Review of Escapement Indicator Streams for the North and Central Coast Salmon Monitoring Program

Final Report

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EXECUTIVE SUMMARY

Annual estimates of returns of each salmon species to each Statistical Area and Conservation Unit (CU) on the North and Central Coast (NCC) of British Columbia are derived from data collected during spawning escapement surveys. The 2006 Core Stock Assessment Program (CSAP) review identified escapement monitoring as a top priority within the CSAP for NCC salmon. An initial set of escapement "indicator streams" was identified for each stock group based on historical time series, the reliability of escapement estimates, and the methods and costs of obtaining these data. This information was used to prepare the 2006 escapement monitoring strategy for NCC salmon stocks. However, the implementation of this strategy has fallen short of the goals in recent years. The number of NCC streams with escapement estimates peaked in the mid-1980s at over 1500 streams, declined to less than 1000 streams in 1994, and reached an all-time low of 476 streams in 2014. A set of streams referred to as "indicator streams" have been more consistently monitored over the years but coverage of these critical streams has also decline in recent years such that only 51% of the 679 indicator streams were surveyed in 2014.

The decline in escapement monitoring effort and the importance of these data for annual assessment of stock status prompted this review of the escapement indicator streams and the discussions regarding survey priorities, methods, and costs with the groups that have been conducting these escapement surveys in recent years. These discussion included representatives from Fisheries and Oceans Canada (DFO), Charter Patrol (CP) operators and most of the NCC First Nations. Each individual or group was provided with an Excel file that contained all the available escapement estimates and meta data for each NCC stream and identified those streams that were previously classified as "indicator streams" for each species. Individuals were asked to identify any indicator streams that should be removed from the list priority streams to monitor each year and streams that should be added to the list to fill monitoring gaps, improve coverage of a statistical area or CU, or provide more reliable escapement estimates than one or more of the current indicator streams. This report provides a series of tables which summarize of our findings by monitoring method for each Statistical Area, monitoring group, species, and CU. Recommendations are provided regarding how to ensure the annual surveys of indicator streams are conducted in a consistent and sustainable manner.

The total estimated cost for annual monitoring of the NCC salmon indicator streams is approximately $2.5 million. Available funding in recent years from DFO, First Nation Agreements, and NGOs has covered $1.7 million (66%) of the required annual funding. Therefore, the additional annual funding required to ensure most of the NCC indicator streams are monitored each year is $0.8 million. There should also be a commitment of at least $0.4 million per year for 5 years for experts to train the escapement monitoring crews, build the capacity within First Nations and seek funding from sources that could cover some of the capital costs related these escapement monitoring efforts. Given the value of Northern BC salmon fisheries to First Nations, recreational anglers, commercial fisheries and Canadians in general, this is a very small additional commitment to ensure that the most critical data for salmon management is collected each year.

BACKGROUND

The purpose of the salmon stock assessment program is to provide the information on stock status, trends and productivity required to inform and guide the decision making process related to salmon stocks and fisheries. Stock assessment data are required to address issues related to conservation, fisheries management, biodiversity, fish habitat, and the effects of climate change.

In 2004, a project was initiated to define the Core Stock Assessment Program (CSAP) for North and Central Coast (NCC) salmon stocks and identify groups interested in participating in the delivery of the CSAP. The 2004-06 project built on the work undertaken by DFO and Indian and Northern Affairs, Canada (INAC) for First Nation Treaty negotiations (English et al. 2004), DFO's internal stock assessment reviews (Blair Holtby, pers. comm.), the Pacific Salmon Foundation (PSF) Science Advisory Panel and the Pacific Fisheries Resource Conservation Council (Riddell 2004). The CSAP review included the definition of stock assessment objectives, discussions with regional biologists and fisheries managers to define stock groupings and an initial set of core stock assessment activities and methods for each salmon species (English et al. 2006).

After extensive discussions with regional DFO biologists, the PSF Science Advisory Panel, and technical representatives from North Coast First Nations from 2004-06, there was general agreement on five objectives. The CSAP should provide:

a. Long-term data sets on stock status and trends needed to identify conservation concerns before they become serious;
b. Timely information on annual stock abundance for pre-season planning and in-season fisheries management;
c. Periodic assessments of productive capacity required to refine stock management targets and decision points for fisheries managers;
d. Information on freshwater and marine survival that can be used to assess the effect of climate change and other large-scale processes; and
e. Opportunities to collect information on biodiversity and fish habitat that will augment other programs that specifically address these issues.

While stock assessment programs typically focus on one or two objectives, the CSAP focused on activities that address multiple objectives and require a long-term commitment from delivery partners. These are the core programs that must be maintained regardless of status of specific stocks or fisheries. Additional programs may be necessary to address local changes in fishing pressure and conservation concerns for specific stocks.

The 2006 review identified escapement monitoring as a top priority within the CSAP for NCC salmon. Escapement monitoring provides the bulk of the data typically used to assess the status of salmon stocks and consumes a significant component of the annual stock assessment resources. Consequently, most of the discussions focused on reviewing escapement monitoring

plans, procedures, and sampling designs. An initial set of escapement "indicator streams" was identified for each stock group based on historical time series, the reliability of escapement estimates, and the methods and costs of obtaining these data. This information was used to prepare the 2006 escapement monitoring strategy for NCC salmon stocks. However, the implementation of this strategy has fallen short of the goals in recent years.

The number of NCC streams with escapement estimates peaked in the mid-1980s at over 1500 streams, declined to less than 1000 streams in 1994 and reached an all-time low of 476 streams in 2014 (Figure 1). A set of streams referred to as "indicator streams" have been more consistently monitored over the years but coverage of these critical streams has also decline in recent years such that only 51% of the 679 indicator streams identified in 2006 were surveyed in 2014 (Figure 2).

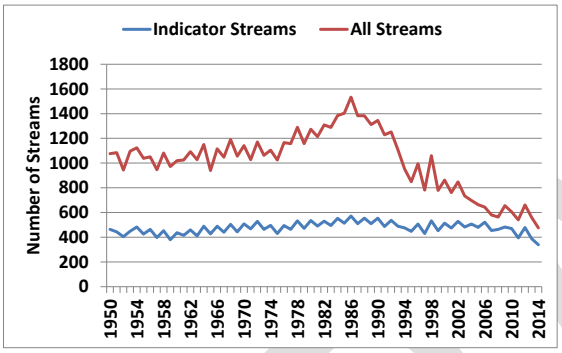

Figure 1. Number of streams surveyed each year.

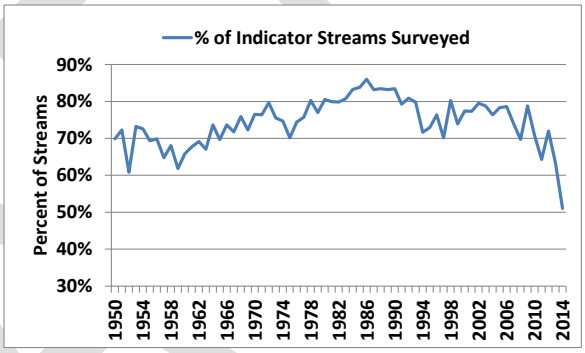

Figure 2. Percent of indicator streams surveyed each year.

The decline in escapement monitoring effort and the importance of these data for annual assessment of stock status prompted this review of the escapement indicator streams and the discussions regarding survey priorities, methods, and costs with the groups that have been conducting these escapement surveys in recent years.

The following is a list of some of the most obvious and compelling reasons for obtaining spawning escapement estimates for the indicator streams:

- ✓ to implement Canada's Wild Salmon Policy (WSP);
- ✓ to monitor the health of salmon stocks for conservation;
- ✓ to assess the effect/impact of fisheries and other local activities (e.g. logging, mining, etc.) on salmon stocks;
- ✓ to set and adjust management goals (e.g. escapement goals, harvest rules, etc.);
- ✓ to meet Canada's commitments under the Canada/US Pacific Salmon Treaty;
- ✓ to maintain Marine Stewardship Council (MSC) certification for the BC commercial fisheries for sockeye, pink and chum salmon;
- ✓ to continue the current 50-61 year time series of annual abundance estimates for BC salmon (e.g. http://shiny.lglsidney.com/ncc-salmon/);

- ✓ to successfully negotiate modern Treaties with BC First Nations that harvest salmon (e.g Nisga'a, Tsawwassen, Maanulth, and many more in process);
- ✓ to provide First Nations and local communities with meaningful jobs related to salmon management and stock assessment;
- ✓ to ensure salmon resources are managed in a responsible manner for the benefit of current and future generations.

When one looks at the above list it is hard to understand how escapement monitoring efforts have been allowed to decline to the point where we are only monitoring 51% of the 679 indicator streams identified by fisheries managers and First Nations as the most reliable indicators of the health for over 120 salmon Conservation Units (CUs) and over 3500 spawning stocks on BCs North and Central Coasts (NCC).

The following sections describe the methods used to compile and review the information available for NCC salmon streams, existing escapement monitoring programs and identify a set of escapement indicator streams for each CU and statistical area and salmon species.

METHODS

The review of the NCC indicator streams was conducted by contacting representatives from most NCC First Nations, Charter Patrol (CP) operators, DFO, and some non-governmental organizations (NGOs) (see Table 1). Each individual or group was provided with an Excel file that contained all the available escapement estimates and meta data for each NCC stream and identified those streams that were previously classified as "indicator streams" for each species. Individuals were asked to identify any indicator streams that should be removed from the list priority streams to monitor each year and streams that should be added to the list to fill monitoring gaps, improve coverage of a statistical area or Conservation Unit (CU), or provide more reliable escapement estimates than one or more of the current indicator streams. The review for each area was facilitated by classifying the streams into the following three categories:

1. indicator streams with escapement estimates in at least three of the eight years (2007-2014) since the 2006 review;
2. indicator streams with two or fewer escapement estimates from 2007-2014; and
3. streams that were not previously identified as indicator streams but had four or more escapement estimates from 2007-2014.

These streams were colour coded using green, red, and purple shading, respectively, so they could be readily identified in the Excel file and on maps for the Central Coast. In most areas, several phone conversations or conference calls were required to complete the review process. The first call described the purpose of the review, explained the information contained in the NCC Streams file and the format for providing feedback for each existing or "new" indicator stream. These introductory calls often included individuals and groups with interests in multiple

areas (e.g., North Coast and Skeena First Nation Stewardship Society, Central Coast Indigenous Resource Alliance). A second call was usually required to obtain the feedback from internal reviews or discuss the information provided. Once a revised list of indicator streams was defined for an area, a third call was often required to obtain information on the recommended escapement monitoring methods, annual costs for each stream and group interested in conducting these surveys. Several groups (e.g., Nisga'a, Gitanyow, and DFO) provided estimates of the annual costs of conducting stream surveys, fence or mark-recapture operations based on past experience. Other groups (e.g., Central Coast First Nations, CP operators) provided estimates of the daily costs for conducting stream surveys and relative ratings of the effort required to conduct surveys for each stream. The relative effort ratings used were:

Easy = three "easy" streams could be surveyed in a single day;
Medium = two "medium" streams could be surveyed in a single day;
Hard = only one "hard" stream could be surveyed in a single day; and
Hard+ = two days required to survey one "hard+" stream.

Since many Chum indicator streams are also Pink indicator streams and the two species are counted during the same surveys, the cost per stream was split equally between these two species. This information was combined with estimates of the daily survey costs for each group based on a minimum of three surveys per stream to compute the annual monitoring cost estimates for each indicator stream (stream-species combination). All of this information was organized into a single file to facilitate the preparation of summary tables of the number of indicator streams and associated monitoring costs by survey method for each statistical area and monitoring group for all species combined or broken down by species or CU.

RESULTS

The more than 30 individuals contacted during this review identified a total of 642 stream-species combinations that should be monitored to provide annual estimates of escapement in even-numbered years (Table 2). Since some streams are not monitored for Pink salmon escapement in odd-numbered years due to very low returns, there are fewer indicator streams (624) in odd-years. The even-year escapement indicator streams included 529 streams that were previously identified as escapement indicator streams and 113 new stream-species combinations to be monitored using visual survey techniques. One potential new counting fence was identified for the Chuckwalla River in Area 9 where escapement estimates could be obtained for 4 species (Chinook, Coho, Pink, and Chum). The Chuckwalla River was previous identified as an indicator stream for each of these species. In addition to identifying new indicator streams, 150 of the previously identified indicator streams were re-classified as "Historical" indicator streams. These streams should continue to be included in the escapement estimation process but would not be part of the core monitoring program in the future. The reasons for the proposal to remove these streams from the list of indicator streams were: 1) recent escapement estimates are not reliable or non-existent for these stream-species combinations; 2) the number of other indicator

streams in the CU was sufficient to provide reliable escapement estimates for the CU; and 3) new indicator streams were identified that could be more consistently monitored than these "Historical" indicator streams. Consequently, proposed new list of indicator streams contains 39 fewer indicator streams than identified in the 2006 CSAP document and subsequent reviews.

The estimated annual costs[1] for monitoring the proposed list of indicator streams in even-numbered years is approximately $2,526,000, including $353,000 in the costs associated with "New" indicator streams and monitoring effort and $2,173,000 in monitoring effort associated with the indicator streams previously identified (Table 2). As indicated above, only 51% of the current list of indicator streams has been monitored in recent years. Since most of the unmonitored indicator streams were likely streams in the "VS Annual" category, the additional costs associated with reinstating these monitoring efforts would be approximately $420,000 (49% of 856,000). Therefore, the additional funding required to monitor the NCC indicator streams on annual basis is $773,000 ($353,000+$420,000).

Table 3 provides a summary of the number of indicator streams and associated monitoring costs for each of the groups currently monitoring these streams or interested in conducting the required escapement monitoring effort in the future. The workbook used to derive these cost estimates includes daily survey costs estimates for each First Nation and CP operator which range from $660/d to $1200/d for visual survey efforts. Cost estimates for the more costly monitoring techniques (DIDSON/ARIS, fence counts, mark-recapture) are based on recent annual costs for these activities. In the Central Coast, a substantial portion of the escapement monitoring using visual survey techniques has been conducted by CP operators (e.g., Stan Hutchings, Doug Stewart, Ralph Nelson) that have been doing these surveys for more than 30 years. Moving forward, it is likely that escapement monitoring will be conducted by a combination of CP and First Nation efforts (e.g., Haisla/CP, Heiltsuk/CP, Kitasoo/CP). For those streams where First Nations are going to take over the monitoring efforts previously done by CP operators, it will be critical that First Nation fisheries technicians work with the CP operators for a few years to ensure that stream specific knowledge and survey methods are transferred so the resulting escapement estimates are comparable with the historical time series. For Areas 5-8, it is critical that this knowledge transfer occurs over the next few years since the current CP operators are nearing retirement.

The number of indicator streams for a specific species ranges from 45 for Chinook to 227 for Chum salmon (Table 4). The estimated annual survey costs were highest for Sockeye and Coho due to the greater use of counting fences for these species and high costs associated with operating these fences. The largest new costs for visual surveys were for Coho salmon enumerations ($95,500) and most of these costs were associated with two new indicator streams

[1] Cost estimates are based on preliminary estimates from each survey group and may be revised during the review process for this draft report.

on Haida Gwaii ($30,000), three in coastal Area 3 ($21,000) and one in the upper Skeena ($15,000). The second largest proposed increase in visual survey costs was for Chum salmon ($56,000) with the addition of 40 new indicator streams (19 in Area 6). While Area 6 previously had 44 indication streams for Chum, the total cost for monitoring these additional 19 streams is only $15,000 because the survey costs are split between Pink and Chum for 12 of these streams. It should also be noted the Areas with the greatest reductions in the number of indicator streams were Haida Gwaii for Chum and Pink salmon and Area 5 for Coho salmon. Appendix Tables A1-A6 provide summaries of the number of indicator streams and annual survey costs by survey method and statistical area for each species. Appendix Tables A1-B6 provide similar summaries for each CU where indicator streams have been identified.

DISCUSSION

Annual escapement estimates are the fundamental building block needed to monitor that status of NCC salmon stocks and estimate the total annual returns from each salmon CU (English et al. 2016). DFO's 1987 Operational Framework for Area 6 included the following quote:

> *"Escapement data are the basis of the whole fisheries management regime, beginning with the expectations of returning stocks based on brood year escapements through to the development of future fishing plans, according to the species and cycle of return. Obviously neither pre-season planning nor computer modeling and run reconstruction or any other long-term strategic planning exercise is possible without this information."*

All of the individuals and groups contacted for this review recognized the importance of conducting annual surveys of at least the core set of escapement indicator streams and were interested in working together to ensure these surveys are conducted in a reliable and sustainable manner. The following section provides a summary of the key feedback received from the individuals contacted in each area.

Summary of Indicator Streams by Statistical Area

The escapement monitoring efforts on Haida Gwaii streams (Area 1, 2E, and 2W) has declined in recent years due to reductions in funding for the Charter Patrol program. Our review of the escapement records for the 147 "even year" Haida Gwaii indicator streams identified in the 2006 review revealed that there were escapement estimated for only 26 (18%) of these streams in 2014. The reviewers identified 85 indicator streams on Haida Gwaii and indicated that 13 of these streams could be monitored by Parks Canada, 17 should be monitored through the Haida Fisheries Program, and the remaining 55 streams should be monitored by DFO. Given the remote location for many of these 55 streams, the reviewers strongly recommended that DFO reinstate a Charter Patrol contract to conduct the annual surveys for these streams. The reviewers also identified 9 new indicator streams (4 Chum, 4 Coho, and 1 Pink) and 62 of the previously identified indicator streams that could be classified as "Historical" indicators that

would not be monitored on an annual basis. The primary reason for the suggested removal of these 62 indicator streams was that the CU or that spatial component of the CU was well represented by other indicator streams. The estimated annual cost associated with monitoring the proposed set of Haida Gwaii indicator streams is $184,700 (Table 3).

In contrast to other areas, the Nass Area (a large portion of Area 3) has seen a marked improvement in the quality and consistency of the annual escapement estimates for Sockeye, Chinook, and Coho salmon since the implementation of the Nisga'a Fisheries Program in 1992. A critical component of these efforts has been the annual mark-recapture programs where tags are applied using fishwheels in the lower Nass River and recovered at the Meziadin fishway, Kwinageese fence and during spawning ground surveys. These annual programs have been supported by funding associated with the Nisga'a Final Agreement, Nisga'a Lisims Government (NLG), and contracts with DFO and the Pacific Salmon Commission (PSC). Nisga'a Lisims Government recently received funding from the PSC to improve escapement monitoring efforts for Chum salmon in Area 3. These funds are being used to identify the streams where Chum salmon escapement can be reliably monitored on an annual basis. The three new Chum indicator streams in Area 3 are streams identified through this process. While the Nisga'a Fisheries Program monitors escapements of Pink and Chum to Nass watershed and several indicator streams, most of the monitoring of the coastal Pink and Chum streams in Area 3 has been the responsibility of DFO through the CP program.

The reviewers identified 53 indicator streams for Area 3 and indicated that 26 of these streams are currently being monitored by NLG and 22 streams by DFO via the CP program. The remaining indicator streams include the Meziadin River which is an indicator stream, monitored jointly by NLG and Gitanyow for three species (Sockeye, Chinook, and Coho) and Brown Bear Creek which is monitored Gitanyow for two species (Sockeye and Coho). The reviewers also identified 6 new indicator streams (3 Chum and 3 Coho) and classified 8 streams as "Historical" indicator streams. The primary reasons for the suggested removal of these 8 indicator streams were the termination of the Kincolith fence operations (3 species), the lack of escapement estimates and concerns regarding the reliability of the escapement estimates for these streams in recent years. The annual costs associated with fishway and fence operations in Area 3 is $295,000 and visual survey costs are estimated to be $175,000 (Table 3).

Our review of the escapement records for the 125 "even year" Area 4 indicator streams identified in the 2006 review revealed that there were escapement estimated for only 49 (39%) of these streams in 2014. The reviewers for this project classified 26 of the 2006 indicator streams as "Historical" indicators and identified 21 new indicator streams. The net result was 120 indicator streams for Area 4 that would be monitored by DFO and 8 different First Nation groups, including: Gitanyow, Gitxsan, Kitsumkalum, Kitselas, Lake Babine Nation (LBN), Metlakatla, North Coast Skeena First Nations Stewardship Society (NCSFNSS), and Wet'suwet'en. With the exception of Gitanyow, all of the streams monitored by these groups were in Area 4. Table 3 provides a summary of the number of indicator streams identified by each of these groups and an

estimate of the associated monitoring costs. For example: Gitxsan Watershed Authority (GWA) identified 24 indicator streams and estimated the annual monitoring cost to be $317,000 for these streams. A very large portion of the GWA costs were associated with the operation of the Damshilquit Fence ($200,000) as an indicator streams for Sockeye and Coho. The estimated cost associated with GWA surveying the 9 new indicator streams they identified was $51,000 (Table 3). The Gitanyow escapement monitoring efforts in Area 4 are limited to the Kitwanga River where they operate a counting fence for all five salmon species at an estimated annual cost of $125,000. The total costs associated with DFO's escapement monitoring efforts for 19 indicator streams in Area 4 was estimated at $278,000 with the vast majority of these costs associated with the operation of the Babine fence for three species ($150,000), the Kitsumkalum River Chinook mark-recapture program ($75,000) and the Toboggan Fence for Coho ($22,000). The escapement estimates for the other indicator streams in Area 4 are derived or proposed to be derived using visual survey techniques.

Our review of the escapement records for the 64 "even year" Area 5 indicator streams identified in the 2006 review revealed that there were escapement estimated for only 24 (38%) of these streams in 2014. The reviewers for this project classified 30 of the 2006 indicator streams as "Historical" indicators and identified 3 new indicator streams. Twenty-four of the 30 "Historical" indicator streams were Coho streams that were monitored fairly consistently until the reduction in escapement monitoring efforts in 1994. The adequacy of the remaining five Coho indicator streams to represent Coho escapement to Area 5 warrant further discussion. The three new indicator streams were Chum streams identified by the Gitxaala reviewer. As a result of these changes, there are now 37 indicator streams in Area 5 that would be monitored by three different groups (20 by Gitxaala, 10 by CP and 7 by Gitga'at/CP). All escapement estimates for Area 5 streams have been derived from ground based visual surveys and it is recommended that similar methods be used in the future. Gitxaala, Gitga'at, and CP operators have all identified the importance of working closely together over the next few years to transfer the stream specific knowledge from the CP operators to the First Nation survey crews and ensure that the CP continues. The estimated annual cost associated with monitoring the proposed set of Area 5 indicator streams is $75,000 (Table 3).

Our review of the escapement records for the 124 "even year" Area 6 indicator streams identified in the 2006 review revealed that there were escapement estimated for 101 (81%) of these streams in 2014. The reviewers for this project classified 9 of the 2006 indicator streams as "Historical" indicators and despite the relatively good coverage of Area 6 streams they identified 54 new indicator streams. Thirty of these new indicator streams were identified because they have been monitored 3 or more times in the last 8 years. The distribution of these new indicator streams between the species is: 19 Chum, 14 Pink, 11 Sockeye, 6 Chinook, and 4 Coho. As a result of these suggested changes, there are now 169 indicator streams in Area 6 that would be monitored by five different groups (89 by CP, 37 by Gitga'at/CP, 34 by Haisla/CP, 5 by Haisla and 2 by Kitasoo). The 22 indicator streams for Coho in Area 6 include all the streams previously

identified as part of the 1999 Comprehensive Coho Enumeration Program for Area 6 (Hutchings, 2015). These escapement monitoring efforts have provided some of the most reliable data on Coho salmon escapement for the NCC. The recommended method for most Area 6 streams is ground based visual surveys, however, there are 12 indicator streams that in Area 6 that are assessed using helicopter surveys because they are too large to survey from the ground. As for Area 5, each First Nation reviewer identified the importance of working with the current CP operators (Stan Hutchings and Doug Stewart) over the next few years to transfer stream specific knowledge and ensure that CP monitoring continue and are coordinated First Nations escapement monitoring programs. The estimated annual cost associated with monitoring the proposed set of Area 6 indicator streams is $180,000 (Table 3).

Our review of the escapement records for the 70 "even year" Area 7 indicator streams identified in the 2006 review revealed that there were escapement estimated for 40 (57%) of these streams in 2014. The reviewers identified 7 new indicator streams and did not classify any of the 2006 indicator streams as "Historical". Reviewers proposed that the 77 indicator stream in Area 7 would be monitored by four groups (26 by Kitasoo, 14 by Kitasoo/CP and 13 by Heiltsuk and 24 by Heiltsuk/CP). The recommended method for all Area 7 streams is ground based visual surveys. The First Nation reviewers and the current CP operator (Ralph Nelson) identified the importance of working together over the next few years to transfer the stream specific knowledge. The estimated annual cost associated with monitoring the proposed set of Area 7 indicator streams is $139,000 (Table 3).

Our review of the escapement records for the 58 "even year" Area 8 indicator streams identified in the 2006 review revealed that there were escapement estimated for 36 (62%) of these streams in 2014. The reviewers identified 13 new indicator streams and classified 7 of the 2006 indicator streams as "Historical". The proposed 64 indicator streams for Area 8 would be monitored by four groups (15 by Heiltsuk/CP 26 by CP, 16 by Nuxalk/CP, 15 by Heiltsuk/CP and 7 by DFO). The recommended method for most Area 8 indicator streams, except Bella Coola Chinook, is ground based visual surveys. Aerial survey techniques were recommended for 9 indicator streams in Area 8. The estimated annual cost for these visual surveys was $93,000. Mark-recapture methods are used to estimate escapement for Bella Coola River Chinook at an annual cost of $75,000. As for Area 7, The First Nation reviewers and the current CP operator (Ralph Nelson) identified the importance of working together over the next few years to transfer the stream specific knowledge. The estimated total annual cost associated with monitoring the proposed set of Area 8 indicator streams is $168,000 (Table 3).

Our review of the escapement records for the 36 "even year" Area 9 indicator streams identified in the 2006 review revealed that there were escapement estimated for 15 (42%) of these streams in 2014. The reviewers identified 2 new indicator streams and classified 9 of the 2006 indicator streams as "Historical". The proposed 30 indicator streams for Area 9 would be monitored by Wuikinuxv (18) and Wuikinuxv/CP (12). These streams include the Wannock River, where a DIDSON/ARIS sonar system and test fishery has been used to estimate Chinook and Sockeye

escapement in recent years, and Chuckwalla River where a new fence is proposed to provide escapement estimates for Chinook, Coho, Pink, and Chum salmon. The annual cost for operating the DIDSON/ARIS sonar system on the Wannock River has been $140,000. The annual cost for operating a counting fence and video system on the Chuckwalla River is estimated to be $100,000. All other indicator streams in Area 9 would be monitored using visual survey techniques. The estimated annual cost associated with Area 9 visual surveys is $57,000 (Table 3).

Our review of the escapement records for the 9 "even year" Area 10 indicator streams identified in the 2006 review revealed that there were escapement estimated for 4 (44%) of these streams in 2014. The reviewers did not identify any new indicator streams and classified 3 of the 2006 indicator streams as "Historical". The proposed 6 indicator streams for Area 10 would be monitored by DFO or CP. The Docee Fence provides escapement estimates for Sockeye and Coho at an annual cost of $44,000. All other indicator streams in Area 10 would be monitored using visual survey techniques. The estimated annual cost associated with Area 10 visual surveys is $9,000 (Table 3).

Charter Patrol Program

The importance of the CP program for annual escapement monitoring and fisheries management activities cannot be overstated. The CP program for Haida Gwaii (Area 1, 2E and 2W) must be reinstated and in other areas the funding for the current CP program must be secured and enhanced. With recent decreases in DFO enforcement vessels and the 1994 decision that fisheries officers would no longer be providing escapement survey data, the CP program is essential for most of the following activities related to salmon stocks and fisheries in the coastal portions of Area 1-10:

1. salmon escapement monitoring for coastal streams;
2. commercial, sport and First Nation fishery monitoring;
3. closed area patrols;
4. collection of biological samples (DNA, juvenile salmon, diseased fish, algae, invasive species, etc.);
5. habitat monitoring (landslides, violations or other issues);
6. enforcement monitoring (Observe, Record and Report);
7. maintenance of boundary signs, trails and in-stream habitat (e.g. beaver dam removal);
8. communications with fishermen, coastal residents, logging companies, fishing camps and other government agencies and pass on concerns, comments and observations to Fisheries Managers.

A recent summary of the CP activities of the Area 6 North Charter Patrol prepared by Stan Hutchings is provided in Appendix C. Several of the CP operators for the North and Central Coast are nearing the end of their career and have extensive knowledge of the salmon stream,

spawning locations and best survey methods for these streams gained through more than 30 years of work in these areas. It is essential that as much as possible of their knowledge is passed on to future CP operators and local First Nations escapement survey crews.

Run Reconstruction Analysis

Annual estimates of the spawning escapement, catch and run size for most NCC salmon CU and Statistical Area are available for 1954-2014 (English et al. 2016). The available escapement estimates for indicator streams 679 indicator streams in even years and 630 indicator streams in odd years provided the basis for the annual escapement estimates for most CUs. In a few instances, data from mark-recapture programs or fence counts are used to derive the total escapement estimates for all streams in a CUs, multiple CUs or a statistical area for a specific species. These programs include the Nisga'a fishwheel program that provides annual estimates of the total escapement for Upper Nass Chinook and Coho and Area 3 Sockeye. The Babine fence counts provide annual escapement estimates for the three Babine Sockeye CUs and Sockeye returning to the Babine spawning channels. None of these annual estimates are included in the nuSEDS database but they are available in the databases, web application (http://shiny.lglsidney.com/ncc-salmon/) and reports related to the 1954-2014 run reconstruction analysis for NCC salmon (English et al. 2015; 2016). Therefore, it is critical that the escapement monitoring programs for the proposed set of indicator streams along with the Nisga'a mark-recapture programs and Babine Fence operations continue so that the time-series of escapement, catch and run size estimates can continue for NCC salmon.

RECOMMENDATIONS

1. DFO should work with NCC First Nations, Charter Patrol operators, regional salmon experts, and NGOs to secure resources needed to train survey crews and implement the annual escapement monitoring program for indicator streams.
2. Technical teams comprised of individuals with escapement monitoring experience in each area should be established to work with the groups responsible for monitoring escapement to indicator streams to ensure the best available methods are applied in each area and survey crews get the training and assistance they need.
3. Reinstate a Charter Patrol program to conduct the streams surveys for the remote portions of Haida Gwaii.
4. Maintain and enhance the Charter Patrol program for Areas 3-10 to ensure that the indicator streams in coastal areas are consistently monitored on an annual basis;
5. Assess the management goals and requirements for Area 5 Coho to determine if the five Coho indicator streams in Area 5 are adequate.
6. Assess the management goals and requirements for Area 6 and ensure that Coho indicators stream program implemented from 1999-2015 is supported into the future.

The total estimated costs for annual monitoring of the NCC salmon indicator streams is approximately $2.5 million. Available funding in recent years from DFO, First Nation Agreements, and NGOs has covered $1.7 million (66%) of the required annual funding. Therefore, the additional annual funding required to ensure most of the NCC indicator streams are monitored each year is $0.8 million. There should also be a commitment of at least $0.4 million per year for 5 years for experts to train the escapement monitoring crews, build the capacity within First Nations and seek funding from sources that could cover some of the capital costs related these escapement monitoring efforts. Given the value of Northern BC salmon fisheries to First Nations, recreational anglers, commercial fisheries and Canadians in general, this is a very small additional commitment to ensure that the most critical data for salmon management is collected each year.

ACKNOWLEDGEMENTS

This project would not have been possible without the cooperation and contributions of numerous individuals with detailed knowledge of NCC salmon spawning streams and escapement monitoring methods. For information regarding Haida Gwaii streams, we thank Peter Katinic with DFO, Mark Spoljaric with the Haida Nation, and Lynn Lee with Parks Canada. For Area 3 information, we thank Richard Alexander and Ian Beveridge with LGL Limited, Ed Desson with Nisga'a Fisheries, Mark Cleveland with Gitanyow Fisheries, and Cory Martens with DFO Prince Rupert. For Area 4 information, we thank Angela Addison with North Coast and Skeena First Nation Stewardship Society, Mark Biagi and Diane Lukasser with Kitsumkalum Fisheries, David Taft with Kitselas First Nation, William Beynon and Ross Wilson with Metlakatla Fisheries, Charlie Moldon with the Gitksan Watershed Authority, and Stu Barnes with the Skeena Fisheries Commission. For Area 5 and 6, we thank the long-term Charter Patrol operators Stan Hutchings and Karen Hansen, Mike Jacobs with the Heisla Nation, Bruce Watkinson with Gitxaala Nation, and Chris Picard with Gitga'at Nation. For Area 7 and 8, we thank Ken Cripps and Larry Greba with Central Coast Indigenous Resource, Ralph Nelson the long-term Charter Patrol operator for Area 7-10 Alliance, Megan Moody and Peter Si with the Nuxalt Nation, Mike Reid with the Heiltsuk Nation, and Rick Neasloff with Kitasoo Nation. For Area 9 and 10, we thank David Rolston with the Wuikinuxv Nation and Brad Koroluk with DFO Bella Coola. This project built on previous reviews that were done with the assistance of Bruce Baxter, Blair Holtby, Steve Cox-Rogers, Peter Hall, Blair Holtby, Dave Peacock, Brian Spilsted, and Ivan Winther with Fisheries and Oceans, Canada. We thank each of these individuals for their assistance and we are especially grateful to Bruce Baxter and Blair Holtby who prepared the critical databases needed to link all BC salmon streams to a Conservation Unit. We thank Dawn Keller with LGL Limited for her assistance with the preparation of this report.

Funding for this project was provided by the Pacific Salmon Foundation (PSF). We thank the PSF for the opportunity to conduct this project and Katrina Conors for project oversight, administration, and her review of this report. We would also like to acknowledge previous

support received from Fisheries and Oceans Canada, Ecotrust, State of the Salmon Program, Pacific Salmon Foundation, and LGL Limited for work related to North Coast and Central Coast salmon databases which provided the foundation for this project.

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TABLES

Table 1. List of the individuals who provided information and recommendations regarding the escapement indicator streams in their respective areas.

Group	Sub-Group	Names	Email Address	Stat Areas
North Coast First Nations				
	Haida Fisheries	Mark Spoljaric	Mark Spoljaric <mark.spoljaric@haidanation.com>	1,2E,2W
	Nisga'a Fisheries	Richard Alexander	Richard Alexander <ralexander@lgl.com>	3
	Nisga'a Fisheries	Ed Desson	Ed Desson <edwardd@nisgaa.net>	3
	Nisga'a Fisheries	Ian Beveridge	Ian Beveridge <ibeveridge@lgl.com>	3
	Skeena Fish Commission	Stu Barnes	Stu Barnes <stu_barnes@skeenafisheries.ca>	4
	Gitanyow	Mark Cleveland	Mark Cleveland <mark.cleveland7@gmail.com>	3,4
	Gitksan Watershed Authority	Charlie Muldon	Charlie Muldon <cmuldon@gitksanwatershed.com>	4
	Lake Babine Nation	Donna MacIntyre	Donna MacIntyre <donna.macintyre@lakebabine.com>	4
	NCSFNSS [1]	Angela Addison	Angela Addison <angela.addison@ncsfnss.ca>	3,4
	Metlakatla	Ross Wilson	Ross Wilson <rwilson@metlakatla.ca>	4
	Metlakatla	William Beynon	William Beynon <wbeynon@metlakatla.ca>	4
	Kitsumkalum	Mark Biagi	Mark Biagi <fisheries.manager@kitsumkalum.bc.ca>	4
	Kitsumkalum	Diane Lukasser	Diane Lukasser <dlukasser@kitsumkalum.bc.ca>	4
	Kitselas	David Taft	David Taft <d.taft@kitselas.com>	4
	Gitxaala	Bruce Watkinson	Bruce Watkinson <watkinson@gitxaalanation.com>	5
	Gitga'at	Chris Picard	Chris Picard <chris.r.picard@gmail.com>	5,6
	Heisla	Mike Jacobs	Mike Jacobs <fisheries@haisla.ca>	6
Central Coast First Nations				
	CCIRA [2]	Ken Cripps	Ken Cripps <crippsk@shaw.ca>	6,7,8
	CCIRA [2]	Larry Greba	Larry Greba <greba@telus.net>	6,7,8
	Wuikinuxv	Dave Rolston	Dave Rolston <wuikinuxvfisheries@wuikinuxv.net>	9
	Nuxalt	Megan Moody	Megan Moody <meganfmoody@gmail.com>	8
	Nuxalt	Peter Si	Peter Si <marine.manager@nuxalknation.ca>	8
	Heiltsuk	Mike Reid	Mike Reid <MReid2@heiltsuknation.ca>	7,8
	Kitasoo	Rick Neasloff		7,8
Charter Patrol				
	Area 5 & 6	Stu Hutchings	Stu Hutchings <hawkbay@citywest.ca>	5,6
	Area 7 & 8	Ralph Nelson	Ralph Nelson <ralphnelson@hotmail.com>	7,8
DFO	Stock Assessment Central	Brad Koroluk	Brad Koroluk <brad.koroluk@dfo-mpo.gc.ca>	6,7,8,9,10
	Fish Management Haida Gwaii	Peter Katinic	Peter Katinic <peter.katinic@dfo-mpo.gc.ca>	1,2E,2W
	Fish Management Haida Gwaii	Victor Fradette	Fradette, Victor <Victor.Fradette@dfo-mpo.gc.ca>	1,2E,2W
	Fish Management 3-5	Corey Martens	Martens, Corey <Corey.Martens@dfo-mpo.gc.ca>	3,4,5
NGOs+Others				
	MCC/RainCoast	Andy Rosenburger	Andy Rosenburger <andy@raincoast.org>	4
	Park Canada	Lynn Lee	Lynn Lee <lynn.lee@pc.gc.ca>	1,2E,2W
Count		32		

[1] NCSFNSS = North Coast and Skeena First Nations Stewardship Society

[2] CCIRA = Central Coast Indigenous Resource Alliance

Table 2. Number of indicator streams by statistical area for all species by survey method. "New (VS)" identifies new stream-species combinations that have been added to the previous list of indicator streams to be monitored using visual survey techniques and "Historical" identifies indicator streams that would remain on the list of indicator streams for historical run reconstructions but have not been consistently monitored in recent years and would not be monitored on an annual basis in the future.

	Number of indicator streams									
Stat. Area	DIDSON/ARIS	Fence	MR Annual	New (Fence)	New (VS)	VS Annual	VS Annual (A)	Total	Historical	Net Change
1					1	11		12	4	-3
2E		1			5	39		45	31	-26
2W					2	26		28	26	-24
3A					5	28	4	37	7	-2
3B		7			1	9		17		1
4A					2	10	2	14	7	-5
4B			1		10	35	1	47	6	4
4C		5			7	12	4	28	4	3
4D		6	1		2	20	2	31	9	-7
5					3	34		37	29	-26
6					54	103	12	169	9	45
7		1			7	69		77		7
8			1		13	41	9	64	7	6
9	2			4	1	18	5	30	8	-7
10		2				2	2	6	3	-3
Total	2	22	3	4	113	457	41	642	150	-37

	Preliminary estimate of the survey costs									
Stat Area	DIDSON/ARIS	Fence	MR Annual	New (Fence)	New (VS)	VS Annual	VS Annual (A)	Total	New	Other
1					15,000	22,000		37,000	15,000	22,000
2E		10,000			5,900	76,100		92,000	5,900	86,100
2W					16,000	39,700		55,700	16,000	39,700
3A					27,000	70,260	13,500	110,760	27,000	83,760
3B		295,000			1,500	80,500		377,000	1,500	375,500
4A					4,680	23,580	24,000	52,260	4,680	47,580
4B			75,000		30,000	108,000	3,000	216,000	30,000	186,000
4C		125,000			26,000	27,380	15,500	193,880	26,000	167,880
4D		372,000	5,400		25,000	40,880	28,500	471,780	25,000	446,780
5					6,000	69,750		75,750	6,000	69,750
6					61,905	90,870	27,630	180,405	61,905	118,500
7		25,000			14,850	99,270		139,120	14,850	124,270
8			75,000		16,695	60,225	16,560	168,480	16,695	151,785
9	140,000			100,000	2,700	40,500	13,500	296,700	102,700	194,000
10		50,000				6,980	1,980	58,960	0	58,960
Total	140,000	877,000	155,400	100,000	253,230	855,995	144,170	2,525,795	353,230	2,172,565

Table 3. Number of indicator streams by monitoring group for all salmon species by survey method. CP = Charter Patrol, HFP = Haida Fisheries Program, LBN = Lake Babine Nation, NCSFNSS = North Coast and Skeena First Nation Stewardship Society, and NLG = Nisga'a Lisims Government.

	Number of indicator streams									
Group	DIDSON/ARIS	Fence	MR Annual	New (Fence)	New (VS)	VS Annual	VS Annual (A)	Total	Historical	Net Change
CP					32	92	10	134	106	-74
DFO		6	3		3	74	6	92	44	-41
Gitanyow		5				2		7		0
Gitga'at/CP					8	35	1	44		8
Gitxaala					3	17		20		3
GWA		2			9	7	6	24		9
Haisla					4	1		5		4
Haisla/CP					12	14	10	36		12
Heiltsuk		1			2	10		13		2
Heiltsuk/CP					12	27		39		12
HFP					4	13		17		4
Kalum					6	16		22		6
Kitasoo					3	25		28		3
Kitasoo/CP					1	13		14		1
Kitselas					4	18	1	23		4
LBN						10		10		0
Metlakatla					1	10		11		1
NCSFNSS							2	2		0
NLG		4			6	18		28		6
NLG/Gitanyow		3						3		0
Nuxalk/CP					1	15		16		1
Parks					1	12		13		1
TWS		1						1		0
Wet'suet'en						3		3		0
Wuikinuxv	2			4		8	4	18		0
Wuikinuxv/CP					1	10	1	12		1
Total	2	22	3	4	113	450	41	635	150	-37

	Preliminary estimate of the survey costs									
Group	DIDSON/ARIS	Fence	MR Annual	New (Fence)	New (VS)	VS Annual	VS Annual (A)	Total	New	Other
CP					30,915	92,100	24,780	147,795	30,915	116,880
DFO		222,000	155,400		3,300	120,480	9,960	511,140	3,300	507,840
Gitanyow		125,000				10,000		135,000	0	135,000
Gitga'at/CP					7,590	37,290	1,980	46,860	7,590	39,270
Gitxaala					6,000	45,000		51,000	6,000	45,000
GWA		200,000			51,000	22,000	44,000	317,000	51,000	266,000
Haisla					4,050	1,350		5,400	4,050	1,350
Haisla/CP					21,600	16,200	22,950	60,750	21,600	39,150
Heiltsuk		25,000			4,050	17,550		46,600	4,050	42,550
Heiltsuk/CP					17,775	47,475		65,250	17,775	47,475
HFP					31,600	48,400		80,000	31,600	48,400
Kalum					18,000	55,800		73,800	18,000	55,800
Kitasoo					5,400	26,325		31,725	5,400	26,325
Kitasoo/CP					2,700	19,395		22,095	2,700	19,395
Kitselas					12,000	49,500	3,000	64,500	12,000	52,500
LBN						13,500		13,500	0	13,500
Metlakatla					2,700	24,300		27,000	2,700	24,300
NCSFNSS							24,000	24,000	0	24,000
NLG		175,000			28,500	104,460		307,960	28,500	279,460
NLG/Gitanyow		120,000						120,000	0	120,000
Nuxalk/CP					1,350	22,950		24,300	1,350	22,950
Parks					2,000	18,500		20,500	2,000	18,500
TWS		10,000						10,000	0	10,000
Wet'suet'en						9,000		9,000	0	9,000
Wuikinuxv	140,000			100,000		21,600	10,800	272,400	100,000	172,400
Wuikinuxv/CP					2,700	18,900	2,700	24,300	2,700	21,600
Total	140,000	877,000	155,400	100,000	253,230	842,075	144,170	2,511,875	353,230	2,158,645

Table 4. Number of escapement indicator streams and annual costs by survey method for each salmon species.

	Number of indicator streams									
Species	DIDSON/ARIS	Fence	MR Annual	New (Fence)	New (VS)	VS Annual	Annual (A)	Total	Historical	Net Change
Sockeye Salmon	1	6	1		16	64	6	94	7	-6
Pink Salmon (odd years)		1		1	29	108	9	148	17	12
Pink Salmon (even years)		1		1	21	135	8	166	40	-19
Chum Salmon		1		1	40	173	12	227	44	-4
Coho Salmon		10		1	21	69	9	110	51	-30
Chinook Salmon	1	4	2	1	15	16	6	45	8	7
Total (odd years)	2	22	3	4	121	430	42	624	127	-21
Total (even years)	2	22	3	4	113	457	41	642	150	-52

	Preliminary estimate of the survey costs									
Species	DIDSON/ARIS	Fence	MR Annual	New (Fence)	New (VS)	VS Annual	Annual (A)	Total	New	Other
Sockeye Salmon	70,000	279,000	5,400		36,960	195,890	35,200	622,450	36,960	585,490
Pink Salmon (odd years)		25,000	0	25,000	31,830	147,985	17,740	247,555	56,830	190,725
Pink Salmon (even years)		25,000	0	25,000	17,765	171,645	19,140	258,550	42,765	215,785
Chum Salmon		25,000	0	25,000	56,445	241,410	31,350	379,205	81,445	297,760
Coho Salmon		394,000	0	25,000	95,500	184,810	42,280	741,590	120,500	621,090
Chinook Salmon	70,000	154,000	150,000	25,000	46,560	62,240	16,200	524,000	71,560	452,440
Total (odd years)	140,000	877,000	155,400	100,000	267,295	832,335	142,770	2,514,800	367,295	2,147,505
Total (even years)	140,000	877,000	155,400	100,000	253,230	855,995	144,170	2,525,795	353,230	2,172,565

APPENDICES

Appendix A

Summary of Indicator Streams and Survey Costs for each Salmon Species by Statistical Area

Appendix Table A1. Indicator streams and survey costs by Statistical Area for Sockeye salmon.

	Number of indicator streams								
Stat. Area	DIDSON/ARIS	Fence	MR Annual	New (VS)	VS Annual	VS Annual (A)	Total	Historical	Net Change
1					3		3		0
2E					1		1	1	-1
2W							0	1	-1
3B		2			3		5		0
4A					3		3	1	-1
4B				1	8		9		0
4C		1		2	1	4	8		0
4D		2	1		12	1	16	1	0
5					7		7	1	-1
6				11	7		18	2	-2
7				1	7		8		0
8				1	4		5		0
9	1				8		9		0
10		1			1		2		0
Total	1	6	1	16	65	5	94	7	-6

	Preliminary estimate of the survey costs								
Stat Area	DIDSON/ARIS	Fence	MR Annual	New (VS)	VS Annual	VS Annual (A)	Total	New	Other
1					9,000		9,000	0	9,000
2E					15,000		15,000	0	15,000
2W								0	0
3B		79,000			37,500		116,500	0	116,500
4A					7,380		7,380	0	7,380
4B				3,600	25,200		28,800	3,600	25,200
4C		25,000		12,000	1,980	15,500	54,480	12,000	42,480
4D		150,000	5,400		18,090	17,000	190,490	0	190,490
5					18,960		18,960	0	18,960
6				17,310	11,340		28,650	17,310	11,340
7				1,350	18,900		20,250	1,350	18,900
8				2,700	8,640		11,340	2,700	8,640
9	70,000				21,600		91,600	0	91,600
10		25,000			5,000		30,000	0	30,000
Total	70,000	279,000	5,400	36,960	198,590	32,500	622,450	36,960	585,490

Appendix Table A2. Indicator streams and survey costs by Statistical Area for even-year Pink salmon.

	Number of indicator streams							
Stat. Area	Fence	New (Fence)	New (VS)	VS Annual	VS Annual (A)	Total	Historical	Net Change
1				4		4	3	-3
2E			1	12		13	11	-10
2W				6		6	6	-6
3A				17	2	19	3	-3
4A				5		5	2	-2
4B			1	2	1	4	1	0
4C	1					1		0
4D				1		1	1	-1
5				13		13	2	-2
6			14	44		58	1	13
7				21		21		0
8			5	5	4	14	5	0
9		1		4	1	6	6	-6
10						0	1	-1
Total	1	1	21	134	8	165	42	-21

	Preliminary estimate of the survey costs							
Stat Area	Fence	New (Fence)	New (VS)	VS Annual	VS Annual (A)	Total	New	Other
1				5,500		5,500	0	5,500
2E			800	12,700		13,500	800	12,700
2W				7,900		7,900	0	7,900
3A				32,790	2,970	35,760	0	35,760
4A				12,150		12,150	0	12,150
4B			1,800	4,200	3,000	9,000	1,800	7,200
4C	25,000					25,000	0	25,000
4D				3,000		3,000	0	3,000
5				23,400		23,400	0	23,400
6			9,990	30,870		40,860	9,990	30,870
7				21,375		21,375	0	21,375
8			5,175	7,020	5,940	18,135	5,175	12,960
9		25,000		6,750	2,700	34,450	25,000	9,450
10						0	0	0
Total	25,000	25,000	17,765	167,655	14,610	250,030	42,765	207,265

Appendix Table A3. Indicator streams and survey costs by Statistical Area for odd-year Pink salmon.

	Number of indicator streams							
Stat. Area	Fence	New (Fence)	New (VS)	VS Annual	VS Annual (A)	Total	Historical	Net Change
2E				2		2	4	-4
3A			1	15	1	17	4	-3
3B			1			1		1
4A				5		5	1	-1
4B			3	2	2	7		3
4C	1					1		0
4D				2		2		0
5			1	11		12	1	0
6			18	43		61	2	16
7				21		21		0
8			5	4	4	13	5	0
9		1		2		3	3	-3
10					1	1		0
Total	1	1	29	107	8	146	20	9

	Preliminary estimate of the survey costs							
Stat Area	Fence	New (Fence)	New (VS)	VS Annual	VS Annual (A)	Total	New	Other
2E				5,800		5,800	0	5,800
3A			3,000	26,820	1,980	31,800	3,000	28,800
3B			1,500			1,500	1,500	0
4A				12,150		12,150	0	12,150
4B			5,100	5,100	4,800	15,000	5,100	9,900
4C	25,000					25,000	0	25,000
4D				4,350		4,350	0	4,350
5			3,000	20,910		23,910	3,000	20,910
6			14,055	30,990		45,045	14,055	30,990
7				22,275		22,275	0	22,275
8			5,175	5,670	4,950	15,795	5,175	10,620
9		25,000		5,400		30,400	25,000	5,400
10					990	990	0	990
Total	25,000	25,000	31,830	139,465	12,720	234,015	56,830	177,185

Appendix Table A4. Indicator streams and survey costs by Statistical Area for Chum salmon.

	Number of indicator streams							
Stat. Area	Fence	New (Fence)	New (VS)	VS Annual	VS Annual (A)	Total	Historical	Net Change
1				4		4		0
2E			4	24		28	16	-12
2W				20		20	16	-16
3A			2	8		10	4	-2
3B			1	1		2		1
4A				1	1	2	1	-1
4B			3	5		8		3
4C	1		2	1		4		2
5			3	8		11	3	0
6			19	44		63	2	17
7			2	37		39		2
8			4	18	5	27	1	3
9		1		5		6	1	-1
10				1	2	3		0
Total	1	1	40	177	8	227	44	-4

	Preliminary estimate of the survey costs							
Stat Area	Fence	New (Fence)	New (VS)	VS Annual	VS Annual (A)	Total	New	Other
1				7,500		7,500	0	7,500
2E			5,100	31,900		37,000	5,100	31,900
2W				31,800		31,800	0	31,800
3A			6,000	21,960		27,960	6,000	21,960
3B			1,500	1,500		3,000	1,500	1,500
4A				1,350	12,000	13,350	0	13,350
4B			7,800	11,400		19,200	7,800	11,400
4C	25,000		6,000	2,000		33,000	6,000	27,000
5			6,000	12,450		18,450	6,000	12,450
6			15,495	36,240		51,735	15,495	36,240
7			4,050	49,545		53,595	4,050	49,545
8			4,500	25,065	10,620	40,185	4,500	35,685
9		25,000		9,450		34,450	25,000	9,450
10				1,980	1,980	3,960	0	3,960
Total	25,000	25,000	56,445	244,140	24,600	375,185	81,445	293,740

Appendix Table A5. Indicator streams and survey costs by Statistical Area for Coho salmon.

	Number of indicator streams							
Stat. Area	Fence	New (Fence)	New (VS)	VS Annual	VS Annual (A)	Total	Historical	Net Change
1			1			1		1
2E	1			2		3	3	-3
2W			2			2	3	-1
3A			3		2	5		3
3B	3			4		7		0
4A			1	1	1	3	2	-1
4B			1	14		15	5	-4
4C	1			9		10	3	-3
4D	3		1	3	1	8	6	-5
5				5		5	24	-24
6			4	13	5	22	3	1
7	1		4	4		9		4
8			3	13		16	1	2
9		1	1	1		3		1
10	1					1	1	-1
Total	10	1	21	69	9	110	51	-30

	Preliminary estimate of the survey costs							
Stat Area	Fence	New (Fence)	New (VS)	VS Annual	VS Annual (A)	Total	New	Other
1			15,000			15,000	15,000	0
2E	10,000			16,500		26,500	0	26,500
2W			16,000			16,000	16,000	0
3A			21,000		6,000	27,000	21,000	6,000
3B	137,000			29,000		166,000	0	166,000
4A			2,700	2,700	12,000	17,400	2,700	14,700
4B			3,000	46,800		49,800	3,000	46,800
4C	25,000			19,400		44,400	0	44,400
4D	172,000		15,000	5,940	11,500	204,440	15,000	189,440
5				11,940		11,940	0	11,940
6			6,330	21,870	12,780	40,980	6,330	34,650
7	25,000		9,450	9,450		43,900	9,450	34,450
8			4,320	18,510		22,830	4,320	18,510
9		25,000	2,700	2,700		30,400	27,700	2,700
10	25,000					25,000	0	25,000
Total	394,000	25,000	95,500	184,810	42,280	741,590	120,500	621,090

Appendix Table A6. Indicator streams and survey costs by Statistical Area for Chinook salmon.

	Number of indicator streams									
Stat. Area	DIDSON/ARIS	Fence	MR Annual	New (Fence)	New (VS)	VS Annual	VS Annual (A)	Total	Historical	Net Change
1								0	1	-1
3A						2		2	1	-1
3B		2				1		3		0
4A					1			1	1	0
4B			1		4	6		11		4
4C		1			3	1		5	1	2
4D		1			1	4		6	1	0
5						1		1		0
6					6		2	8	1	5
8			1			1		2		0
9	1			1			4	6	1	-1
10								0	1	-1
Total	1	4	2	1	15	16	6	45	8	7

	Preliminary estimate of the survey costs									
Stat Area	DIDSON/ARIS	Fence	MR Annual	New (Fence)	New (VS)	VS Annual	VS Annual (A)	Total	New	Other
1								0	0	0
3A						3,960		3,960	0	3,960
3B		79,000				12,500		91,500	0	91,500
4A					1,980			1,980	1,980	0
4B			75,000		13,800	20,400		109,200	13,800	95,400
4C		25,000			8,000	4,000		37,000	8,000	29,000
4D		50,000			10,000	13,850		73,850	10,000	63,850
5						3,000		3,000	0	3,000
6					12,780		5,400	18,180	12,780	5,400
8			75,000			990		75,990	0	75,990
9	70,000			25,000			10,800	105,800	25,000	80,800
10								0	0	0
Total	70,000	154,000	150,000	25,000	46,560	58,700	16,200	520,460	71,560	448,900

Appendix B

Summary of Indicator Streams and Survey Costs for each Salmon Species by Conservation Unit

Appendix Table B1. Indicator streams and survey costs by Conservation Unit for Sockeye salmon.

	Number of indicator streams								
Conservation Unit	DIDSON/ARIS	Fence	MR Annual	New (VS)	VS Annual	VS Annual (A)	Total	Historical	Net Change
Alastair					2		2		0
Asitika					1		1		0
Awun					1		1		0
Azuklotz					1		1		0
Babine		1			8		9		0
Backland					1		1		0
Bear						1	1	1	-1
Bloomfield					1		1		0
Canoona					1		1		0
Curtis Inlet					1		1		0
Damdochax/Wiminasik					1		1		0
Damshilgwit		1					1		0
Devon					1		1		0
Evelyn					1		1		0
Fred Wright		1					1		0
Freeda/Brodie							0	1	-1
Hartley Bay					1		1		0
Johnston							0	1	-1
Kadjusdis River					1		1		0
Kainet Creek					1		1		0
Keecha					1		1		0
Kent Inlet Lagoon Creek				1			1		0
Kisameet				1			1		0
Kitlope					1		1		0
Kitsumkalum				1	2		3		0
Kitwancool		1					1		0
Koeye					1		1		0
Kooryet					1		1		0
Kwakwa Creek					1		1		0
Lakelse					3		3		0
Long		1			1		2		0
Lowe/Simpson/Weare					1		1		0
Lower Nass-Portland					1		1		0
Marian/Eden					1		1		0
Mary Cove Creek					1		1		0
Mathers							0	1	-1
Mcdonell					1		1		0
Mercer							0	1	-1
Meziadin		1					1		0
Mikado					1		1		0
Morice			1				1		1
Motase					1		1		0
Namu					1		1		0
Northern Coastal Fjords				9	2		11	2	-2
Owikeno					8		8		0
Port John					1		1		0
Price Creek				1			1		0
Prudhomme					2		2		0
Roderick					1		1		0
Shawatlan					1		1		0
Skeena River				2			2		0
Skeena River-high interio					1		1		0
Skidegate					1		1		0
Sockeye Creek				1			1		0
Stephens						1	1		0
Swan						3	3		0
Tahlo/Morrison					1		1		0
Tankeeah River					1		1		0
Tsimtack Lakes					1		1		0
Upper Nass River					1		1		0
Wannock[Owikeno]	1						1		0
Yakoun					1		1		0
Yeo					1		1		0
Total	1	6	1	16	65	5	94	7	-6

Appendix Table B1. Continued.

	Preliminary estimate of the survey costs								
Conservation Unit	DIDSON/ARIS	Fence	MR Annual	New (VS)	VS Annual	VS Annual (A)	Total	New	Other
Alastair					6,000		6,000	0	6,000
Asitika					1,980		1,980	0	1,980
Awun					2,000		2,000	0	2,000
Azuklotz					1,980		1,980	0	1,980
Babine		50,000			10,800		60,800	0	60,800
Backland					1,980		1,980	0	1,980
Bear						17,000	17,000	0	17,000
Bloomfield					990		990	0	990
Canoona					990		990	0	990
Curtis Inlet					3,000		3,000	0	3,000
Damdochax/Wiminasik					12,500		12,500	0	12,500
Damshilgwit		100,000					100,000	0	100,000
Devon					3,000		3,000	0	3,000
Evelyn					2,700		2,700	0	2,700
Fred Wright		39,000					39,000	0	39,000
Freeda/Brodie								0	0
Hartley Bay					990		990	0	990
Johnston								0	0
Kadjusdis River					2,700		2,700	0	2,700
Kainet Creek					2,700		2,700	0	2,700
Keecha					3,000		3,000	0	3,000
Kent Inlet Lagoon Creek				990			990	990	0
Kisameet				2,700			2,700	2,700	0
Kitlope					2,700		2,700	0	2,700
Kitsumkalum				3,600	7,200		10,800	3,600	7,200
Kitwancool		25,000					25,000	0	25,000
Koeye					1,980		1,980	0	1,980
Kooryet					3,000		3,000	0	3,000
Kwakwa Creek					990		990	0	990
Lakelse					9,000		9,000	0	9,000
Long		25,000			5,000		30,000	0	30,000
Lowe/Simpson/Weare					1,980		1,980	0	1,980
Lower Nass-Portland					20,000		20,000	0	20,000
Marian/Eden					5,000		5,000	0	5,000
Mary Cove Creek					2,700		2,700	0	2,700
Mathers								0	0
Mcdonell					3,000		3,000	0	3,000
Mercer								0	0
Meziadin		40,000					40,000	0	40,000
Mikado					3,000		3,000	0	3,000
Morice			5,400				5,400	0	5,400
Motase					1,980		1,980	0	1,980
Namu					1,980		1,980	0	1,980
Northern Coastal Fjords				13,620	5,400		19,020	13,620	5,400
Owikeno					21,600		21,600	0	21,600
Port John					1,980		1,980	0	1,980
Price Creek				2,700			2,700	2,700	0
Prudhomme					5,400		5,400	0	5,400
Roderick					2,700		2,700	0	2,700
Shawatlan					1,980		1,980	0	1,980
Skeena River				12,000			12,000	12,000	0
Skeena River-high interic					1,980		1,980	0	1,980
Skidegate					15,000		15,000	0	15,000
Sockeye Creek				1,350			1,350	1,350	0
Stephens						3,875	3,875	0	3,875
Swan						11,625	11,625	0	11,625
Tahlo/Morrison					1,350		1,350	0	1,350
Tankeeah River					2,700		2,700	0	2,700
Tsimtack Lakes					1,980		1,980	0	1,980
Upper Nass River					5,000		5,000	0	5,000
Wannock[Owikeno]	70,000						70,000	0	70,000
Yakoun					2,000		2,000	0	2,000
Yeo					2,700		2,700	0	2,700
Total	70,000	279,000	5,400	36,960	198,590	32,500	622,450	36,960	585,490

Appendix Table B2. Indicator streams and survey costs by Conservation Unit for even-year Pink salmon.

	Number of indicator streams							
Conservation Unit	Fence	New (Fence)	New (VS)	VS Annual	VS Annual (A)	Total	Historical	Net Change
East Haida Gwaii			1	12		13	11	-10
Hecate Lowlands			4	34	1	39	2	2
Hecate Strait-Fjords		1	15	49	4	69	13	2
Middle-Upper Skeena	1			1		2	1	-1
Nass-Skeena Estuary			1	28	3	32	6	-5
North Haida Gwaii				4		4	3	-3
West Haida Gwaii				6		6	6	-6
Total	1	1	21	134	8	165	42	-21

	Preliminary estimate of the survey costs							
Conservation Unit	Fence	New (Fence)	New (VS)	VS Annual	VS Annual (A)	Total	New	Other
East Haida Gwaii			800	12,700		13,500	800	12,700
Hecate Lowlands			3,345	38,775	1,980	44,100	3,345	40,755
Hecate Strait-Fjords		25,000	11,820	42,660	6,660	86,140	36,820	49,320
Middle-Upper Skeena	25,000			3,000		28,000	0	28,000
Nass-Skeena Estuary			1,800	57,120	5,970	64,890	1,800	63,090
North Haida Gwaii				5,500		5,500	0	5,500
West Haida Gwaii				7,900		7,900	0	7,900
Total	25,000	25,000	17,765	167,655	14,610	250,030	42,765	207,265

Appendix Table B3. Indicator streams and survey costs by Conservation Unit for odd-year Pink salmon.

	Number of indicator streams							
Conservation Unit	Fence	New (Fence)	New (VS)	VS Annual	VS Annual (A)	Total	Historical	Net Change
East Haida Gwaii				2		2	4	-4
Hecate Strait-Fjords			20	44	2	66	4	16
Hecate Strait-Lowlands			4	31	1	36	2	2
Lower Skeena			3	2	2	7	1	2
Middle & Upper Skeena		1		2		3		0
Nass-Portland-Observatory			2	13	1	16	2	0
Nass-Skeena Estuary				11		11	2	-2
Smith-Rivers-Bella Coola-Dean			1	2	2	5	5	-5
Total		1	30	136	115	154	166	29	9

	Preliminary estimate of the survey costs							
Conservation Unit	Fence	New (Fence)	New (VS)	VS Annual	VS Annual (A)	Total	New	Other
East Haida Gwaii				5,800		5,800	0	5,800
Hecate Strait-Fjords			16,875	37,740	1,980	56,595	16,875	39,720
Hecate Strait-Lowlands			5,355	34,335	1,980	41,670	5,355	36,315
Lower Skeena			5,100	5,100	4,800	15,000	5,100	9,900
Middle & Upper Skeena		25,000		4,350		29,350	0	29,350
Nass-Portland-Observatory			4,500	22,860	1,980	29,340	4,500	24,840
Nass-Skeena Estuary				25,590		25,590	0	25,590
Smith-Rivers-Bella Coola-Dean			25,000	3,690	1,980	30,670	25,000	5,670
Total		25,000	25,000	31,830	139,465	12,720	234,015	56,830	177,185

Appendix Table B4. Indicator streams and survey costs by Conservation Unit for Chum salmon.

	Number of indicator streams							
Conservation Unit	Fence	New (Fence)	New (VS)	VS Annual	VS Annual (A)	Total	Historical	Net Change
Bella Coola River-Late				7		7		0
Bella Coola-Dean Rivers				4	3	7		0
Douglas-Gardner			17	23		40		17
East HG			2	20		22	12	-10
Hecate Lowlands			2	35		37	4	-2
Lower Nass			1	1		2		1
Lower Skeena			3	5	1	9		3
Middle Skeena	1		2	1		4		2
Mussel-Kynoch				12		12		0
North Haida Gwaii				3		3		0
North Haida Gwaii-Stanley Creek				1		1		0
Portland Canal-Observatory				4		4	2	-2
Portland Inlet			2	4		6	1	1
Rivers Inlet		1		3		4	1	-1
Skeena Estuary			3	2		5	3	0
Skidegate			2	7		9	6	-4
Smith Inlet				3	2	5		0
Spiller-Fitz Hugh-Burke			6	25	2	33	1	5
West Haida Gwaii				17		17	14	-14
Total	1	1	40	177	8	227	44	-4

	Preliminary estimate of the survey costs							
Conservation Unit	Fence	New (Fence)	New (VS)	VS Annual	VS Annual (A)	Total	New	Other
Bella Coola River-Late				8,640		8,640	0	8,640
Bella Coola-Dean Rivers				6,750	7,650	14,400	0	14,400
Douglas-Gardner			14,175	20,670		34,845	14,175	20,670
East HG			3,500	27,600		31,100	3,500	27,600
Hecate Lowlands			1,320	32,400		33,720	1,320	32,400
Lower Nass			1,500	1,500		3,000	1,500	1,500
Lower Skeena			7,800	11,400	12,000	31,200	7,800	23,400
Middle Skeena	25,000		6,000	2,000		33,000	6,000	27,000
Mussel-Kynoch				12,240		12,240	0	12,240
North Haida Gwaii				5,500		5,500	0	5,500
North Haida Gwaii-Stanley Creek				2,000		2,000	0	2,000
Portland Canal-Observatory				18,000		18,000	0	18,000
Portland Inlet			6,000	3,960		9,960	6,000	3,960
Rivers Inlet		25,000		5,400		30,400	25,000	5,400
Skeena Estuary			6,000	4,350		10,350	6,000	4,350
Skidegate			1,600	7,800		9,400	1,600	7,800
Smith Inlet				6,030	1,980	8,010	0	8,010
Spiller-Fitz Hugh-Burke			8,550	39,600	2,970	51,120	8,550	42,570
West Haida Gwaii				28,300		28,300	0	28,300
Total	25,000	25,000	56,445	244,140	24,600	375,185	81,445	293,740

Appendix Table B5. Indicator streams and survey costs by Conservation Unit for Coho salmon.

	Number of indicator streams							
Conservation Unit	Fence	New (Fence)	New (VS)	VS Annual	VS Annual (A)	Total	Historical	Net Change
Bella Coola-Dean Rivers			3	10		13	1	2
Brim-Wahoo					2	2		0
Douglas Channel-Kitimat Arm			3	2		5		3
Haida Gwaii-East				2		2	3	-3
Haida Gwaii-Graham Island Lowlands	1		1			2		1
Haida Gwaii-West			2			2	3	-1
Hecate Strait Mainland	1		3	9	1	14	26	-23
Lower Nass	1			3		4		0
Lower Skeena			1	14	1	16	5	-4
Middle Skeena	3			10		13	9	-9
Mussel-Kynoch			1	2		3		1
Northern Coastal Streams			1	12	2	15	1	0
Portland Sound-Observatory Inlet-Portland Canal			3		2	5		3
Rivers Inlet		1	1	1		3		1
Skeena Estuary			1	1		2	2	-1
Smith Inlet	1					1	1	-1
Upper Nass	2			1		3		0
Upper Skeena	1		1	2	1	5		1
Total	10	1	21	69	9	110	51	-30

	Preliminary estimate of the survey costs							
Conservation Unit	Fence	New (Fence)	New (VS)	VS Annual	VS Annual (A)	Total	New	Other
Bella Coola-Dean Rivers			4,320	11,850		16,170	4,320	11,850
Brim-Wahoo					5,400	5,400	0	5,400
Douglas Channel-Kitimat Arm			5,670	3,330		9,000	5,670	3,330
Haida Gwaii-East				16,500		16,500	0	16,500
Haida Gwaii-Graham Island Lowlands	10,000		15,000			25,000	15,000	10,000
Haida Gwaii-West			16,000			16,000	16,000	0
Hecate Strait Mainland	25,000		6,750	18,240	1,980	51,970	6,750	45,220
Lower Nass	58,000			24,000		82,000	0	82,000
Lower Skeena			3,000	46,800	12,000	61,800	3,000	58,800
Middle Skeena	97,000			21,380		118,380	0	118,380
Mussel-Kynoch			2,700	3,690		6,390	2,700	3,690
Northern Coastal Streams			660	24,660	5,400	30,720	660	30,060
Portland Sound-Observatory Inlet-Portland Canal			21,000		6,000	27,000	21,000	6,000
Rivers Inlet		25,000	2,700	2,700		30,400	27,700	2,700
Skeena Estuary			2,700	2,700		5,400	2,700	2,700
Smith Inlet	25,000					25,000	0	25,000
Upper Nass	79,000			5,000		84,000	0	84,000
Upper Skeena	100,000		15,000	3,960	11,500	130,460	15,000	115,460
Total	394,000	25,000	95,500	184,810	42,280	741,590	120,500	621,090

Appendix Table B6. Indicator streams and survey costs by Conservation Unit for Chinook salmon.

	Number of indicator streams									
Conservation Unit	DIDSON/ARIS	Fence	MR Annual	New (Fence)	New (VS)	VS Annual	VS Annual (A)	Total	Historical	Net Change
Bella Coola-Bentinck			1					1		0
Dean River						1		1		0
Docee								0	1	-1
Ecstall								0	1	-1
Haida Gwaii-North								0	1	-1
Kalum-early timing					1	1		2		1
Kalum-late timing			1					1		0
Lakelse					1			1		1
Lower Skeena						4		4		0
Middle Skeena-large lakes		1				4		5		0
Middle Skeena-mainstem tributaries		1			3	1		5	1	2
North & Central Coast-early timing					6		2	8	1	5
North & Central Coast-late timing						1		1		0
Portland Sound-Observatory Inlet-Lower Nass						2		2	1	-1
Rivers Inlet				1			4	5	1	-1
Skeena Estuary					1			1		1
Upper Bulkley River								0	1	-1
Upper Nass		2				1		3		0
Upper Skeena					1			1		1
Wannock	1							1		0
Zymoetz					2	1		3		2
Total	1	4	2	1	15	16	6	45	8	7

	Preliminary estimate of the survey costs									
Conservation Unit	DIDSON/ARIS	Fence	MR Annual	New (Fence)	New (VS)	VS Annual	VS Annual (A)	Total	New	Other
Bella Coola-Bentinck			75,000					75,000	0	75,000
Dean River						990		990	0	990
Docee								0	0	0
Ecstall								0	0	0
Haida Gwaii-North								0	0	0
Kalum-early timing					3,600	3,600		7,200	3,600	3,600
Kalum-late timing			75,000					75,000	0	75,000
Lakelse					3,000			3,000	3,000	0
Lower Skeena						13,800		13,800	0	13,800
Middle Skeena-large lakes		50,000				13,850		63,850	0	63,850
Middle Skeena-mainstem tributaries		25,000			8,000	4,000		37,000	8,000	29,000
North & Central Coast-early timing					12,780		5,400	18,180	12,780	5,400
North & Central Coast-late timing						3,000		3,000	0	3,000
Portland Sound-Observatory Inlet-Lower Nass						3,960		3,960	0	3,960
Rivers Inlet				25,000			10,800	35,800	25,000	10,800
Skeena Estuary					1,980			1,980	1,980	0
Upper Bulkley River								0	0	0
Upper Nass		79,000				12,500		91,500	0	91,500
Upper Skeena					10,000			10,000	10,000	0
Wannock	70,000							70,000	0	70,000
Zymoetz					7,200	3,000		10,200	7,200	3,000
Total	70,000	154,000	150,000	25,000	46,560	58,700	16,200	520,460	71,560	448,900

Appendix C

Area 6 North Charter Patrol Program slides, 2016

Appendix C1. Area 6 North Charter Patrol slides, 2016.

Area 6 North Charter Patrol – Stan Hutchings

Chinook DNA baseline sampling

Many miles of river to run, sport checks and spawning salmon to count

Now here's a fish barrier removal project

Charter Patrol Program Priorities

Under the direction of Fisheries Management in Prince Rupert our duties include:

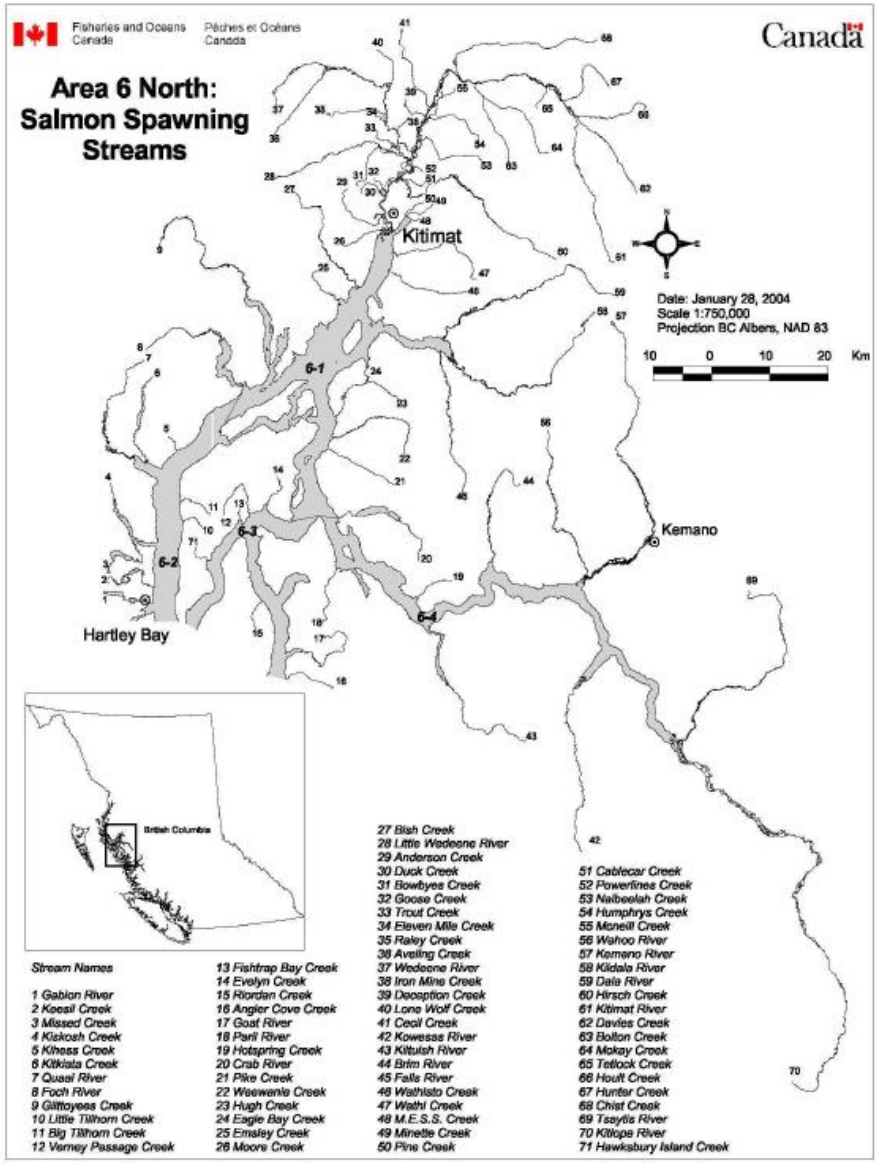
- **Salmon stock assessment (counting spawning salmon)**
- **Commercial, Sport and Food, Social & Ceremonial fishery monitoring**
- **Closed area patrols**
- **Collection of biological data (DNA samples, juvenile salmon samples, diseased fish, algae, invasive species, etc.)**
- **Habitat monitoring (landslides, violations or other issues)**
- **Enforcement monitoring (Observe, Record & Report)**
- **Maintenance of boundary signs, trails and in-stream habitat (I.e. beaver dams)**
- **Connect with fishermen, coastal residents, logging companies, fishing camps and other government agencies. Pass on concerns, comments and observations to Fisheries Management.**

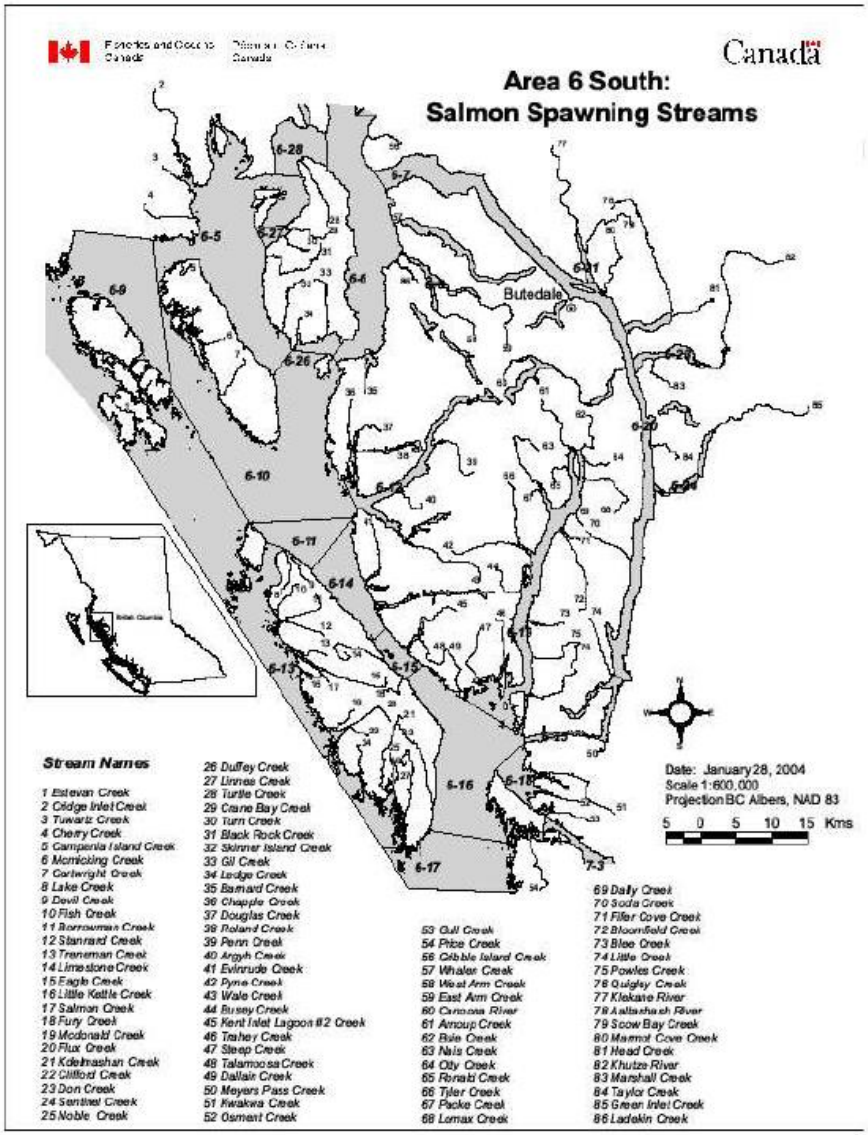
The Miles & Miles of Remote Coastline Patrolled

Area 6 contains over 575 nautical miles of channels, inlet and sounds. Overall area is over 10,000 square miles. My area of operation is the Kitimat Valley, Douglas Channel, Devastation Channel, Gardner Canal, lower Grenville Channel, around Gil Island with over 50 streams inspected annually.

2015 Area 6 North Program:

- 1,718 nautical miles by main vessel – Hawk Bay
- 2,726 nautical miles by auxiliary vessel – jetboat or inflatable
- 650 kilometers by foot and canoe


Fisheries and Oceans Canada
Pêches et Océans Canada
Canada
Area 6 North:
Salmon Spawning
Streams
Kitimat
Kemano
Hartley Bay
6-1
6-2
6-3
6-4
Date: January 28, 2004
Scale 1:750,000
Projection BC Albers, NAD 83
10 0 10 20 Km
British Columbia
Stream Names
1 Gabion River
2 Keesil Creek
3 Missed Creek
4 Kiskosh Creek
5 Kitness Creek
6 Kitkista Creek
7 Quasi River
8 Foch River
9 Gitttayees Creek
10 Little Tillhorn Creek
11 Big Tillhorn Creek
12 Verney Passage Creek
13 Fishtrap Bay Creek
14 Evelyn Creek
15 Riordan Creek
16 Angler Cove Creek
17 Goat River
18 Paril River
19 Hotspring Creek
20 Crab River
21 Pike Creek
22 Weewanie Creek
23 Hugh Creek
24 Eagle Bay Creek
25 Emsley Creek
26 Moore Creek
27 Bish Creek
28 Little Wedeene River
29 Anderson Creek
30 Duck Creek
31 Bowbyes Creek
32 Goose Creek
33 Trout Creek
34 Eleven Mile Creek
35 Raley Creek
36 Aveling Creek
37 Wedeene River
38 Iron Mine Creek
39 Deception Creek
40 Lone Wolf Creek
41 Cecil Creek
42 Kowesss River
43 Kitlutish River
44 Brim River
45 Falls River
46 Wathlsto Creek
47 Wathl Creek
48 M.E.S.S. Creek
49 Minette Creek
50 Pine Creek
51 Cablecar Creek
52 Powerlines Creek
53 Naibeelah Creek
54 Humphrys Creek
55 Mcneill Creek
56 Wahoo River
57 Kemano River
58 Kildala River
59 Dala River
60 Hirsch Creek
61 Kitimat River
62 Davies Creek
63 Bolton Creek
64 Mckay Creek
65 Tetlock Creek
66 Hoult Creek
67 Hunter Creek
68 Chist Creek
69 Tsaytis River
70 Kitlope River
71 Hawksbury Island Creek


Canada
Area 6 South:
Salmon Spawning Streams
Butedale
6-28
6-27
6-26
6-5
6-6
6-7
6-9
6-10
6-11
6-12
6-13
6-14
6-15
6-16
6-17
6-18
6-19
6-20
6-21
7-3
Stream Names
1 Estevan Creek
2 Cridge Inlet Creek
3 Tuwartz Creek
4 Cherry Creek
5 Campania Island Creek
6 Mcmicking Creek
7 Cartwright Creek
8 Lake Creek
9 Devil Creek
10 Fish Creek
11 Borrowman Creek
12 Stannard Creek
13 Treneman Creek
14 Limestone Creek
15 Eagle Creek
16 Little Kettle Creek
17 Salmon Creek
18 Fury Creek
19 Mcdonald Creek
20 Flux Creek
21 Kdelthashan Creek
22 Clifford Creek
23 Don Creek
24 Sentinel Creek
25 Noble Creek
26 Duffey Creek
27 Linnes Creek
28 Turtle Creek
29 Crane Bay Creek
30 Turn Creek
31 Black Rock Creek
32 Skinner Island Creek
33 Gil Creek
34 Ledge Creek
35 Barnard Creek
36 Chapple Creek
37 Douglas Creek
38 Roland Creek
39 Penn Creek
40 Argyle Creek
41 Evinrude Creek
42 Pyne Creek
43 Wale Creek
44 Bussey Creek
45 Kent Inlet Lagoon #2 Creek
46 Tasher Creek
47 Steep Creek
48 Talamoosa Creek
49 Dallair Creek
50 Meyers Pass Creek
51 Kwakwa Creek
52 Osment Creek
53 Gull Creek
54 Price Creek
56 Gibble Island Creek
57 Whaler Creek
58 West Arm Creek
59 East Arm Creek
60 Canoona River
61 Aroup Creek
62 Bole Creek
63 Nals Creek
64 Oby Creek
65 Rinatti Creek
66 Tyler Creek
67 Packe Creek
68 Lomax Creek
69 Daily Creek
70 Soda Creek
71 Filer Cove Creek
72 Bloomfield Creek
73 Blee Creek
74 Little Creek
75 Powles Creek
76 Quigley Creek
77 Klekane River
78 Kalteshesh River
79 Snow Bay Creek
80 Marmot Cove Creek
81 Head Creek
82 Khutze River
83 Marshall Creek
84 Taylor Creek
85 Green Inlet Creek
86 Ladekin Creek
Date: January 28, 2004
Scale 1:600,000
Projection BC Albers, NAD 83
5 0 5 10 15 Kms

2015 Accomplishments

- 256 salmon spawning inspections completed in Areas 3, 4 (Lakelse), 5 & 6 in 110 days
- 150 salmon escapement estimates made for individual stocks
- 810 DNA samples taken for both baseline and fishery composition
- 14 days net fishing – 308 hails/50 inquiries

2015 Co-Management - Gitga'at and Haisla

- I have worked closely with the Gitga'at and Haisla Guardians for a number of years, endeavoring to pass on my local knowledge and counting techniques.
- The Haisla and I have effectively developed a system over the last 10 years to cover their traditional area - they work systems that are available to them from Kitamaat and ones with high traditional value (i.e. Evelyn, Kitlope) while I cover the more remote systems.
- We also work together on a number of systems including the major rivers covered by the helicopter flights.

Area 5 & 6 Coho Program

- Comprehensive data and reports by reach and system compiled from 1999 to 2015 – reports prepared on my own time
- 22 dedicated systems monitored
- $10K canoes stashed in area for access to upper rivers
- Only long term coho assessment project on north coast outer systems

Who are Charter Patrolmen?

Who are we?

Charter Patrolmen are not DFO employees. We are dedicated, experienced individuals contracted by DFO. We are required to provide a fully equipped vessel, equipment and crew to complete the contract requirements.

Why do we do it?

We enjoy the lifestyle, the people we work with and the opportunity to work in the marine environment and do something worthwhile for the Pacific salmon resource. Between the 4 North Coast Charter Patrolmen, we have over 100 years of experience on the job (yes-that does mean we are getting old!). Our backgrounds are diverse - shipwright, aircraft mechanic, fishery officer, fisherman, commercial diver…). We all hold down other work through the "non-salmon" season to pay the bills but keep coming back because we believe what we do is important and we truly love our jobs.

How do we get the job?

- **Every 3 years, DFO puts out a "Request for Bids for Contract Patrol Services". We fill out a zillion page application, attach all required documentation (FAC, Swift Water Training, Wilderness First Aid, WCB coverage, Insurance Coverage, Marine tickets, etc.) and calculate a daily rate for the next three years. A DFO committee reviews our sealed bids and we are rated by cost, experience and equipment. Depending on DFO budgets, contracts are awarded annually. There are no guarantees of work - we usually don't have a contract or know how many days that we may be working until June.**

- **We are required to provide all equipment, accommodation and provisions for our own crew and DFO personnel to remain in the field for extended periods. The Request for Bids details exact requirements - size of main vessel, skiff or jetboat, satellite phones, etc.. Our fuel costs are reimbursed by DFO, but we are required to cover all other expenses (insurance, WCB, medical, training, maintenance, phone bills, wages and supplies).**

Cost of Doing Business

- **The North Coast covers DFO Management Areas 3 through 6. Each charter patrolman is assigned a particular area to focus effort on, but can be mobilized throughout the North Coast as required.**
- **In 2016 my DFO contract is for Areas 3 & 6 for 110 days @$625/day, fuel extra. This provides a patrolman with over 30 years experience with DFO as Fishery Officer, Ships Officer and Patrolman, CSI certified platform vessel, 22' jetboat with inboard, 22' polaris inflatable, deckhand, insurance, truck, canoes, field equipment & all supplies. I also volunteer over a week annually to this program.**
- **As contractors there are no restrictions on our operating hours, with long days the norm (in 2015 worked 12.5 hours per day), no OT, no statutory holidays and no weekends.**
- **In the past 2 years 10 days extra have been funded by the Haisla and for 1 year by the Gitga'at. Helicopter costs have been covered in recent years by the Haisla, with a contribution from DFO. I have also collected donations from sport fishing lodges, commercial fisherman and paid out of pocket for the helicopter program.**

How do we count salmon?

- There is no magic to counting salmon in streams on the coast. It takes a few years of experience to develop the skills as well as a willingness to work in the wilderness, often in inclement weather. Most people, when counting large numbers of anything, tend to count low. For salmon, it is the consistency of the count that is important. Having the same person, counting the same stream, the same way, at the same times, year after year, estimating the number of spawners allows a trend to develop (high, low or the same).

- What comes with experience is the local knowledge – how to access the river, when to count (timing of the run), where to look (the location in the stream where the salmon spawn) and the what (there are five species of salmon and they all have to be counted separately).

Why do we need Charter Patrolmen?

- **North Coast Charter Patrolmen are currently the eyes and ears of DFO - we spend over 95% of our time in the field working with all user groups, augmenting DFO's management and enforcement presence on the grounds. We are often the only DFO presence on the grounds, and even with cutbacks, represent DFO's largest single presence on the water. We believe that we provide a cost-effective method to meet seasonal demands.**

- **Fishery Officers, dedicated to enforcement duties, no longer count spawning salmon. They are limited by funding in their opportunity to patrol coastal areas.**

- **First Nations Guardians work in their territories but are limited to day time patrols only and limited access to remote systems.**

State of Affairs

- North Coast Department of Fisheries Patrol Vessels:
  1994 – 6
  2004 – 1
  2015 – 1/3 (Captain Goddard)

- Only 4 North Coast Charter Patrolmen in 2016 covering areas 3 to 6

- This is the lowest presence DFO has had on the water during a salmon season

- Is this a program the Department can do without?

What can be done?

- **DFO's North Coast Fisheries Management recognizes and supports the value and service of the Charter Patrol Program. Other areas on the coast have been cut even more drastically. In some cases, First Nations and volunteer groups have filled the void. In other cases, salmon are just not being counted and remote areas not monitored.**

- **DFO and many other recent reports and inquiries continue to call for improved escapement data, increased enforcement and management while the Charter Patrol program continues to be cut.**

- **This program has proven itself and continues to be effective and cost efficient, while providing detailed, reliable and consistent information.**

- **Consider long term funding for this program, including the continuation of the Area 5 & 6 Coho project.**

The Future

- **Please consider long term funding for this program, including the continuation of the Area 5 & 6 Coho project.**
- **Ideal coverage would be 120 days plus 30 Days for the coho program.**