could be transferred to larger systems (see the discussion of ecosystem-based management in Chapter 4, DFO overview).¹⁸¹

Watermilfoil removal

Eurasian watermilfoil (milfoil) is an invasive plant introduced to North America more than a century ago and first observed in Cultus Lake in the late 1970s. It colonizes the lake bottom to the depth of light penetration and has spread across most of Cultus Lake’s nearshore area. Recent surveys show that it continues to spread, though more slowly.¹⁸²

The effect milfoil has had on Cultus Lake sockeye is uncertain. It is thought to impair spawning habitat and, potentially, to provide habitat for young fish such as pikeminnow that ultimately prey on sockeye. Dive surveys in 1982 found that dense patches of milfoil had displaced sockeye from areas previously used for spawning. After removal in 1983, large numbers of spawners returned to cleared areas. However, Cultus Lake sockeye have been observed spawning in deeper areas that milfoil cannot colonize.¹⁸³ Dr. Bradford testified that remote-operated vehicle photography work completed after the conservation strategy was written showed that sockeye spawn much deeper than previously thought. This finding has alleviated some of the concern about milfoil. Still, it is not clear whether spawning salmon prefer the deep-water areas or whether they are sub-optimal for spawning and the salmon use them simply because they are free of milfoil. As Dr. Bradford stated, milfoil has “probably affected where fish spawn, but it hasn’t prevented fish from spawning, we don’t think so.”¹⁸⁴

Dr. Bradford testified that milfoil is an extremely difficult weed to control. DFO conducted an experimental removal under the recovery strategy, but the milfoil grew back within months.¹⁸⁵ DFO has since abandoned attempts to remove milfoil. Mr. Schubert agreed that when spawner populations increase “to probably the top of the [WSP] red zone limit,” milfoil may become a limiting factor, and DFO may need to consider removal options again.¹⁸⁶

Habitat assessment and restoration

Cultus Lake has been a popular location for summer recreation for over a century and, at present, millions of visitors visit every year. When sockeye salmon share spawning and rearing habitat with so many people, conflicts are likely to occur.

The authors of the conservation strategy did not identify freshwater habitat loss as the main cause of the decline of the Cultus Lake sockeye population. Nonetheless, they recognized that the alleviation of freshwater habitat issues should improve survival at all life stages and contribute to recovery of Cultus Lake sockeye. The conservation strategy documents a number of examples of human activity in or near Cultus Lake and, for some of them, the impact they have likely had on the habitat:

- Disturbance by swimmers at the lake outlet can delay fish for several hours.
- Boating causes pollution of the water with hydrocarbons and metals.
- Recent developments in the vicinity include gravel mines, golf courses, water slides, boat and jet-ski rentals, and riding stables.
- Habitat alterations include the logging of lowland and higher elevations; the removal of shoreline vegetation for beaches, campsites, and boat launches; creek channelization; the addition of sand to beaches; and the construction of wharves and piers.
- Septic systems for surrounding residences and campgrounds have the potential for seepage into the lake.
- Several stormwater runoff systems discharge directly into the lake.¹⁸⁷

The conservation strategy notes that the relationship of Cultus Lake sockeye to its freshwater environment needs more study:

When it comes to understanding the threats to the population, the weakest links may be our knowledge of habitat capacity and the impacts of habitat change. The overall importance of such impacts is difficult to assess because there are significant knowledge gaps about how habitat is used by various life stages of Cultus sockeye. Measures for protecting habitat will be much better designed and justified if they are based on solid data.¹⁸⁸

Since 2005, when the conservation strategy was nearly finalized, DFO has made some effort to map and assess habitat features and threats at Cultus Lake. These efforts include studies of nutrient sources, led by the Cultus Lake Stewardship Society, and, through DFO Science, limnological and hydroacoustic assessments of the lake.¹⁸⁹ DFO oversaw a study on groundwater percolation and another on contaminants, and, as I describe above, it attempted to study and address milfoil.¹⁹⁰

When asked to identify any activities in the last six years that would constitute attempts to mitigate the effects of various threats on Cultus Lake sockeye habitat, Mr. Schubert spoke of efforts to improve knowledge of the role habitat has played in the collapse of the population rather than of particular efforts to mitigate any potential impact.¹⁹¹ He and Dr. Bradford could not identify measures taken to mitigate the impact of any threat on the habitat. Mr. Schubert explained, “The collection of knowledge was our first step. And beyond that, I don’t think we’ve identified any smoking gun, therefore there haven’t been much in the way of attempts to change habitats.”¹⁹² Overall, the tenor of the witnesses’ evidence was that, because the limited habitat assessment work undertaken to date has not identified impact on habitat as a cause of decline, mitigating habitat threats has not been a priority.

However, not all the habitat threats identified in the recovery strategy have been assessed. Cultus Lake’s Lindell Beach provides an example. Although the distribution and behaviour of adult Cultus sockeye within the lake are poorly known, a general trend has emerged – sockeye are no longer found spawning in shallow beach habitat to the same extent that they were in the past.¹⁹³ The conservation strategy notes that Lindell Beach was once a heavily used sockeye spawning area.¹⁹⁴ When Mr. Schubert was questioned about the habitat disturbances at Lindell Beach, he explained that the beach was initially developed as a summer cottage area in the 1950s and that a significant number of cottages have been built right on the beach, many with piers. He testified that he was not aware of any direct impact on the habitat from the cottages and piers, but that, to his knowledge, DFO had not assessed the impact in any structured way.¹⁹⁵

The conservation strategy notes that it was not possible to determine the type of spawning habitat which Cultus sockeye prefer, whether deeper or shallower habitats:

On the one hand, if the shallower habitats where spawners were historically observed are the preferred habitat, then recent impacts such as the encroachment of watermilfoil, changes to the aquifers and physical alteration of the beaches may have caused spawners to move to deeper water. If this is the case, the shallower areas require urgent attention. On the other hand, if the deeper habitats are preferred and the shallower habitats are only used when abundance is high (as it was in the late 1960s), then the total spawning area may be underestimated. Either way, while there may be enough habitat available for the current low spawning populations, it may be both quantitatively and qualitatively inadequate for the larger, recovered [populations] envisaged by the Team.¹⁹⁶

Dr. Bradford's testimony suggests that DFO has not gained further insight into the problem since it created the conservation strategy:

[W]e have early observations from biologists who dangled off the docks and watched the salmon, so I'm not sure that the docks caused the fish to not be at Lindell Beach. The one possibility is that they are at Lindell Beach because when the spawning populations were large they pushed into the shallow waters, and now that the spawning populations are small, they are now using the deeper areas that they always did use, but we didn't know about it until we got the underwater camera involved. So we're not sure why that change has occurred at Lindell Beach.¹⁹⁷

Without knowing why Cultus sockeye are not spawning at Lindell Beach, or any other area where they formerly spawned, DFO does not know whether attempting to protect or restore such habitat would be beneficial enough to justify the expense. It also has no assurance that other measures, such as harvest restrictions, will not be wasted because the larger escapements are limited by the reduced capacity of the spawning grounds.

Funding for Cultus Lake sockeye recovery efforts

Funding for Cultus Lake sockeye recovery efforts is allocated to three specific activities: smolt and adult enumeration; enhancement; and activities aimed at improving freshwater survival. Mr. Schubert testified that Cultus Lake recovery activities began receiving funding from the national Species at Risk Coordination / Espèces en Péril (SARCEP) program in the 2003/4 fiscal year. Those funds were to support the operations of the recovery team and to support commissioning research and reports as needed.¹⁹⁸ In late 2004, Dr. Davis informed the recovery team that the minister had committed to continue funding recovery actions despite the fact that Cultus Lake sockeye had not been listed under SARA.¹⁹⁹

In 2009, DFO officials decided that the national SARCEP program would no longer fund recovery for those species that Canada had declined to list under SARA.²⁰⁰ Mr. Schubert testified that he, as chair of the conservation team, was consulted on the impact the budget cuts would have. From 2009 onwards, Cultus Lake recovery funding became dependent on the Pacific Region. Mr. Schubert stated that the actual impact of that change in funding was limited because of the replacement funding that was made available: "Cultus actually got off quite lucky in that process because most of our projects were funded. There was a loss of projects directed towards investigations into freshwater survival but our other main projects were funded."²⁰¹ Some projects were funded through other means, such as limnological studies through A-based funding (see Chapter 4, DFO overview), and the pikeminnow removal program through the Pacific Salmon Commission and, later, through the initiative of the commercial fishing sector.²⁰²

In 2008, when the conservation team was assembled, one of its objectives was to develop an implementation plan to put the conservation strategy into action.²⁰³ However, at the time of the hearings, no plan had been developed. Mr. Schubert explained that, as funding from SARCEP depleted, "it was again kind of an ad hoc process off the side of tables of the team members without any real commitment other than the base recovery project. So a lot of the ... objectives on the terms of reference we have not been able to achieve because we simply do not have the resources to do so."²⁰⁴

Mr. Schubert testified that the SARCEP funding was more secure than having to rely on individual sectors to prioritize Cultus Lake recovery efforts among their decisions on funding allocation. He believed there is now a greater possibility that Cultus Lake recovery could lose capacity, depending on how each sector views Cultus Lake recovery among its overall priorities.²⁰⁵ Until 2009–10, funding for Cultus Lake sockeye recovery efforts was relatively stable.²⁰⁶ In 2010–11, the conservation team lost its funding for freshwater habitat recovery efforts, leaving only the enhancement and the enumeration programs funded.²⁰⁷ Mr. Schubert testified that, although the decision to terminate the captive breeding aspect of the enhancement program should mean that supplementation funding is relatively safe, “it’s always a concern that one of those two pieces [enhancement and enumeration programs] might be lost.”²⁰⁸

■ Assessing recovery against the recovery objectives and other benchmarks

In 2010, DFO reported that the prospects for Cultus Lake sockeye remained highly uncertain and that they were tied to future trends in marine survival.²⁰⁹ It is useful to consider the assessments of DFO’s progress on recovering Cultus Lake sockeye. Here I consider two such assessments, one from Dr. Bradford and colleagues, and one through the Marine Stewardship Council (MSC).

Dr. Bradford’s 2010 status assessment

I have already referred to a 2010 CSAS research paper by Dr. Bradford and colleagues (the Bradford paper), which reviews the current status of the population and the efficacy of some of the recovery measures that have been implemented. Dr. Bradford and colleagues considered the progress made in meeting all four objectives of the conservation strategy.* For objectives 3 (to permit COSEWIC delisting) and 4 (to

support long-term sustainable use) there were no numerical targets in the recovery strategy. In their evaluation, the authors substituted their estimations of lower and upper benchmarks of the WSP.²¹⁰ In his testimony, Dr. Bradford explained that the objectives were developed before the WSP and that he considered the substitution to be reasonable.²¹¹

The Bradford paper concludes that, since 2002, the Cultus Lake sockeye population has failed to meet each objective set out in the conservation strategy. The average number of spawners remains at about 1,000 fish, but two of the four cycle lines have consistently remained below 500 spawners, falling short of Objective 1. The second objective of growth in three of four years has not been met. Finally, the population is well below the lower and upper abundance benchmarks estimated by the authors: the average number of wild adult spawners entering the lake in the four years before 2010 was 997 fish; the estimated lower benchmark is 10,200 spawners.²¹²

Dr. Bradford and colleagues assessed only the “major recovery actions” – harvest reductions, captive broodstock, and predator control. They did not consider efforts to remove milfoil or address habitat threats. The assessment concludes that predator control work appears to have increased the survival of juveniles in the lake. It also finds that supplemental releases of juveniles from the captive breeding program to the lake have resulted in increasing numbers of returning hatchery adults, but their success as spawners in the wild remains unknown.²¹³

Dr. Bradford and colleagues conclude that low smolt-recruit survival is the main factor limiting population growth. They also conclude that the recovery of the Cultus Lake sockeye population remains highly uncertain and that continued monitoring is needed to determine if the recovery actions are in fact reducing risks to the population.²¹⁴

Marine Stewardship Council certification surveillance report

In Chapter 10, Wild Salmon Policy, I describe how the Marine Stewardship Council (MSC) certification

* Because only spawner abundance was evaluated, and not habitat or ecosystem considerations, the analysis is but a subset of the factors that might be included in a full WSP status evaluation.

process resulted in the certification of the Fraser River sockeye salmon fishery as a sustainable fishery, with a number of conditions to be met by DFO, the management agency. As part of the certification process, and to help the assessors as they evaluated its performance on three MSC conditions, DFO prepared a table that referred to the Bradford paper.²¹⁵ Intertek Moody Marine produced an assessment report entitled *Surveillance Report: British Columbia Commercial Sockeye Salmon Fisheries*, dated October 2011 (Surveillance Report).²¹⁶

Condition 7 of the Surveillance Report requires DFO to provide “a clear commitment to implement the recovery plan for Cultus sockeye and evidence that fisheries management actions are consistent with the recovery goals for Cultus sockeye.”²¹⁷ The report documents an indicator score increase from 70 to 80 (out of 100), due to DFO’s progress toward the recovery objectives for Cultus Lake sockeye and the protection of Cultus sockeye within the IFMP. In particular, fishery management actions to protect Cultus sockeye are clearly defined in IFMPs. The Surveillance Report observes that the Cultus exploitation rate in 2010 will likely exceed the 20–30 percent target range proposed for 2010, but because of the high returns, the escapement exceeded the short-term Cultus escapement objective. The degree of spawning success will not be known until the smolts are enumerated as they leave Cultus Lake in the spring of 2012.²¹⁸

Condition 28 also relates to Cultus Lake sockeye. It stipulates that DFO must provide target reference points for the Cultus Lake sockeye stock, a clear indication of the commitment to implement the Conservation Plan, and an assessment of the probability of recovery and the timing for recovery. Although the original score for this condition was 70, the assessors deferred drawing conclusions until the next surveillance audit because of concerns about the impact of the 2010 fishery on the recovery of Cultus Lake sockeye and the need to finalize the 2010 exploitation rates before assessing the potential impact of the fishery.²¹⁹

Condition 25 states that DFO must provide a clear commitment to implement recovery action plans for Cultus and Sakinaw sockeye salmon.

DFO’s plan to meet the condition includes implementing the WSP, particularly strategies 4 and 5.²²⁰ The assessors gave this indicator a score of 80.

The WSP and Cultus Lake sockeye recovery efforts

A May 2008 memorandum for the regional director general asserts that “extensive measures have been put in place under the *Fisheries Act* and the Wild Salmon Policy to conserve and recover [Cultus Lake sockeye].”²²¹ These measures did not include the identification of benchmarks for the Cultus Lake sockeye Conservation Unit under Strategy 1.* Moreover, the evidence showed no efforts directed toward Cultus Lake populations under strategies 2, 3, or 4.

DFO has not produced a habitat status report for Cultus Lake sockeye using indicators developed under the WSP.²²² Mr. Schubert was unable to explain why DFO hadn’t prioritized Cultus Lake in developing habitat status reports, noting that it “would be a relatively simple one.”²²³ He testified that the conservation team has a limited capacity, no budget, and is currently without a habitat representative. A WSP-driven habitat status report is a “fairly detailed document that we didn’t have the resources to address.”²²⁴ Mr. Schubert also agreed that creation of a WSP-driven habitat status report would be a useful process in general, although he stressed that the conservation team’s findings to date suggest that habitat has not played a significant role in the collapse of the Cultus Lake sockeye population.²²⁵

Asked how the recovery implementation process could be improved, Mr. Schubert suggested that the best process is identified in Strategy 4 of the WSP. The WSP speaks of interim procedures to expand the approach now used to develop IFMPs for salmon. It uses the term “response team” to describe interim multi-stakeholder groups that would provide recommendations for protection and restoration of priority Conservation Units.²²⁶ Mr. Schubert testified that he attempted to form a WSP response team in August 2006, but it “never went anywhere at regional headquarters.”²²⁷ The structure conferred on the

* The paper by Grant and colleagues (Exhibit 1915) and the Bradford paper (Exhibit 804) provide estimates or ranges that I describe above. As of the close of hearings, these estimates had not been formally adopted by DFO.

planning process by formalizing it under the WSP, he stated, would go a long way toward achieving an implementation plan that the conservation team has been unable to achieve.²²⁸

■ Findings

Throughout the hearings I heard differing opinions on the importance of smaller sockeye populations, such as Cultus Lake sockeye, to the overall sustainability of the Fraser River sockeye fishery. Some argued that, as long as the large Conservation Units (CUs) remain productive, some small CUs can be lost without sacrificing a sustainable Fraser River sockeye fishery.²²⁹ Others maintained that sustainable fisheries require at least some degree of biodiversity.²³⁰ The Wild Salmon Policy (WSP) holds that protecting diversity is “the most prudent policy for the future continuance of wild salmon.”²³¹ And to people who have sustained themselves historically on the harvest of a particular CU, biodiversity and a sustainable fishery are one and the same.²³²

The harvest management decisions the Department of Fisheries and Oceans (DFO) grapples with are said to involve trade-offs between biodiversity and exploitation; between degrees of conservation of some CUs, such as Cultus Lake, and degrees of forgone yield of others.* David Bevan, associate deputy minister, alluded to some of the negative outcomes of such decisions in the past:

We have an obligation to maintain biodiversity and we have seen that there’s an obvious, and significant, and severe, in some cases, socio-economic impact of not looking after the resources that we’re responsible for ... we have considerable and unpleasant experience in situations where we didn’t look after the stocks first and socio-economic impacts were much, much more severe than had we taken care of the fish first.²³³

For Fraser River sockeye and other Pacific salmon, the potential impact of these decisions

is supposed to be examined under the integrated strategic plans described in Strategy 4 of the WSP. Strategy 4, like most of the WSP strategies, has yet to be implemented.

With this context in mind, I provide my findings regarding DFO’s management of Cultus Lake sockeye. I must acknowledge that Cultus Lake sockeye are one salmon CU for which DFO should be making decisions under a policy intended to guide decisions for all Pacific salmon CUs. Therefore, my findings do not lead directly to specific recommendations. Instead, they serve to underscore the importance of the Wild Salmon Policy and the recommendations I make relating to its implementation in Volume 3 of this Report.

SARA listing advice

In 2004, DFO advised the minister of environment not to recommend emergency listing of Cultus Lake sockeye under the *Species at Risk Act* (SARA). In doing so, the evidence shows that DFO made a commitment to both the minister of environment and the public that it would undertake management measures to address the imminent threat to Cultus Lake sockeye.

I find that DFO followed through on some of its commitments to remove the imminent threat to Cultus Lake sockeye, such as removing pikeminnow and maintaining the enhancement program, but that it has achieved limited progress on other commitments. Eurasian watermilfoil (milfoil) removal proved too difficult, habitat assessment has not been done comprehensively, and there is no evidence of habitat restoration. Harvest restrictions, while significant, were not as stringent as DFO initially suggested, increasing from an allowable rate of 10–12 percent in 2004 and 2005 to 30 percent in 2006, and never again returning to 10–12 percent. Actual harvest rates, as set out in Table 1.11.1, also exceeded the allowable rates in 2004 and 2010.

DFO also advised the minister of environment not to recommend ordinary listing of Cultus Lake sockeye under SARA. In doing so, DFO again

* Dr. Carl Walters (a professor at the University of British Columbia), Transcript, February 9, 2011, pp. 38–39. However, see the contrasting testimony of Dr. Brian Riddell, chief executive officer of the Pacific Salmon Foundation, who stated that debates about trade-offs are actually debates about the rate of use, and that maximizing salmon production and salmon diversity are consistent objectives. This issue is discussed in chapters 10, Wild Salmon Policy, and 5, Sockeye fishery management.

committed to certain recovery measures. It also relied on the socio-economic impact analysis that arrived at a figure of \$125 million in lost revenue. I heard extensive evidence on the criticisms that the recovery team and others made of the socio-economic analysis.

I find that the analysis by DFO of the socio-economic impact of listing Cultus Lake sockeye under SARA was both procedurally and substantively deficient. DFO failed to take into account some critical biological factors as well as the biological uncertainty underpinning the analysis. The analysis focused sharply on short-term financial costs, giving little consideration to long-term benefits, social implications, or alternative fishing strategies. In my view, the recovery team should have been given the opportunity to provide input to the socio-economic analysis of the impact of listing the species, a topic with which its members were thoroughly familiar. The criticisms of the socio-economic analysis I summarize earlier in this chapter are well founded and provide an ample list of the ways DFO could improve future socio-economic analyses, particularly in moving forward with Strategy 4 of the WSP.

Regardless of whether DFO is again called on to advise the minister of environment on recommending SARA listing for a Fraser River sockeye population, DFO managers will continue to be faced with decisions that call on them to weigh biodiversity against harvest in a context of considerable uncertainty. Those decisions will be based on predictions of environmental, social, and economic impact. The WSP anticipates this kind of balancing and suggests a planning structure and procedure to address these issues in Strategy 4 and in Appendix 2. If preventing the loss of a small sockeye population is in fact prohibitively expensive in terms of social and economic impact, that decision will have to be arrived at through the collaborative, transparent process envisioned in Strategy 4. I discuss Strategy 4 in Chapter 10, Wild Salmon Policy, and make recommendations relating to it in Volume 3 of this Report.

Recovery measures

Although Cultus Lake sockeye returned in strong numbers in 2010, it is too soon to say whether

the CU is on its way to recovery. However, I am prepared to make findings of fact with respect to the recovery measures DFO has engaged in to date. Before doing so, I must mention that it became clear to me in the hearings that dedicated DFO staff working “on the ground” to protect Cultus Lake sockeye have put in considerable effort to protect this genetically unique population. I have no doubts about the integrity of the members of the recovery team or the DFO staff I heard from who worked tirelessly, with limited resources, to implement the recovery measures for the Cultus Lake sockeye CU.

Harvest restrictions

As I mentioned, following the decision not to list Cultus Lake sockeye under SARA, DFO reduced Cultus Lake sockeye exploitation rates significantly, although only for two years to the degree DFO initially proposed (see Table 1.11.1). Cultus Lake sockeye conservation objectives are supposed to inform harvest rates, but witnesses told me that the conservation team does not advise fisheries management directly, and it was not until 2011 that IFMPs explicitly referred to conservation objectives.

I accept the evidence that there has been a disconnect between the recovery team’s conservation work and some of DFO’s decisions that affect Cultus Lake sockeye, including harvest management decisions. The evidence was insufficient to allow me to draw conclusions on whether DFO is adequately considering Cultus Lake sockeye conservation objectives when setting exploitation rates. Nor can I conclude whether the target and actual exploitation rates have been conservative enough or more conservative than necessary – only after a number of years may the answer to that question emerge. Looking forward, the integrated strategic planning process described in Strategy 4 of the WSP should, when implemented, ensure that conservation objectives are fully integrated into harvest management decisions.

Enhancement program

DFO’s captive breeding program for Cultus Lake sockeye has recently been terminated, as I wrote above, and the fry and smolt supplementation work will be re-evaluated in 2013. Witnesses described

the captive breeding program as successful, and evidence shows that supplementation has been a major contributor to the number of adults returning to Cultus Lake. The success of the enhancement program for Cultus Lake sockeye will depend on the relative reproductive success of hatchery fish in the wild, which remains to be determined.

Based on the evidence, I find that the conservation-based enhancement program at Cultus Lake appears to have contributed to Cultus sockeye survival. I support the course of action DFO is taking in re-evaluating the supplementation program in 2013.

Habitat assessment and restoration

The Cultus Lake sockeye CU is one of the most-studied populations of salmon in British Columbia, yet the evidence shows that significant gaps in knowledge remain regarding how Cultus Lake sockeye use their habitat throughout their life cycle. What is not known is easy to ignore. For example, DFO has not determined whether the existing Cultus Lake habitat, without further improvements, will be capable of supporting the larger population envisioned by the conservation strategy and preliminary WSP benchmarks. As a result, DFO does not understand the extent to which milfoil encroachment and other habitat changes in Cultus Lake may have the potential to limit the benefit accrued from harvest restrictions or other recovery measures. There was no evidence of DFO completing habitat restoration work, other than failed attempts to remove milfoil. As Chapter 6, Habitat management, shows, the unrelenting, incremental loss and degradation of fish habitat remains a significant challenge for DFO to address.

The evidence leads me to conclude that, because DFO has not identified impact on habitat as a cause of the decline of Cultus Lake sockeye, the department does not consider it a priority to address the impact of various threats on habitat in and around Cultus Lake. Impact and threats to habitat have not yet been fully assessed, and as a result, it is unclear whether other conservation measures, such as harvest restrictions, will be fully effective in meeting the conservation objectives. Although the Bradford paper is an important assessment of Cultus Lake sockeye, nothing DFO has produced for Cultus Lake sockeye captures the detail envisioned

in a WSP habitat status report. In my view, completing a habitat status report under Strategy 2 of the WSP would likely benefit the Cultus Lake sockeye CU.²³⁴ Habitat status information is used to inform decisions under Strategy 4. I discuss habitat status reports in Chapter 10, Wild Salmon Policy, and make recommendations relating to Strategy 2 in Volume 3.

Pikeminnow removal and habitat monitoring

I describe above that DFO and the commercial fishing sector have removed pikeminnow from Cultus Lake in order to increase juvenile Cultus sockeye survival. I also explain that, although many fish in Cultus Lake prey on juvenile sockeye, only the native pikeminnow has been targeted for removal. The evidence is clear that pikeminnow removal is associated with increased Cultus sockeye survival. It may be less effective if the Cultus Lake population increases in size, and it may not be effective at all in other lake systems. Dr. Bradford and Mr. Hume cautioned that pikeminnow removal, as an artificial manipulation of the ecosystem, brings unknown risks.

In their 2010 status paper, Dr. Bradford and colleagues proposed five recommendations for Cultus Lake sockeye.²³⁵ Although I found them all appropriate, it is not necessary to repeat them here. In my view, the central theme underlying their recommendations is the need for a thorough monitoring program and continual review of the ongoing recovery measures. As the authors advise, the current recovery measures are essential if we are to recover the Cultus Lake sockeye population, but the exact nature of the measures and their effects must be continually reviewed and monitored. Monitoring at Cultus Lake will also help DFO better understand the degree of success that similar recovery measures may have for other sockeye populations, although not all measures that are effective for Cultus Lake will be appropriate for other populations, and vice versa.

I accept the evidence that, in Cultus Lake, pikeminnow removal has increased freshwater fry survival at low densities. I also find that pikeminnow removal is in many respects a good example of DFO and industry collaboration toward common objectives. However, manipulation of a species and

its environment is both risky and experimental. Pikeminnow removal may also be contrary to ecosystem-based management (see Chapter 4, DFO overview). If pikeminnow removal continues in Cultus Lake, DFO must oversee rigorous monitoring of the Cultus Lake ecosystem to ensure that this artificial manipulation of the environment does not trigger undesirable side effects. Monitoring to understand changes in freshwater ecosystems is the crux of WSP Strategy 3. I address monitoring under the WSP in Chapter 10, Wild Salmon Policy, and I make recommendations in Volume 3 of this Report.

Effective recovery planning

I explain above that DFO has not satisfied any of the four objectives it set out in the Cultus Sockeye Conservation Strategy. In my view, at least five related factors may have inhibited the effectiveness of DFO's recovery planning for Cultus Lake sockeye.

- First, the recovery team was disbanded shortly after finalizing the recovery strategy in 2005, leaving a void in recovery planning.
- Second, the conservation team that formed in 2007 with DFO-only membership has been unable to achieve its mandate. The evidence shows that, following the loss of dedicated SARCEP funding, the conservation team has been under-resourced.
- Third, after finalizing the recovery strategy, DFO failed to prepare an action or implementation plan. The lack of an action plan for Cultus Lake sockeye has meant that DFO has been without the component that “actually accomplishes the work.”²³⁶ Had the population been listed under SARA, DFO would have been obliged to publish an action plan within the time specified in the recovery strategy.²³⁷
- Fourth, as I mention above, it is not clear whether there is an adequate process for Cultus Lake sockeye conservation objectives to inform fisheries management decisions effectively.
- The fifth and perhaps overriding factor is that the WSP has not guided recovery planning for Cultus Lake sockeye. The evidence shows that, despite significant work to estimate benchmarks for Cultus Lake sockeye, DFO has not officially identified even provisional benchmarks under Strategy 1. Moreover, DFO has not directed any efforts toward Cultus Lake sockeye under the other WSP strategies.

It is not necessary, nor does the evidence permit me, to attempt to determine the extent to which each factor or factors were responsible for the lack of progress in recovery planning and implementation. It may have been a number of them in combination, or there may have been other factors at play that did not emerge from the evidence before me. However, in my view, Cultus Lake sockeye recovery would likely have benefited from an action or implementation plan to achieve the conservation strategy's objectives. Under the WSP, strategic planning for Cultus Lake sockeye, or any other salmon CU, is supposed to occur under Strategy 4. The WSP speaks of interim procedures under Action Step 4.1 to plan for salmon recovery, including the formation of “response teams.” Witnesses told me that the recovery team, because it included representatives of First Nations and other local and regional interests, resembled a WSP-driven response team. I accept Mr. Schubert's testimony that a formal WSP-driven process would probably go a long way toward achieving the implementation plan for Cultus Lake sockeye that DFO has so far been unable to achieve.

Notes

1 Exhibit 914, p. 7; Rob Morley, Transcript, October 28, 2010, pp. 47–48; Brian Riddell, Transcript, February 2, 2011, p. 14; Neil Schubert and Michael Bradford, Transcript, June 1, 2011, p. 61.
 2 Exhibit 914, p. 6.
 3 Exhibit 772, p. 1.
 4 Carl Walters, Transcript, February 9, 2011, p. 62; Exhibit 914, p. 13.
 5 Exhibit 930, p. 1; Exhibit 924, p. 60; Exhibit 914, p. 13.

6 Exhibit 1915, pp. 48–51, 117–18.
 7 Exhibit 562, p. 92 (Table 1).
 8 Exhibit 924, p. ii.
 9 Michael Lapointe, Transcript, January 19, 2011, pp. 32–35.
 10 Exhibit 913, pp. 34–35; Barry Rosenberger, Transcript, January 24, 2011, p. 81; Karl English, Transcript, April 15, 2011, p. 58.
 11 Exhibit 924, p. 31.
 12 Exhibit 913, pp. 34–38; Exhibit 931; Exhibit 924, pp. 31–32;

- Rob Morley, Transcript, June 3, 2011, pp. 75–77; Jim Woodey, Transcript, February 9, 2011, pp. 40–41.
- 13 See, e.g., Public submission 0276-COSTIN, available at www.cohencommission.ca.
- 14 Exhibit 913, p. vii; Carl Walters, Transcript, February 10, 2011, p. 56.
- 15 Timber Whitehouse, Transcript, February 3, 2011, pp. 12–13.
- 16 Exhibit 8, p. 35; Susan Farlinger, Transcript, December 16, 2010, pp. 51–52.
- 17 Exhibit 8, pp. 9, 27, 45.
- 18 Transcript, May 31, 2011, p. 86.
- 19 John Davis, Transcript, May 30, 2011, p. 6; Exhibit 916, p. 1.
- 20 Exhibit 924.
- 21 Exhibit 913, p. ix.
- 22 Neil Schubert, Transcript, May 31, 2011, pp. 42–43.
- 23 Exhibit 913, p. 40.
- 24 Exhibit 913, pp. i, ix.
- 25 Exhibit 913, p. 39.
- 26 John Davis, Transcript, May 30, 2011, p. 7, and July 8, 2011, p. 15; Neil Schubert, Transcript, May 31, 2011, p. 43. See also Exhibit 887, p. 2.
- 27 Exhibit 885, p. 1.
- 28 Exhibit 916, pp. 1–2.
- 29 Transcript, May 31, 2011, p. 70.
- 30 Transcript, June 1, 2011, p. 3; Exhibit 914, p. 46.
- 31 Neil Schubert, Transcript, May 31, 2011, p. 71.
- 32 Transcript, May 31, 2011, p. 72. See also pp. 89–90.
- 33 Transcript, June 1, 2011, pp. 61–63.
- 34 Exhibit 925.
- 35 Transcript, December 2, 2010, p. 7.
- 36 Exhibit 897, p. 2.
- 37 *Georgia Strait Alliance v. Canada (Minister of Fisheries and Oceans)*, 2012 FCA 40, paras 109, 126–31.
- 38 *Species at Risk Act*, SC 2002, c. 29, s. 27(1), s. 27(2)(b), s. 2(1).
- 39 *Species at Risk Act*, SC 2002, c. 29, s. 27(1.1).
- 40 *Species at Risk Act*, SC 2002, c. 29, s. 29(1).
- 41 Exhibit 1329, p. 2.
- 42 Exhibit 887, p. 1.
- 43 Exhibit 887.
- 44 Exhibit 1329; John Davis, Transcript, July 8, 2011, pp. 1–2.
- 45 John Davis, Transcript, May 30, 2011, pp. 7–8; Exhibit 1329, p. 4.
- 46 Exhibit 887, p. 3.
- 47 Exhibit 1330, p. 1.
- 48 Exhibit 1329, p. 4.
- 49 Exhibit 1329, p. 13.
- 50 Exhibit 886.
- 51 *Species at Risk Act*, SC 2002, c. 29, s. 27(1.1).
- 52 John Davis, Transcript, May 30, 2011, pp. 11–12.
- 53 John Davis, Transcript, May 31, 2011, p. 89.
- 54 Exhibit 909, p. 1.
- 55 Transcript, June 1, 2011, p. 58.
- 56 Transcript, June 1, 2011, pp. 58–59.
- 57 Exhibit 909, pp. 1–2.
- 58 John Davis, Transcript, May 30, 2011, p. 12.
- 59 Exhibit 895, p. 114.
- 60 Exhibit 892A.
- 61 Exhibit 1331, p. 4.
- 62 Transcript, May 31, 2011, p. 74.
- 63 Exhibit 892h, p. 3.
- 64 Transcript, June 1, 2011, p. 51; Exhibit 917.
- 65 Transcript, June 1, 2011, p. 51.
- 66 Neil Schubert, Transcript, May 31, 2011, p. 75.
- 67 Neil Schubert, Transcript, May 31, 2011, pp. 74–75.
- 68 Transcript, June 1, 2011, p. 52. See also Exhibit 917.
- 69 Neil Schubert, Transcript, June 1, 2011, p. 53; Exhibit 917.
- 70 Transcript, June 1, 2011, pp. 52–53.
- 71 Exhibit 932, p. 1.
- 72 Exhibit 891, p. 17.
- 73 Exhibit 893, pp. 1–2.
- 74 Exhibit 892G, p. 4.
- 75 Exhibit 893, p. 2.
- 76 Exhibit 891, p. 17.
- 77 Transcript, June 1, 2011, pp. 41–42; Exhibit 892G. See also Exhibit 896.
- 78 Exhibit 892G, pp. 3–4.
- 79 Transcript, May 31, 2011, pp. 29–30.
- 80 Neil Schubert, Transcript, May 31, 2011, pp. 72–73; Neil Schubert, Transcript, June 1, 2011, pp. 3–4.
- 81 Transcript, June 1, 2011, pp. 7–9; Exhibit 1331; Exhibit 895, p. 103.
- 82 Exhibit 890; John Davis, Transcript, May 30, 2011, p. 16.
- 83 Transcript, June 1, 2011, p. 4.
- 84 Transcript, June 1, 2011, pp. 51–52.
- 85 Exhibit 918, p. 9.
- 86 Exhibit 892G, pp. 1–2; Exhibit 896, p. 12.
- 87 Exhibit 894, p. 1.
- 88 Exhibit 894, p. 2; Final Submissions of the First Nations Coalition, p. 214.
- 89 Exhibit 918, p. 10.
- 90 Transcript, September 28, 2011, pp. 43–44.
- 91 Transcript, September 28, 2011, pp. 44–45.
- 92 John Davis, Transcript, May 30, 2011, pp. 16–17.
- 93 John Davis, Transcript, May 30, 2011, pp. 14–15.
- 94 Exhibit 889, p. 3.
- 95 Exhibit 889A, p. 4.
- 96 Exhibit 889B, p. 8.
- 97 Exhibit 1331, p. 5.
- 98 Exhibit 1331, p. 6.
- 99 Exhibit 1333, p. 1.
- 100 Exhibit 895.
- 101 Exhibit 895, p. 103.
- 102 Exhibit 895, p. 96.
- 103 Exhibit 895, p. 113.
- 104 Exhibit 895, p. 114.
- 105 Exhibit 895, p. 104.
- 106 Exhibit 920, p. 3.
- 107 Exhibit 916, at p. 2.
- 108 Transcript, Neil Schubert, May 31, 2011, pp. 44, 89.
- 109 Transcript, Neil Schubert, May 31, 2011, pp. 44–45.
- 110 Transcript, Neil Schubert, May 31, 2011, pp. 45–46. The final Conservation Strategy is Exhibit 914.
- 111 Exhibit 922, p. 2.
- 112 Exhibit 919.
- 113 Transcript, May 31, 2011, p. 77.
- 114 Exhibit 928, p. 1; Neil Schubert, Transcript, May 31, 2011, p. 95.
- 115 Exhibit 928, p. 1.
- 116 Transcript, May 31, 2011, p. 78; Exhibit 916.
- 117 Exhibit 426; Jeffery Young, Transcript, February 11, 2011, p. 63.
- 118 Exhibit 426, p. 1.
- 119 Exhibit 921.
- 120 Exhibit 921, p. 2.
- 121 Exhibit 921, p. 2.
- 122 Transcript, May 31, 2011, pp. 41–42.
- 123 Exhibit 922.
- 124 Exhibit 922.
- 125 Transcript, May 31, 2011, pp. 42, 81.
- 126 Transcript, May 31, 2011, p. 46.
- 127 Exhibit 926.
- 128 Exhibit 914, p. 4.
- 129 Transcript, May 31, 2011, p. 47.
- 130 Exhibit 914, p. 4.
- 131 *Species at Risk Act*, SC 2002, c. 29, s. 49.
- 132 Exhibit 920; Exhibit 1218; Exhibit 1218A.
- 133 Exhibit 928; Neil Schubert, Transcript, May 31, 2011, p. 95.
- 134 Transcript, June 2, 2011, pp. 95–97. See also Jeff Grout, Transcript, January 17, 2011, pp. 33, 51.

- 135 Transcript, January 21, 2011, pp. 23–24.
136 Transcript, May 31, 2011, p. 63.
137 Exhibit 1915, p. 50.
138 Exhibit 1218, pp. 3–4.
139 Exhibit 804.
140 Transcript, May 31, 2011, pp. 63–64.
141 Exhibit 804, p. 16.
142 Exhibit 1218, p. 6; Exhibit 886, p. 1.
143 Exhibit 1218, p. 6.
144 Barry Rosenberger, Transcript, January 21, 2011, pp. 5–6.
145 Barry Rosenberger, Transcript, January 24, 2011, pp. 20–21.
146 Exhibit 804, p. 20.
147 Exhibit 804A, p. 5.
148 Exhibit 804A, p. 2.
149 Transcript, February 8, 2011, p. 50.
150 Transcript, February 8, 2011, pp. 118–19.
151 Transcript, November 2, 2010, p. 43; Jeff Grout, Transcript, January 21, 2011, p. 60.
152 Transcript, June 1, 2011, p. 66.
153 Exhibit 804, p. 6.
154 Neil Schubert, Transcript, May 31, 2011, pp. 66–67.
155 Exhibit 804, p. 6.
156 Transcript, May 31, 2011, p. 50.
157 Transcript, May 31, 2011, pp. 65–66.
158 Transcript, June 1, 2011, p. 29; Exhibit 804, p. 19.
159 Exhibit 804, p. 12.
160 Transcript, June 1, 2011, p. 29; Exhibit 804, p. 19.
161 Exhibit 804, p. 22.
162 Transcript, May 31, 2011, p. 66.
163 Transcript, May 31, 2011, pp. 66–67; Transcript, June 1, 2011, p. 64.
164 Exhibit 804, p. 22.
165 Transcript, May 31, 2011, p. 66.
166 Exhibit 914, p. 12.
167 Transcript, May 31, 2011, p. 51.
168 Exhibit 804, p. 16.
169 Paul Sprout, Transcript, November 4, 2010, pp. 123–24; Ernie Crey, Transcript, July 4, 2011, p. 40; Ken Malloway, Transcript, May 12, 2011, pp. 67–68.
170 Transcript, June 1, 2011, p. 40. See also Brian Riddell, Transcript, February 3, 2011, pp. 13–14.
171 Exhibit 804, p. 18.
172 Transcript, May 31, 2011, p. 65; Transcript, June 1, 2011, p. 21.
173 Transcript, May 31, 2011, p. 65.
174 Transcript, June 1, 2011, pp. 40–41.
175 Transcript, May 31, 2011, p. 51.
176 Transcript, June 1, 2011, p. 34.
177 Exhibit 804, p. 20.
178 Transcript, June 1, 2011, pp. 40–41.
179 Transcript, May 5, 2011, pp. 27, 47.
180 Transcript, May 5, 2011, p. 47.
181 Transcript, May 5, 2011, p. 32.
182 Exhibit 914, p. 13; Michael Bradford, Transcript, May 31, 2011, p. 52.
183 Exhibit 914, p. 13.
184 Transcript, June 1, 2011, p. 45.
185 Transcript, May 31, 2011, p. 52.
186 Transcript, May 31, 2011, p. 52; Transcript, June 1, 2011, p. 45.
187 Exhibit 914, pp. 13–16, 30.
188 Exhibit 914, p. 22.
189 Transcript, May 31, 2011, pp. 94–95.
190 Transcript, May 31, 2011, p. 54; Transcript, June 1, 2011, p. 23; Exhibit 915.
191 Transcript, May 31, 2011, p. 54.
192 Transcript, May 31, 2011, p. 54.
193 Exhibit 914, pp. 5, 15; Michael Bradford, Transcript, June 1, 2011, pp. 37–38.
194 Exhibit 914, p. 15.
195 Transcript, May 31, 2011, pp. 54–55.
196 Exhibit 914, p. 19.
197 Transcript, June 1, 2011, pp. 36–37.
198 Transcript, May 31, 2011, pp. 92–93.
199 Exhibit 918, p. 5; Neil Schubert, Transcript, May 31, 2011, p. 76.
200 Neil Schubert, Transcript, May 31, 2011, pp. 82–83.
201 Transcript, May 31, 2011, p. 83.
202 Transcript, May 31, 2011, pp. 82–83, 92–94; Exhibit 927.
203 Exhibit 922, p. 2.
204 Transcript, May 31, 2011, p. 81.
205 Transcript, June 1, 2011, pp. 25–26.
206 Exhibit 927.
207 Exhibit 927.
208 Transcript, June 1, 2011, pp. 25–26.
209 Exhibit 1915, p. 49.
210 Exhibit 804, p. 2.
211 Transcript, May 31, 2011, p. 60.
212 Exhibit 804, p. 12.
213 Exhibit 804, p. v.
214 Exhibit 804, pp. v, 18.
215 Exhibit 969; Exhibit 1218, pp. 1–2.
216 Exhibit 1993A.
217 Exhibit 1993A, p. 27.
218 Exhibit 1993A, pp. 27–29.
219 Exhibit 1993A, pp. 46–47.
220 Exhibit 1993A, pp. 42–43.
221 Exhibit 922, p. 1.
222 Susan Farlinger, Transcript, December 16, 2010, pp. 75–76.
223 Transcript, June 1, 2011, p. 19.
224 Transcript, May 31, 2011, p. 56.
225 Transcript, June 1, 2011, p. 20.
226 Exhibit 8, p. 26.
227 Transcript, May 31, 2011, p. 82.
228 Transcript, May 31, 2011, p. 82.
229 See, e.g., Carl Walters, Transcript, February 10, 2011, pp. 33–34.
230 See, e.g., Michael Staley, Transcript, February 7, 2011, p. 75; Brian Riddell, Transcript, November 30, 2010, p. 3; Michael Lapointe, Transcript, October 25, 2010, pp. 70–71.
231 Exhibit 8, p. 9.
232 Michael Staley, Transcript, February 7, 2011, p. 75.
233 Transcript, November 2, 2010, p. 70.
234 Transcript, June 1, 2011, p. 20.
235 Exhibit 804, p. 22.
236 Neil Schubert, Transcript, June 1, 2011, p. 43.
237 *Species at Risk Act*, SC 2002. c. 29, s. 27 (1), s. 41(1)(g).