

# **Upper Fraser Fisheries Conservation Alliance**

## **Strategic Plan for a Watershed Based Approach to Facilitating First Nations' Co-Management of the Anadromous Resources of the Upper Fraser Watershed**

**February 2004**

**Prepared on behalf of the Parties of the  
Upper Fraser Fisheries Conservation Alliance**

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## **EXECUTIVE SUMMARY**

In 2001 the concept of a “fisheries interest group” comprising upper Fraser First Nations and Fisheries and Oceans Canada was conceived. The impetus for the formation of such a group was born out of the commonalities that upper Fraser First Nations share in relation to the aquatic resources of the area, including their desire to ensure these resources are managed in a sustainable manner, challenges each face in accessing these resources, and their unique cultural identity with these resources. Additionally, the groups also shared a common desire to implement specific technically-based capacity development and scientific initiatives, the achievement of which it was recognized could be more effectively and efficiently pursued working together, as opposed to working in isolation. Through ongoing meetings, the group has adopted the name of the Upper Fraser Fisheries Conservation Alliance (UFFCA) and presently acts as an “ad hoc” technical forum where technical and political personnel from upper Fraser First Nations attend nearly monthly meetings. The UFFCA has developed a vision statement, objectives, and has emphasized a watershed-based approach to its planning and activities, rather than an approach based on political boundaries, owing to the UFFCA’s technical focus. Meetings generally include discussions relating to technical issues involving upper Fraser fisheries resources and are open to all who wish to attend. DFO has had continual participation in the process of the group’s formation and has provided ongoing support for the UFFCA’s meeting forums.

The upper Fraser First Nations recognized their need to develop the required capacities to participate more effectively in all aspects of the existing realm of fisheries management activities taking place within the upper Fraser. Additionally, it was recognized by DFO and First Nations that there were considerable information gaps relating to the fisheries resources of the area that, if redressed, had the potential to contribute to more effective and sustainable management of these resources. The upper Fraser First Nations considered the pursuit of both of these objectives (i.e. increased participation in ongoing fisheries management activities, and pursuing the redress of scientific information gaps) as priorities to further their interests. In order to guide and facilitate the UFFCA’s objectives with respect to capacity development and their participation in and management of scientific initiatives, a need was identified to develop a strategic plan. Funds for this purpose were received from Fisheries and Oceans Canada, which were subsequently administered through the Carrier Sekani Tribal Council, who completed the development of this plan. In order to keep this planning task within a reasonable “scope” given limited available funds and time, only the anadromous resources of the upper Fraser watershed are

considered. However, it should be noted that the UFFCA is equally concerned with the sustainable management and conservation of all aquatic resources.

A draft outline of the proposed strategic plan was presented, discussed and altered at several UFFCA forums. The parties to the UFFCA determined that the geographical area considered within this plan would include the Fraser River and all tributaries from the Fraser's headwaters downstream to the confluence of Deadman Creek. Information required for the development of this document originated from questionnaires that were sent to all First Nations in the upper Fraser, numerous DFO staff, and other individuals. Additionally, numerous persons were petitioned by phone interview, available literature sources were researched, and the knowledge of the author was utilized to derive the required information. For the purposes of this plan, the geographic area has been divided into 5 watershed-based subunits that encompass the largest sub-basins to the Fraser. A thorough description of the anadromous stocks within each subunit and recent escapement trends for each stock are provided. A technical summary is provided that gives an overview of the ongoing fisheries management activities that are annually or regularly occurring, including DFO's "internal" habitat and enforcement programs, for each subunit. An estimate of the source and amount of financial resources contributed to these programs, as well as the nature and source of the human resource capacities required to undertake these activities is summarized. Additionally, an overview is provided of the scientific information gaps that were identified within each of the subunits by various respondents to questionnaires, with a corresponding estimate of the human resource and financial capacities that would be required to redress these issues. This information is provided within the technical summaries for each of the subunits. A sixth technical summary is provided for capacity requirements and information gaps that were commonly identified as being required for all subunits.

Specific recommendations are outlined to guide the implementation of this plan. The plan makes suggestions as to the development of specific infrastructure components within the UFFCA and corresponding board governance mechanisms that would allow the Alliance to petition for and administer funding on the behalf of upper Fraser First Nations and retain and hire staff. Options for the UFFCA to explore for the purposes of accessing funding that would allow for the formation of the suggested UFFCA "entity" and subsequent implementation of the plan are presented. Two Alliance staff positions are suggested and corresponding priority duties and responsibilities for each position are outlined for an approximate one-year period. Recommended short-term priorities for the Alliance parties to pursue include the provision of recognized technical training for First Nations technical personnel and



implementation of the suggested means for increasing training, employment and capacity development opportunities for First Nations personnel. Suggested methods of increasing capacity development opportunities and post-secondary enrollment related to fisheries and resource management include the establishment of mentoring positions and establishing/improving relationships between First Nations Education Coordinators and fisheries program, DFO and Alliance staff, as well as other avenues.

As available funding and resources will control the rate at which recommended actions within this plan are implemented, timelines are not established relating to the plan's implementation, or the rate at which various capacities should be developed. Rather, prioritization of the recommended items for pursuit within the plan is suggested with all those items relating to capacity development being foremost. With respect to the specific technical projects that have been identified within each subunit, further subunit specific planning is suggested whereby projects can be prioritized and planning related to specific activities can be accomplished. As well, further strategic planning is recommended to take place specific to many of the larger issues identified within the plan.

Two of the primary short-term recommendations of this plan have been pursued. These include the submission of a proposal to the BC Capacity Initiative to provide a Fisheries Field Technician Training course for First Nations technicians and to hire an associated Coordinator position, and a proposal to the Federal Aboriginal Aquatic Resource and Oceans Management (AAROM) Program. Funding has been received from the AAROM and will be utilized prior to March 31, 2004 to carry out primary recommendations relating to developing the UFFCA's infrastructure. Notification regarding the possibility of BC Capacity Initiative funding will not be known until late March 2004.

## **INTRODUCTION**

The Upper Fraser Fisheries Conservation Alliance (UFFCA) is an informal “working group” of First Nations and Fisheries and Oceans Canada (DFO). The first meeting of these parties occurred in the winter of 2002. Issues discussed during these forums have included developing a watershed-based approach to fisheries management within the upper Fraser watershed, which includes First Nations and DFO working in a cooperative manner between and amongst their respective agencies and organizations. The Alliance meetings and subsequent business have had a positive and constructive atmosphere, which has led to the desire to formally construct a plan outlining technical aspects of fisheries management within the upper Fraser area and recommending plausible mechanisms that could see First Nations playing a larger role in these activities, and, eventually co-managing the resource in this regard. This document was subsequently commissioned by the participating parties to the UFFCA, after DFO indicated financial support was available, in order to identify short and long-term strategies for the furtherance of Alliance participants desires for achieving co-management of the anadromous stocks of the upper Fraser River watershed. Funding was provided by DFO to the Carrier Sekani Tribal Council to prepare this document on behalf of the Alliance participants.

### **UFFCA Background**

As indicated above, the UFFCA, which is presently an informal or “ad hoc” working group, was initiated in January of 2002 with a workshop in Prince George that was initiated and organized by staff from the Carrier Sekani Tribal Council (CSTC) and Fisheries and Oceans Canada (DFO). All upper Fraser First Nations were invited to this “organizing” workshop, whereby the desire of attendees to initiate an alliance of upper river groups to pursue common objectives in relation to the fisheries resources of the area was assessed. The desire of some upper Fraser First Nations to achieve a “fisheries-related unity” among themselves is bourn out of common interests and objectives that these groups share related to their geographical proximity within the upper watershed, whereby:

- The natal habitat of many of the largest Fraser sockeye, Chinook, Interior Fraser Coho and Pink Salmon stocks are present within their Territories and these First Nations feel an inherent responsibility as caretakers of these habitats and their stocks.
- Their ability to successfully access the anadromous fish resources that annually return to the upper Fraser is dependent on exploitation of these stocks in downstream and marine environments, and they are therefore “at the end of the line in terms of the impact of all other fisheries.”

- The marine and lower river exploitation of stocks returning the upper Fraser affect and control the productivity of freshwater ecosystems in the area, and the resident fisheries that these ecosystems support.
- They have not been afforded economic opportunity related to these anadromous resources but are strategically located to benefit from potential terminal harvests of upper Fraser sockeye stocks.
- Large-scale terminal enumeration activities are conducted within their Territories and the upper Fraser groups can accrue significant employment and other benefits through these programs. Additionally, protection of the natal habitats of these stocks is essential to these stocks' health and habitat protection roles provide additional opportunities for employment and capacity development.

Subsequent to the January 2002 “organizational” meeting, the Alliance adopted the UFFCA name and held workshops in February and March 2002 focussing on informing and integrating DFO staff and potential funding agencies to the UFFCA’s intended purpose. Since that time the UFFCA has continued to meet approximately bimonthly. During the UFFCA’s initial meetings a mission statement with associated objectives were jointly developed by the Alliance parties, as follows:

*The Upper Fraser Fisheries Conservation Alliance is a working group that functions without prejudice to Aboriginal rights, including title; through a cooperative agreement (governed by a Memorandum of Understanding) with Participating Aboriginal Organizations in the Upper Fraser River Watershed and Fisheries and Oceans Canada (hereafter referred to as “The Parties”). The Parties commit to an open and transparent process that:*

- 1. Develops and implements co-operative management for the protection of fish species and the ecosystems upon which fish depend by taking an integrated approach with Aboriginal Organizations in the Upper Fraser River, federal and provincial governments and where appropriate other parties with an interest in fish.*
- 2. Coordinates funding to support the group’s initiatives, make better use of resources available, and to eliminate funding competition (where possible) amongst the Parties.*
- 3. Benefits Aboriginal Organizations and their membership by identifying and developing economic opportunities associated with fisheries resources.*
- 4. Achieves consensus on short term (up to five years) and long-term (five years and longer) objectives.*

5. *Develops and implements plans based on the best available science and Aboriginal ecological knowledge. Does not limit or replace any bilateral process, interim measure, or other negotiated agreement.*

The focus of the UFFCA was watershed-based management. A high priority initiative the UFFCA identified for pursuit was described as the development of a Strategic Plan for the Watershed-Based Co-Management (WBC-MP) of the upper Fraser anadromous resources (i.e. Objective 1 above). This plan was to be technical in nature and “detail what activities will be carried out, and when, the people (positions) involved, capacity building needs (with time frames), and associated costs.” This strategic planning process was commissioned to facilitate the UFFCA’s intended pursuit of the WBC-M initiative.

### **UFFCA WBC-M Initiative Purpose**

The primary concern of the Alliance First Nations is that the anadromous stocks within the upper Fraser watershed are managed in a sustainable and effective manner based on the best available science, Traditional Ecological Knowledge (TEK) and meaningful principles of conservation and ecosystem health. As previously mentioned, the Alliance First Nations have expressed intent to undertake an enhanced/increased level of participation within and direction of the fisheries management activities taking place within their respective Territories, and where necessary, expand the realm of fisheries related information available, through the collection of additional scientific and/or TEK. This concept has been referred to within the Alliance as the Watershed Based Co-Management initiative (WBC-M). Specifically, the intentions or Goals of this initiative can be described as follows:

- Acquire, retain and continually upgrade information pertaining to upper Fraser watershed anadromous stocks to ensure their effective management, and expand and promote the responsible stewardship of this resource in order to ensure its perpetual conservation and sustainability.
- Develop the necessary human resource capacities within the Alliance First Nations to effectively engage and achieve the above goal in a co-management or sole-management capacity.

Related Objectives with regards to the WBC-M initiative and its Goals, can be described as follows:

- Develop a comprehensive plan for the UFFCA geographical area that examines the fish stocks present and their current and historical status, past

and present enumeration and assessment activities, additional aspects of enumeration, assessment and/or other information/activities that are required to effectively manage the stocks, and determine a prioritized plan for project initiation and completion and associated timelines.

- Provide a suite of First Nations technical personnel fully qualified to:
  - Undertake fisheries management related initiatives of a high priority to the Alliance (as identified in the plan), which are not being addressed by DFO or other organizations.
  - To obtain a larger proportion of the seasonal employment opportunities available within large-scale enumeration activities and compete for and undertake the positions now filled by DFO staff within the upper Fraser.
- Develop a multiyear plan to guide the development of the necessary capacity, training, education, and mentoring of the personnel First Nations will require to initiate/pursue the technical aspects of the plan.
- Identify potential funding mechanisms, sources and partnerships to support the implementation of the plan and secure necessary resources.
- Establish Alliance structures and staffing and interrelationships with member First Nations, DFO, other agencies and NGOs that are required to support this initiative.

These specific Goals and Objectives of the Alliance's intentions were impartially "created" by the author for the purposes of directing the development of this plan. They were created from the author's interpretations of past Alliance forum discussions regarding this initiative and the development of this plan. Strategic planning for the implementation and completion of an initiative, and subsequently the achievement of the initiative's specific goal(s), is inherently easier and can be more effective if the specific intent of the initiative being planned for is defined. Therefore the Goals and Objectives described above were utilized as the framework on which this plan is centred. These Goals and Objectives were reviewed and accepted by the parties to the Alliance prior to the completion of this plan.

### **Strategic Planning Process**

As referred to above, the Carrier Sekani Tribal Council was commissioned to prepare a strategic plan for the UFFCA to facilitate the Alliance's achievement of their

primary objective of creating a successful and meaningful co-management regime for anadromous fisheries resources within the upper Fraser River watershed. The related Goals and Objectives discussed above, as well as a general framework for this plan, were provided to the UFFCA for review prior to the initiation of this document. General acceptance of the intended format and content of this plan was received.

For the purposes of this planning process it was necessary to assign a geographical context to the area intended to be targeted for a greater degree of First Nations participation in fisheries management (i.e. the co-management initiative). This geographical area has been separated into five watershed-based sub-units and the following information, specific to each subunit, is discussed:

- First Nations interests.
- A description of fish stocks present.
- Ongoing and past enumeration activities undertaken.
- Further assessments/information deemed required.
- An estimate of DFO's existing annual commitment of resources, and the characteristics of those resources, and to what activities they are committed.
- An estimate of additional resources, and their required characteristics, to undertake further fisheries management initiatives deemed necessary.

This information was ascertained from the knowledge of the author, participating Alliance First Nations, DFO personnel, and literature sources. All First Nation groups within the planning area, and DFO stock assessment and resource management personnel were requested to complete and return questionnaires for the purposes of collecting technical information. Information sources are cited where relevant.

Where possible, components of this information are further utilized to determine the types of personnel resources required for a specific area, for both ongoing and further required fisheries management activities, including the skills and training required by the personnel, and an estimate of the financial resources required to support these activities. As the number of personnel required within an area or for a specific set of technical projects is largely dependent on available funding, and vice versa, it was difficult to specifically identify these factors in most instances. Potential avenues to secure the required training and capacity are discussed, as well, available options for securing funding to support a greater level of First Nations participation in the roles identified, and therefore achieve the level of co-management desired, is discussed.

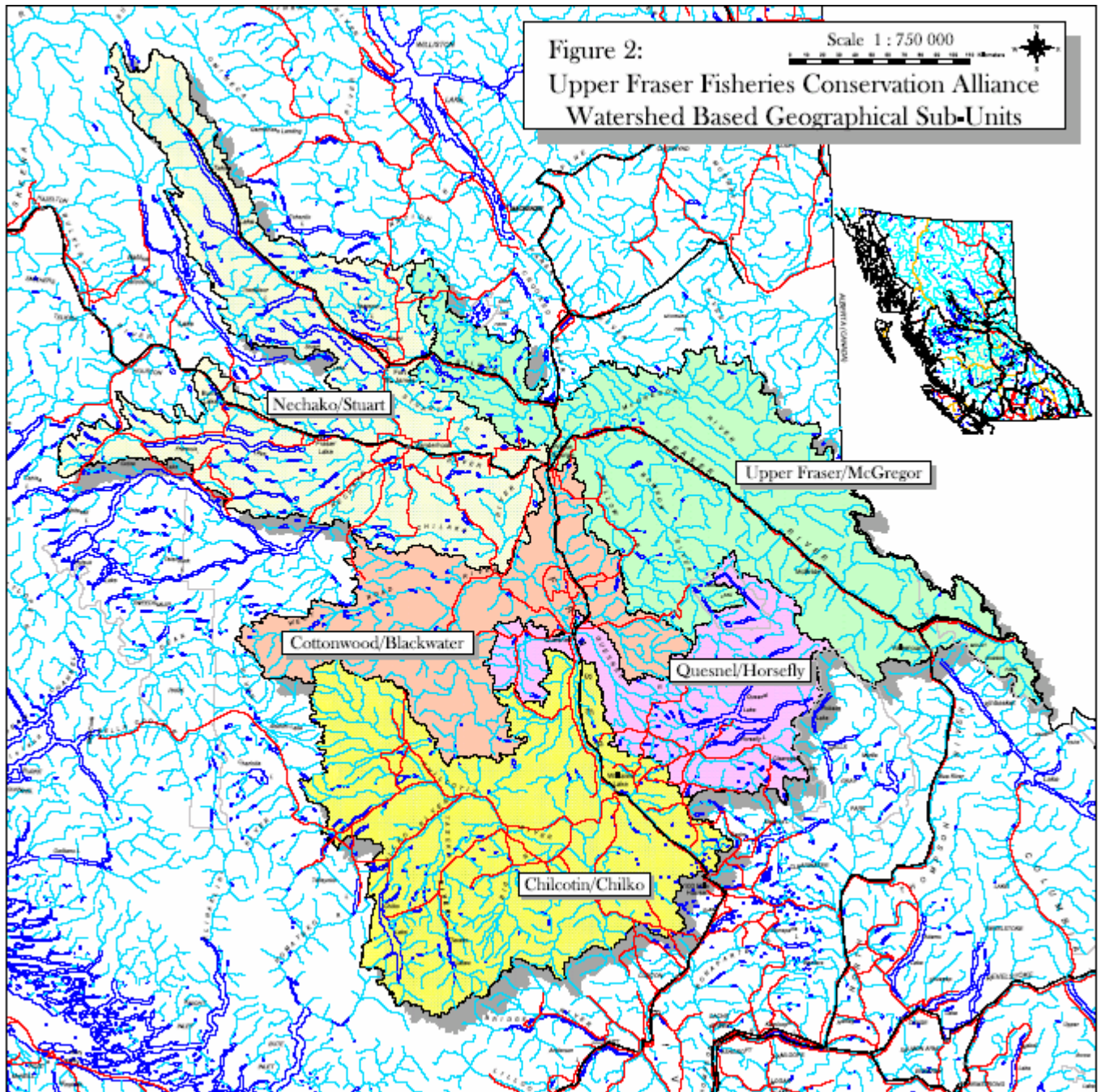
### **Strategic Planning Purpose**

The participating members of the Upper Fraser Fisheries Conservation Alliance (UFFCA) recognized a need for a plan to outline the goals and objectives of the UFFCA and define potential strategies and associated activities required to pursue and achieve these objectives. A primary objective reiterated by the participating First Nations of the Alliance has been the development of a watershed-based plan to facilitate the co-management of the fisheries resources of the upper Fraser River watershed between First Nations and DFO. The desired plan was to identify the activities presently undertaken by DFO, additional activities identified as being required with respect to the management of target stocks, and identify the skills, training and personnel capacity that would have to be developed by First Nations in order to undertake an active role in the fisheries management activities taking place within their Territories. The plan would thereby serve the purpose of directing the focus of First Nations of the Alliance in pursuit of this objective.

Upon eventual adoption of the plan, there was further recognition that this plan could serve for the purposes of presenting to political leaders to describe the structure and purpose of the Alliance, with respect to the potential of First Nations to play a larger role in fisheries management, in order to garner and/or continue support for the Alliance's objectives. As well, the document could be utilized to approach funding agencies and potential business partners to describe the structure and purpose of the Alliance and potentially assist in leveraging funds to support its' objective of a greater degree of participation within the management of fish and fisheries.

### **Geographical Context**

The geographical area that forms the basis of this planning process encompasses all portions of the upper Fraser River watershed from the confluence of Deadman Creek to the headwaters of the Fraser River, including all portions of all tributaries to the Fraser River upstream of and including Deadman Creek (Figures 1 and 2). Due to the large size of this area and the complexity of the associated fisheries related information, for the purposes of this plan the area has been divided into 5 sub-units of Chilcotin/Chilko, Quesnel/Horsefly, Cottonwood/Blackwater, Upper Fraser/McGregor and Nechako/Stuart. For the purposes of maintaining the continuity of the watershed-based approach to the plan, despite the fact the Territories of many of the First Nations within the plan area extend outside of the Fraser watershed, these areas are not considered within the plan.





### **Assumptions**

Several assumptions have been inherent in the development of this plan. These include the continued involvement and support of DFO in furthering the co-management objective of the Alliance. As well, the continued and expanded involvement of the participating First Nations of the Alliance in pursuit of this co-management objective has been assumed.

### **DFO's Role/Participation**

To date, staff from the Fisheries and Oceans Canada (DFO) have been instrumental in the initiation and furtherance of the Alliance, have participated without prejudice to issues of rights and title, and have been fully supportive of the Alliance's identification and intention to pursue several potential endeavors. This plan has therefore been drafted assuming the continued involvement and support of DFO staff in the development and furtherance of the Alliance's objectives, which, in the opinion of the author, is considered fundamental to the future success of the Alliance in its proposed format and function.

### **First Nation's Role/Participation**

Representatives from several First Nations have participated in the past UFFCA meetings/forums. There appeared to be strong support for the development of a watershed-based plan for the co-management of upper Fraser fisheries resources. The geographical context that has been applied to this strategic plan assumes that the First Nation communities that occur and/or have interests within the plan area will wish to pursue the co-management objective. Instances whereby a particular First Nation or multiple First Nations oppose aspects of this plan are not discussed within this document, as this would largely be a political issue. Also, this plan was developed assuming the Alliance parties are supportive of the Alliance formalizing itself as an entity to support this endeavour, including developing an infrastructure of staff to support the Alliance First Nations in the implementation of this initiative. This assumption is discussed thoroughly within later portions of this report.

### **Plan Focus**

This plan only considers the anadromous species within the upper Fraser area and has little focus on "specific" habitat related issues. The resources available for the development of this plan would not allow for inclusion of information relating to the wealth of resident fish stocks contained within the area. Additionally, there appears to be significantly more management activity focussed on Federally managed fish within the upper Fraser; relative to Provincially managed resident fish resources. With respect to habitat, while it is recognized that in some instances upper Fraser

anadromous stocks may presently be reduced due to habitat impairment from land use practices, the plan has little focus on habitat related issues. The rationale for not focusing on these areas include the lack of funding available for undertaking habitat restoration endeavours and the substantive evidence that anadromous stock escapement to the majority of upper Fraser natal habitats is far more controlled by exploitative factors in marine and lower river fisheries than by natal habitat impairment. In instances where habitat impairment has led to severe decreases in stock escapement, these specific streams and situations are discussed within this plan. Additionally, it was precluded that a narrower plan focus would provide a higher probability of achieving success, and the existing WBC-M plan Goals and Objectives of increasing First Nation's capacities and roles in anadromous stock management, and producing expanded and improved science in relation to these stocks, were lofty aspirations on their own.

### **Co-Management Definition**

The term "co-management" has come to assume a variety of meanings and carry a number of connotations. Within the context of First Nations in British Columbia the term is usually utilized by First Nations in the realm of resource management to imply a situation whereby First Nations are afforded an equal "say" or "vote" in management decisions surrounding resources occurring within their Territories, and specifically those decisions affecting exploitative factors on the resource and subsequent allocation. This is specifically the manner in which many First Nations in the B.C. Treaty Process use the term. Within the context of this WBC-M plan, the term co-management is being utilized to describe a situation whereby upper Fraser First Nations are equal partners, or perhaps the leading partners, in the development and execution of programs focussing on the management of upper Fraser anadromous stocks within the upper Fraser geographical area. At present, these are largely terminal spawner enumeration and egg-fry survival programs, but also include habitat protection, enhancement and enforcement related activities, and some research endeavours. Co-management within the context of this plan does not directly afford First Nations management authority to affect decisions regarding allocation of these resources. This is a political issue and the intent of the W-BCM initiative and this plan is to focus on technical aspects of anadromous resource management. However, the terminal management activities that take place within the upper Fraser form the basis of the broader context of fisheries management whereby decisions regarding run forecasting and allowable/acceptable exploitative factors are calculated.

### **WBC-M Plan Context (Treaty, Rights and Title)**

Several respondents to questionnaires circulated during the process of the development of this plan requested clarification as to where the WBC-M initiative and this corresponding plan “fit” within the context of Treaty and the issues of Rights and Title. The following is offered, which is strictly the opinion of the author, and is only intended to provide clarification of this issue.

As discussed above, First Nations within the upper Fraser share many commonalities with respect to their historical linkage to, present day reliance on, and ongoing challenges to accessing anadromous resources. Related to these commonalities is the desire to effect positive change in the management of these resources and their habitats to ensure their perpetual sustainability, their required contribution to ecological processes, and that upper river First Nation groups can access and utilize the resources to a suitable degree. It is felt that a greater degree of First Nations participation, management and direction in the scientific programs undertaken within the upper Fraser with respect anadromous resources is the most effective manner in which they can effect this positive change. This is primarily a technically driven process whereby First Nations must acquire the suitable capacities to undertake the desired roles and responsibilities, with a secondary non-technical aspect whereby the political will must exist to provide funding so that this capacity development can continue and the required technical programs can continue and/or be implemented.

Alternatively, but similarly, all upper Fraser First Nations wish to play a role in affecting management decisions relating to how upper Fraser anadromous resources are managed in a broader context of fisheries management. This includes possessing “recognized authority” in determining allowable exploitative factors, including the location, manner and allowable rates of exploitation and subsequent beneficiaries (i.e. issues of Rights and Title, and Treaty or Agreements). While these processes and determinations require sound technical information of the nature referred to in the paragraph above, any process whereby First Nations are afforded the “recognized authority” described above will be politically driven. As the UFFCA and the W-BCM Initiative is intended to deal only with matters of a technical nature, only the First Nation’s aspirations described in the paragraph above are encompassed within this plan.

In essence, the aspirations of upper Fraser First Nations can be described as those which require significant technical work with secondary political support, and those that require a significant shift in Federal/Provincial policy (political will) with the technical support required to facilitate this shift being secondary. This plan and the

UFFCA are focused on the achievement of the aspirations that are primarily technically driven. The aspirations of the upper Fraser First Nations, with respect to anadromous resource management, that are politically driven (i.e. Rights and Title and Treaty Rights) are being pursued by some First Nations through the BC Treaty Process and/or litigation. Within the context of the B.C. Treaty Process and issues of First Nation's Rights and Title, the UFFCA's intended vision for the WBC-M Initiative, and therefore the purpose of this plan, can be interpreted as working towards mid-ground between where upper Fraser First Nations are generally at now, in relation to anadromous resource management, and where they wish to be in this respect in the future. It could be also described as an "interim solution," until fundamental issues of First Nations Rights and Title can be dealt with in a satisfactory manner, whether through the B.C. Treaty Process, other processes, or legal avenues.

Irrespective of the concerns and issues that may be derived by the context of the WBC-M initiative and this plan, First Nations and DFO within the upper Fraser have identified numerous issues related to the management of anadromous resources of the area through this planning process. These issues largely relate to the conservation and effective management of these stocks whereby benefits accrued from the resources are more equitably distributed through the watershed. In many instances the concerns of First Nations and DFO overlap. As First Nations continue to pursue their interests with respect to these anadromous resources, while continuing to seek definition and/or recognition of the issues of Aboriginal Rights and Title, there is a need for First Nations to continue to develop their capacity to participate effectively in all realms of fisheries resource management.

## **SUBUNIT TECHNICAL SUMMARIES**

The following sections summarize ongoing technical programs and associated existing capacities, informational gaps and proposed directions for new initiatives identified in relation to the anadromous resources of the upper Fraser River. This information is presented in 5 sections corresponding to the 5 geographical subunits delineated within the planning area, as described above, and a 6<sup>th</sup> section that describes information deficiencies and proposed new or additional fish management initiatives or directions that were commonly identified by individuals petitioned from all or most subunits.

## **UPPER FRASER/McGREGOR**

### **Geographical Context**

The upper Fraser/McGregor subunit includes all portions of the Fraser River watershed upstream of the confluence of the Nechako River (Figure 2). This area includes the most mountainous and highest elevation portions of the upper Fraser watershed, and subsequently contributes a significant proportion of the mean annual discharge of the Fraser River relative to its area. The elevation and climatic conditions and subsequent snow pack and permanent ice fields contribute to the maintenance of a very cool water temperature regime within this portion of the watershed. As well, the characteristics described above create a large number of tributary streams to the Fraser mainstem, which are of significant size. This area of the watershed is likely the least populated of the entire Fraser watershed in relation to number of people/km<sup>2</sup> of watershed area. The area is dominated by the ESSF (Englemann Spruce) and ICH (Interior Cedar-Hemlock) biogeoclimatic zones and contains one of the few representative areas of antique interior rainforest. Forest harvesting is extensive and forestry is the main industrial activity. Agricultural and urban development are relatively minor by comparison. Corridor development has occurred throughout the entire length of the upper Fraser valley from Prince George to near the headwaters, as Highway 16 East, BC Rail and the Canadian National Railway all run to the Alberta border via this route.

### **First Nations Interest**

This area largely falls within the Traditional Territory of the Lheidli T'enneh First Nation. The upper/eastern portions of the subunit occur within a Lheidli T'enneh/North Thompson Indian Band common use area. The North Thompson Indian Band is a member of the Shuswap Nation Tribal Council (SNTC). The fisheries body of the SNTC, the Secwepemc Fisheries Commission (SFC), conducts annual enumerations of chinook stocks in the Fraser mainstem population at Tete Jaune. Lheidli T'enneh is an independent First Nation and has had a very active fisheries/natural resource management program over the last ten years and in cooperation with DFO and the province, has completed and/or participated in numerous assessment, enumeration and research programs on a large number of watershed/basins and fish stocks within the upper Fraser area.

### **Stocks Present**

#### **Chinook Salmon**

Anadromous stocks within this area are dominated by chinook salmon. Virtually all 4<sup>th</sup> order (i.e. generally streams greater than 5-7meters channel width) and larger

Fraser River tributaries with suitable habitat, and the Fraser mainstem itself, serve as natal spawning and rearing habitats for chinook. These chinook are believed to all belong to the 5<sub>2</sub><sup>1</sup> Spring stock grouping and enter the lower Fraser from February to early July, and generally approach peak spawning activity within their upper Fraser natal habitats around August 20.

It is believed that all upper Fraser chinook stocks reside within their natal streams for a year post-emergence, but it has been documented that many out-migrate to the Fraser mainstem and possibly downstream and into other tributaries, for the purposes of rearing (Bradford and Taylor, 1997). Age of returning adults is 3-6 years, but the majority return at age five. Total chinook escapement to the upper Fraser subunit varies from 15-30% of the total Fraser chinook escapement excluding the Harrison River chinook stock. Total spawning escapements ranged from approximately 11,500 to 28,000 from 1991-2002 and averaged 19,000. Top chinook producers within the upper Fraser include the Bowron River, Slim Creek, McGregor/Herrick rivers and tributaries, and the Fraser mainstem population at Tete Jaune.

#### Sockeye Salmon

The sole major sockeye stock within the upper Fraser/McGregor subunit is the Bowron stock. This stock is managed within the Early Summer stock aggregate, based on timing of entry into the lower Fraser River in early to mid-July. Bowron sockeye reach spawning grounds in the upper Bowron watershed in mid to late August. Spawning habitats occur within the Bowron River (upstream of Bowron Lake) and Huckey Creek (tributary to upper Bowron River) with Bowron Lake acting as the nursery lake. Other spawning habitats for this sockeye stock are known to occur within the Indianpoint Creek/Indian Lake system, which is tributary to the Bowron River downstream of Bowron Lake. Most of the juvenile sockeye rear for one year in their nursery lake before migrating to the ocean; however, a small percentage will rear for two years before emigration occurs (N. Todd personal communication).

Table 1. Numbers of adult chinook enumerated in natal habitats within the upper Fraser/McGregor Subunit from 1991-2002.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	Peak Live	A.U.C.	Peak Live	A.U.C.	Peak Live	A.U.C.
Bowron River & tribs	4200	4670	6140	9104	8316	4577	7334	7618	3455	3220	2767	5491	5700	8719	5456
Catfish Creek					N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Present	N/A
Dome Creek	523	458	575	530	550	571	625	400	309	198	N/A	49	N/A	450	Fence / MR
Driscoll Creek					N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	26	N/A
East Twin Creek								64	N.I.	18	N/A	35	N/A	51	N/A
Goat River	107	100	55	293	400	440	354	302	89	212	220	411	502	820	817
Holly Cross Creek					N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	12	N/A
Holliday Creek										15	20	74	N/A	126	N/A
Holmes River	1500	2150	2100	1877	2600	2775	3203	2362	523	1795	2188	1018	1158	3740	3690
Horsey Creek	50	90	130	unk	120	20	75	57	14	128	N/A	78	N/A	308	N/A
Humbug Creek									N.I.	26	N/A	22	N/A	85	N/A
Kenneth Creek								132	17	65	N/A	58	N/A	338	N/A
Kiwa Creek								15	N.I.	N.I.	N/A	N.I.	N/A	N.I.	N/A
McKale River								20	present	32	N/A	9	N/A	81	N/A
McGregor/Herrick & tributaries	1300	4150	unk	1851	2412	3461	2505	4471	1870	2449	N/A	2420	1053	3751	2752
Morkill River	1000	1800	unk	1231	407	567	550	2398	1152	926	755	Present	N/A	Present	N/A
Nevin Creek								161	46	62	N/A	57	N/A	132	N/A
Ptarmigan Creek								58	103	49	36	8	N/A	66	N/A
Red Mountain Creek					N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Present	N/A
Robson River										22	N/A	N/O	N/A	175	N/A
Salmon River	300	300	25	729	901	1054	1200	1362	823	634	634	478	600	429	607
Slim Creek	2500	1725	1300	2473	4634	2268	3130	2664	1235	2112	1517	2876	2100	3021	2790
Small Creek								115	66	34	43	48	N/A	268	N/A
Snowshoe Creek					N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	165	N/A
Swift Creek	600	980	1000	886	1700	1500	1200	1098	375	486	458	982	N/A	1535	N/A
Torpy River	2000	2600	1000	1921	1590	1055	1042	2293	1819	1468	1586	1755	1791	2565	2111
Walker Creek	100	500	150	240	101	426	122	392	206	252	199	177	158	381	338
West Twin Creek								24	N.I.	34	23	14	N/A	22	N/A
Willow/Wansa	500	700	600	1170	817	1612	1961	2041	717	1314	1021	893	786	1033	907
<b>Totals</b>	<b>14680</b>	<b>20223</b>	<b>13075</b>	<b>22305</b>	<b>24548</b>	<b>20326</b>	<b>23301</b>	<b>28047</b>	<b>12819</b>	<b>15550</b>	<b>11467</b>	<b>16953</b>	<b>13848</b>	<b>28299</b>	<b>19468</b>

TEK information indicates that the Bowron sockeye stock was once quite large as Lheidli elders indicate that many traditional fishing sites for sockeye were situated along the Fraser upstream of the Nechako confluence. DFO escapement records also

indicate spawning escapements larger than in recent years, reaching a peak estimated escapement of 34,000 fish in 1995 (Table 3).

Table 2. Available data for spawner escapement and total adult return from brood year for the Bowron River sockeye stock from 1956-1988 respectively.

<b>BOWRON LAKE</b>															
1992 CYCLE YEAR				1993 CYCLE YEAR				1994 CYCLE YEAR				1995 CYCLE YEAR			
Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio	Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio	Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio	Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio
1956	6,994	38,484	5.50	1957	12,011	41,966	3.49	1958	14,843	18,155	1.22	1959	29,247	61,865	2.12
1960	7,620	17,733	2.33	1961	7,449	28,148	3.78	1962	6,286	21,327	3.39	1963	25,141	214,316	8.52
1964	1,500	27,507	18.34	1965	2,659	17,849	6.71	1966	2,470	22,249	9.01	1967	31,695	206,494	6.52
1968	3,611	44,642	12.36	1969	3,872	17,211	4.44	1970	1,305	16,197	12.41	1971	25,497	124,507	4.88
1972	4,138	20,361	4.92	1973	4,558	8,546	1.87	1974	1,850	12,396	6.70	1975	29,700	170,357	5.74
1976	2,250	7,112	3.16	1977	2,500	15,396	6.16	1978	3,141	40,626	12.93	1979	35,000	29,984	0.86
1980	2,894	45,170	15.611	1981	1,170	16,532	14.13	1982	1,647	4,645	2.82	1983	6,451	25,184	3.90
1984	10,461	48,486	4.63	1985	6,395	20,607	3.22	1986	3,118	22,133	7.10	1987	11,071	20,973	1.89
1988	12,780	19,283	1.51												
Average	5,805	29,864	7.60	Average	5,077	20,782	5.48	Average	4,333	19,716	6.95	Average	24,225	106,710	4.30

Table 3. Numbers of sockeye spawners enumerated in the Bowron watershed from 1988-2002. "N.O." infers no sockeye observed, "N.I." infers not inspected, blank cell indicates database did not specify.

Year	Bowron River	Indian Point Creek	Total
1988	12780	NO	12780
1989	2534	NI	2534
1990	7992	NI	7992
1991	4919	NO	4919
1992	2560	NI	2560
1993	1184	NI	1184
1994	4415		4415
1995	34431		34431
1996	8176	NO	8176
1997	4811	NO	4811
1998	4777	NO	4777
1999	8238		8238
2000	13440		13440
2001	5842		5842
2002	8770		8770

A sediment core sampling study conducted by Lheidli/DFO on Bowron Lake in 2000 indicated that the Upper Bowron system probably supported in excess of 50,000



sockeye spawners annually prior to the early 1900's and the advent of modern style commercial fisheries. Recorded spawner escapement for the period 1988-2002 ranged from approximately 1,200 to 34,000 and averaged 8,000 (Table 3). Natal spawning and rearing habitats of the stock occur within Bowron Lakes Provincial Park (established since the 1940s). The natal spawning and rearing habitats of the Bowron sockeye have therefore not been degraded to any extent. The dangerously low recently recorded escapements of this stock are due in most years to the continued high levels of by-catch of this stock in commercial fisheries targeting the Early Summer and Mid-Summer Run stock groupings. In addition, First Nations fisheries in the Fraser River that target the Early Summer Run group also have an impact on spawning escapement of Bowron sockeye.

It is thought that a small sockeye stock previously occurred within the Slim Creek and Slim/Tumuch lakes system. Virtually nothing is known of this small stock. During chinook studies in 2000 and 2001 in the Slim Creek watershed, only one adult sockeye was observed. It is believed that sockeye stocks were previously present within the Willow River watershed, as evidenced by naturally occurring kokanee populations within several lakes in the watershed. The anadromous life history portion of these stocks was likely curtailed by the formation of a migration barrier on the lower portion of the Willow River (approximately a kilometer downstream from Highway 16) that now limits upstream fish access with the exception of chinook on years of suitable discharge conditions. This barrier has occurred largely through the continued decay and collapse of canyon walls in the lower Willow. Its relation to impeding fish access and its feasibility for modification has been studied by the Lheidli T'enneh (1999 & 2000) and earlier by DFO. The number of sockeye stocks within the upper Fraser subunit is sparse due to the limited presence of suitable nursery lake habitats.

Coho are not known from the upper Fraser/McGregor subunit, although specific directed efforts at enumeration have not been attempted. Coho are known to occur in small numbers within the Nechako system.

### **Ongoing Enumeration/Assessment/Management Activities**

Largely owing to the remote and expansive nature of this subunit, annual enumeration of many of the chinook stocks in this area was very rudimentary or non-existent until the mid 1980s. Since then, enumeration of spawning adult chinook is completed on nearly all chinook producing streams via repeated helicopter flights and subsequent generation of a peak live count and in recent years an Area Under the Curve (AUC) estimate as well. DFO stock assessment personnel from Kamloops coordinate and

conduct the bulk of these flights with assistance of other DFO staff from various offices. The Lheidli T'enneh have assisted with these flights in the past and have also conducted two years of chinook redd residency surveys. These surveys have been completed on Slim Creek and are intended to determine the time that chinook in this system spend on their spawning redds, prior to spawning, during active spawning, and post-spawning. This information is utilized as an AUC, which is a method to generate an estimate of the total number of chinook that spawned in Slim Creek in a given year. Intentions are to expand this work to other natal streams of upper Fraser chinook stocks in the future.

Several chinook stocks that utilize smaller upper Fraser tributaries are enumerated by ground-based visual surveys, which are completed several times on each system each year. This work is largely completed by individuals that reside in the Dome Creek to McBride area who are annually contracted on a seasonal basis by DFO's Stock Assessment Division.

Bowron sockeye are enumerated by helicopter near peak spawning timing in small streams tributary to Bowron Lake. More recently, in order to substantiate aerial enumerations of the stock, Lheidli T'enneh fisheries staff have counted returning sockeye from the bridge at the Bowron Lake outlet.

Past relatively large-scale fisheries management related activities undertaken by DFO in the upper Fraser/McGregor subunit have included the occasional operation of a temporary sockeye enumeration fence on the Bowron River near its outlet from Bowron Lake. These activities have not been undertaken since the 1980s.

#### Enhancement

One chinook stock within this subunit is the subject of enhancement efforts. Brood stock are annually collected from Dome Creek and their progeny are raised at the Penny Hatchery. This hatchery is staffed by a local resident of the area and is funded through DFO's Community Economic Development Program (CEDP) and Canadian Forest Products Ltd. (Canfor). The subsequent annual hatchery releases of chinook smolts possessing Coded Wire Tags (CWTs) and fin clips currently provide the only mechanism for detection of upper Fraser chinook stocks in marine and lower Fraser fisheries. This stock and the hatchery provide the only "index" of upper Fraser chinook exploitation and marine survival. In addition, a fish counting fence has been operated annually on Dome Creek for several years. Staffing for the Dome Creek fence and associated operations has come from the Penny Enhancement Society through the DFO Community Economic Development Program (CEDP) under the

supervision of the DFO Community Advisor. Brood stock for Penny Hatchery are obtained from the fence, and the rest of the chinook are counted and passed upstream. In many years the fence has to be installed late because of high water, or is washed out during the season; thus only in some years is a relatively complete count obtained. In 2002 staff from the Lheidli T'enneh fisheries program worked with Dome Creek fence staff to assist in all aspects of the operation. This included application of Peterson Disc tags to all adult chinook passing through the fence and subsequent recovery of tagged and untagged carcasses post spawning.

### Habitat Protection

Activities associated with habitat protection are completed by DFO habitat and enforcement staff, and Provincial habitat protection personnel and enforcement staff. DFO staff from Prince George cover the western portion of the upper Fraser subunit from Prince George to the Robson Valley Forest District boundary, which is located on the western margins of the Goat River and Morkill River watersheds. Habitat protection activities in the eastern portion of the subunit are serviced from DFO's office in Clearwater. Habitat protection and enforcement activities in the upper Fraser area are largely focused around forestry related development. In combination, the two Federal offices dedicate a total of 2 fulltime habitat staff and 1 fulltime and 1 seasonal enforcement staff to the upper Fraser/McGregor subunit.

### Sport Fishing

There is very little sport fishing effort directed at anadromous stocks within the upper Fraser/McGregor subunit. There is a sport-kill fishery for chinook in the Bowron for one month of the year (July 15- Aug 15). A sporadic creel survey program has been conducted on this fishery and is completed by technicians contracted by DFO. The Lheidli T'enneh Band was contracted for the completion of this program for one season in the past. It is thought that the fishery normally results in fewer than 100 chinook being harvested but catches have exceeded 250. No other sport-kill fisheries on anadromous stocks are offered within this subunit. Very minimal effort at sport-release fisheries directed at salmon have been noted within the subunit. A sport-kill fishing opportunity for chinook has been offered annually on the Fraser mainstem immediately downstream of the mouth of the Nechako River since 1999. This area falls outside of the upper Fraser/McGregor subunit and is therefore not discussed here.

Table 4. A summary of the existing fish stock and fisheries management activities and associated roles presently supported by DFO, NGOs and First Nations personnel within the upper Fraser/McGregor Sub-unit.

<b>Project</b>	<b>Present Responsibility</b>	<b>Funding Source &amp; Amount (\$)</b>	<b>Staffing Requirements/ Timing</b>	<b>Staff Skills</b>
Chinook Enumeration. Large program within upper Fraser/McGregor. Twenty to 30 streams are flown up to 5 times each to generate an AUC estimate. Some smaller streams are enumerated via ground/walking surveys. Flights are generally initiated on August 10 and continue to early September.	DFO stock assessment funds and completes the project. Small amount of observer assistance provided by Lheidli T'enneh technicians.	DFO-Stock assessment 150,000-180,000	Staffing is generally provided through stock assessment in Kamloops with assistance from Prince George DFO. Daily requirements for observers ranges from 2-4/day for a period of 3 weeks.	Lead observer must have numerous years of experience in counting from helicopter (preferably specifically within this area). Second observer should have some experience.
Sockeye Enumeration. Only includes the Bowron stock. Is generally conducted via aerial enumerations of spawning tributaries to Bowron Lake. Lheidli T'enneh has conducted visual counts at the bridge over the outlet of Bowron Lake in recent years.	DFO stock assessment techs (2), occasional contribution of Lheidli T'enneh technical assistance with provision of observer.	DFO-Stock assessment (~5,000) Lheidli T'enneh (~5,000)	Staffing is normally provided from stock assessment personnel in Kamloops or Williams Lake. Time of flights is generally mid-August to early September.	Lead observer must have numerous years of experience in counting from helicopter (preferably specifically within this area). Second observer should have some experience.
Dome Creek Chinook Fence. Operated for the purposes of maintaining an index stock on the upper Fraser (collection of fence counts of escapement and collection of CWTs).	HEB community advisor coordinates work and provides Stock Assessment Technician for overall direction and supervision. Operational personnel are contracted from the local community of Dome Creek	Funding is provided through donations from Canfor and DFO (CEDP)	1 DFO stock assessment technician for two months, 3-5 technicians from Dome Creek area. 2 technicians provided from Lheidli.	DFO stock assessment technician has post secondary training and several years of experience, Dome Creek and Lheidli technicians possess on the job training. Supervisory staff must have experience managing fence operations.
Dome Creek Mark-Recovery Conducted in association with fence	2002 was the first year of the program which is	Lheidli AFS and DFO	Last week of July to first week of September. Mark	2-3 technicians with experience conducting stream

*Strategic Plan for a Watershed Based Approach to Facilitating First Nations' Co-Management of the Anadromous Resources of the Upper Fraser Watershed*

<b>Project</b>	<b>Present Responsibility</b>	<b>Funding Source &amp; Amount (\$)</b>	<b>Staffing Requirements/ Timing</b>	<b>Staff Skills</b>
operation. Lheidli T'enneh participated for the first time in 2002 and assisted in fence operation and conducted a mark-recapture program on chinook.	intended to be completed for a number of years.	(PST)	application and recovery operations were coordinated and completed by Lheidli technicians.	surveys for a period of 5-6 weeks. Must also have experience handling fish and applying tags.
Dome Creek Chinook/Penny Hatchery. Limited production facility but is deemed important due to its production of CWTagged individuals and their subsequent use in deriving exploitation and marine survival information for upper Fraser chinook. The only index stock within the upper Fraser chinook group.	Brood are collected at the Dome Creek fence and progeny are reared at the hatchery site, which is located on the opposite side of the Fraser River in the community of Penny.	Funding is provided through donations from Canfor and DFO (CEDP).	One fulltime fish culture technician is required and several seasonal persons are required for short-term tasks.	Fish culture technician/hatchery manager must be on-site and have extensive experience with hatchery operations and fish/Chinook culture methods.
Habitat and Enforcement DFO's commitment of habitat (HEB) and enforcement (C&P) staff to land/water use monitoring and compliance. C&P Officers are responsible for conducting enforcement of Fisheries Act. HEB Biologist is responsible for review of development plans or various natures and CEAA applications.	Contributed from offices in Prince George (to Morkill /Fraser River confluence) and Clearwater (headwaters downstream to Morkill /Fraser River confluence).	Core funding DFO Pacific Region. Approx. 240K	Upper Fraser McGregor subunit presently receives the approximate commitment of two C&P officers, largely for the purposes of enforcement of the Fisheries Act and related investigations. An additional commitment of a Habitat Biologist (HEB) is also contributed to this area to support C&P operations in the area and review various development plans and CEAA applications.	C&P Officers have specific technical diplomas and related enforcement officer training. Habitat Biologist has minimum bachelors degree and one year experience in related field.
Aboriginal FSC Fishery Monitoring	Lheidli T'enneh. See	See Cotton	See Cotton Wood	See Cotton Wood Blackwater

*Strategic Plan for a Watershed Based Approach to Facilitating First Nations' Co-Management of the Anadromous Resources of the Upper Fraser Watershed*

<b>Project</b>	<b>Present Responsibility</b>	<b>Funding Source &amp; Amount (\$)</b>	<b>Staffing Requirements/ Timing</b>	<b>Staff Skills</b>
<p>Vast majority of fishing effort takes place below the Nechako confluence and within the Nechako and is therefore discussed more thoroughly relative to those subunits. Within this sub-unit most fishing occurs in the Fraser River near Shelly from Canfor's Bridge crossing to the vicinity of Lheidli's village.</p>	<p>Cotton Wood Blackwater and Nechako/Stuart Subunits</p>	<p>Wood Blackwater and Nechako/Stuart Subunits</p>	<p>Blackwater and Nechako/Stuart Subunits</p>	<p>and Nechako/ Stuart Subunits</p>

### **Existing Capacity Summary**

Based on table 4 above, it is apparent that there are numerous fisheries related management capacities presently dedicated to the performance of existing duties and programs within the upper Fraser/McGregor Subunit. This includes the dedication of approximately two fulltime habitat compliance and investigation officers, a single fulltime fish culture technician with several seasonal personnel assisting with related duties, seasonal technical positions related to the operation of the Dome Creek chinook counting fence, as well as the commitment of relatively minor amounts of time from stock assessment technicians for aerial chinook and sockeye assessment programs. The largest single annual O&M expenditure related to the above activities is likely the costs of helicopter usage for the purposes of aerial chinook and sockeye escapement estimations.

### **Fish/Habitat Management Issues, Information/Capacity Gaps**

#### Chinook Enumeration Issues

The annual enumeration of chinook escapements in the upper Fraser/McGregor subunit via helicopter flights and subsequent AUC estimations is the presently utilized means of enumerating the many remote chinook producing streams in this subunit. However, there is further work required in relation to the use of this methodology to ensure that resulting estimations are indeed reasonably accurate and therefore cost effective. The two largest unknown factors that affect the potential accuracy of these counts are:

1. The proportion of fish present within the systems that are being observed and counted. This is affected by water clarity (turbidity, light conditions), water depth (stage and stream character), substrate composition and algal growth, observer effectiveness (experience), and flight conditions (weather, pilot).
2. The subsequent expansion of counts via AUC analysis is dependent on the number of fish observed, the number of flights, frequency of flights assumptions relating to the period of time that adult chinook remain in their natal streams and are visible to counters and their redd residency time.

In addition, there are several streams that are far too turbid on a continuous basis throughout the chinook spawning “window” to allow for an accurate estimation of their population size. These include Herrick Creek, Herrick tributaries Ice and Spakwaniko creeks, the Morkill River and several other systems.

Management activities required in relation to the issues identified above with respect to chinook enumeration within the upper Fraser/McGregor subunit include the following:

Redd residency appears to be linked with the temperature regime chinook experience during their spawning activities, and the chinook bearing streams within this subunit possess a wide range of temperature regimes. There must therefore be additional redd residency surveys conducted on a number of streams within the upper Fraser/McGregor area in order to obtain the information required to generate stock specific AUC estimates of escapement. Linked to this would logically be the collection of several years of stream temperature regime information (at least through the spawning period) from the majority of chinook producing streams in the subunit.

Dome Creek is presently the only chinook producing system in the upper Fraser/McGregor subunit for which there is the potential to obtain complete counts of chinook escapement. It would be beneficial to obtain total confirmed and/or highly accurate estimates of adult escapement information, either through fence and/or mark-recapture operations, on a number of systems that are annually enumerated by helicopter in order to correlate and calibrate helicopter counts and subsequent aerial count expansions. Unfortunately Dome Creek has not proven to be suitable for comparing fence count to aerial surveys as tree canopy in the lower river and the small stock spread out over a long distance in the upper reaches (seldom flown due to cost). In this case helicopter estimates of escapement are known to be inaccurate when compared to the fence counts.

There are methodologies that could be utilized to estimate chinook spawner escapements on streams that are too turbid to gather even rudimentary helicopter estimates. These methodologies would be labor and cost intensive and would have to be annually repetitive until such time that accurate means of correlating chinook escapement in these turbid systems could be made to representative "index" streams. In particular, this type of activity needs to be pursued on Herrick Creek and possibly the Morkill River. Herrick Creek appears to possess a significant amount of viable spawning habitat and some spawning chinook are evident during low turbidity enumeration.

Presently, DNA is the only mechanism utilized for chinook stock identification purposes for the chinook originating from the upper Fraser/McGregor subunit and completed DNA profiles (i.e. enough samples collected and analyzed) do not exist for



some stocks. Sufficient numbers of additional tissue samples need to be obtained from all chinook producing systems in the upper Fraser/McGregor. The option exists to collect these samples from juveniles or adults, and the relative benefits and drawbacks of either collection strategy requires assessment prior to their collection.

### Enumeration Strategy

There is a need for the development of an overall long-term upper Fraser/McGregor chinook spawner enumeration strategy, including a review of the results and effectiveness of the existing process, (for which much of the necessary information would be derived from the redress of the issues and suggested projects discussed above). Annual helicopter enumerations are very expensive and until much of the information as suggested above is developed, the accuracy of this methodology on many streams will be in question. As information relating to the suggested projects is developed, a plan for continued aerial enumeration of these streams could be refined in terms of the number of required flights and their schedule based on stream/stock specific timing, stream specific predictions of temperature regime, and stock specific characteristics of redd residency.

In addition, examinations of correlations between annual counts on different systems over several years of data may indicate that it is not necessary to count all systems annually due to a possible high degree of correlation between annual trends in escapement (i.e. determination of index stocks for enumeration). This type of analysis should be incorporated into the development of the enumeration strategy.

### Productive Capacity Assessment

There is also a need to develop a strategy to assess the productive capacity of the many chinook producing streams within the upper Fraser and therefore provide the information necessary to develop scientifically based escapement targets. There has only been “accurate” (accurate in the sense that all major chinook spawning areas are assessed annually) annual escapement records developed for the upper Fraser/McGregor chinook stocks since 1985, and as discussed above, the accuracy of annual enumerations since 1985 is still questionable for many streams. It is apparent during this 17 year period that chinook escapements to many systems have increased in response to DFO’s chinook management policy that was imposed during a portion of that time period. This apparent increase suggests that escapement levels were well below productive capacity.

The strategy to assess the chinook production capability of this subunit should include evaluating and amalgamating TEK and Western Ecological Knowledge (WEK)

estimations of the historical (pre-commercial exploitation) chinook spawner escapements in several upper Fraser/ McGregor systems. Evidence of First Nations usage of the resource is evident throughout the area and knowledge of past usage patterns should be gathered. As well, quantitative surveys of spawning habitat and juvenile rearing potential and usage should be completed.

There is a need for the development of additional information specific to life history strategy of upper Fraser chinook, specifically as it relates to the freshwater rearing habits of juvenile fish. Adult scale patterns and juvenile surveys within natal streams both indicate that the upper Fraser/McGregor chinook stocks all reside in freshwater for a year prior to out-migrating to the marine environment. However, previous work has indicated that many juveniles originating from natal habitats within streams tributary to the upper Fraser/McGregor out-migrate at various times within their first year to the Fraser mainstem, where they over-winter before leaving fresh water as yearling smolts (Bradford). Others juveniles maintain residence within their natal habitats for their first year before out-migrating to the Fraser and downstream. It is not known to what extent that these various life history strategies contribute to eventual adult production and subsequent spawning escapement. This information is critical to an accurate estimation of the productive capacity of the upper Fraser/McGregor for chinook, and thus the development of escapement targets.

#### Escapement Target Development

As the activities described above are undertaken and the associated productive capability information is developed, escapement targets for upper Fraser/McGregor chinook stocks can be developed. This work should be completed as a component of the Wild Salmon Policy implementation.

#### Sockeye Issues

The continued decline in Bowron sockeye returning annually is wholly dependent of decisions made with respect to lower Fraser River and marine fisheries. The catch of Bowron sockeye within commercial fisheries, and within First Nations' in-river fisheries, has approached exploitation levels of 60-75% in some years. This unsustainably high level of exploitation on the much smaller Bowron stock over a number of generations has depressed the present spawning population on all cycle years to levels that are well below normal cyclical minimums. The continued and ongoing depression of the strength of the Bowron sockeye stock concerns the Lheidli T'enneh First Nation, as they recognize the inherent impact the sustained absence of large quantities of returning adult sockeye has likely had on the health of the aquatic and terrestrial ecosystems of the Bowron watershed.

There is a fundamental need for the development of a recovery strategy to rebuild the Bowron sockeye stock to historical levels of abundance. This strategy must include continued and expanded efforts to discourage and discontinue the implementation of fisheries that exploit this stock. In addition, despite the natal spawning and rearing habitat of this stock being sheltered from physical alteration, a need to enhance the rebuilding of the stock through increasing the productive capacity of Bowron Lake via lake fertilization has been suggested. The productivity of Bowron Lake requires a thorough examination to determine if this may be a feasible means of increasing smolt production and survival. Multiple generations and decades of declining marine derived inputs of nutrients into the system, relative to the historical norms, have likely severely altered and reduced the ability of the lake to support rearing sockeye juveniles. The recovery strategy developed should consider the two factors described above (reducing exploitation and increasing smolt output) and be long-term.

Historical and more recent evidence exists indicating a stock of sockeye may have utilized the Slim Creek Slim/Tumuch lakes system. The presence of kokanee in the lakes possibly verifies that sockeye once used this system. There does not appear to have been any recent assessments of the status of this stock. Efforts to investigate the existence and status of this stock should be undertaken. There is also TEK indicating evidence for the past presence of a sockeye population that once utilized the Salmon River watershed. This evidence should be developed and if sufficient rationale exists, consideration should be given to stock re-establishment.

### **General Issues and Opportunities**

The fish counting fence annually operated on Dome Creek has been operated without any participation of First Nations personnel until 2002. A strategy and related efforts should be undertaken to continue increasing involvement of First Nations personnel into this operation. This is also key as there are recommendations suggested above to expand fence and mark-recapture operations to other systems within the upper Fraser/McGregor for the purposes of calibrating aerial enumerations and the development of the required capacity could be partially obtained on the Dome fence operation.

Additionally, the Penny chinook hatchery has been operating without little participation from First Nation's personnel since its inception. While the nature and degree of the level of enhancement of upper Fraser chinook stocks created by this hatchery is minimal, it is an invaluable mechanism for the purposes of providing a source of marked (adipose clipped) and CWTagged smolts to assess freshwater and

oceanic migratory patterns and timing, and marine and freshwater exploitation rates on upper Fraser/ McGregor chinook stocks. If so desired, a strategy and related efforts should be undertaken to initiate involvement of First Nations personnel into this operation.

Relatively extensive studies have been completed on the upstream fish migration barrier on the lower Willow River. These have included studies of the nature of the barrier and potential means of modification to improve upstream fish access, the state of mainstem and tributary habitats upstream of the barrier in relation to potential chinook productive capability, and the ecological implications of facilitating annual upstream access for chinook on the existing fish faunal assemblage (Lheidli T'enneh 1999, 2000 & 2002). The rationale for exploring the potential for facilitating upstream access for chinook was the thought that the productive potential of the upper Willow would be comparable to that of the Bowron River. Initial assessments of the barrier by DFO Engineering staff indicated that it was plausible to improve upstream migration via controlled blasting of rock in several problematic areas. During public consultation undertaken by the Lheidli T'enneh it was noted that there was some public opposition to the potential for modifying the barrier, largely due to recreationalists' self-serving interests and misinformation (i.e. rock/ice climbers that use the Willow canyon believing that their climbing opportunities would be altered, and kayakers and canoeists believing the whitewater that is now utilized would be altered and/or the presence of chinook would lead to the imposition of environmental regulations restricting their use of the stream).

Continued active investigation into the plausibility and rationale for carrying out this barrier modification should be continued. Efforts should possibly focus on establishing evidence for past anadromous access to the upper watershed and historical levels of use. This information should be compiled with information developed relating to the historical levels of chinook escapement on other upper Fraser/McGregor systems. If it is apparent that historical escapement levels were considerably higher than recent and present day escapements, this information could be utilized as a strong rationale for furthering the project. As well, if past levels of anadromous use of the upper Willow can be established, this would provide further ecological rationale for the project. Alternatively, the basis of the project provides for a good opportunity for conducting research into the effects of chinook colonization on under utilized habitats, habitat carrying capacity and other conditions that could be generated by conducting a juvenile chinook stocking program in the watershed upstream of the barrier. This may also provide a safe (reversible) mechanism for assessing the potential for increasing chinook production by improving access conditions.

Table 5. A summary of the fish stock and fisheries management activities and related roles that, if undertaken, were identified as being potentially beneficial to the management of the anadromous resources of the upper Fraser/McGregor Subunit by either First Nations or Fisheries and Oceans Canada staff during this strategic planning process.

<b>Project</b>	<b>Rationale and Description</b>	<b>Suggested Format and Action</b>	<b>Funding Source &amp; Amount (\$)</b>	<b>Staffing Requirements/ Timing</b>
Refinement of Accuracy of Aerial Estimates of Chinook Escapement	Some need for understanding statistical properties and impact of varying chinook behaviour and counter accuracy on visual adult chinook survey estimates. Will include fence counts and/or further mark-recovery projects such as that conducted on Dome Creek. Also, includes further assessments of redd residency and role stream temperature plays on spawning behaviour and timing (see below).	Mark-recovery program in conjunction with Dome fence operation is intended to continue. First Nations should maintain and enhance involvement to develop capacity. Need for development of strategy that identifies additional streams in the upper Fraser/McGregor where these activities should be conducted and assesses associated logistical considerations with each stream and estimated costs.	Cost and source of revenues for Dome project are described above. Cost for development of strategy is relatively small ~ 10K. Cost of fence/weir and/or mark-recovery programs will be quite large.	Strategy will have to be developed by qualified biologist in conjunction with DFO stock assessment personnel. Fence and mark-recovery programs require numerous entry level technicians with direct supervision from experienced technicians.
Refinement of Accuracy of Aerial Estimates of Chinook Escapement	Redd residency studies in upper Fraser/McGregor systems of varying character to assess timing and duration of spawning. Temperature monitoring programs. These will be required to interpolate aerial adult escapement estimates to area under curve expansions and quantify factors effecting spawning behaviour.	Activities have been initiated by Lheidli in one system and are planned to be expanded to other systems. Need to develop plan identifying streams and locations where future surveys will take place and assess logistics of each. As well, need to integrate stream temperature monitoring program into plan and summarize past enumeration results relative to temperature monitoring (ongoing program/reporting).	Source of funds for existing/past work has been through AFS and additional DFO contributions.	Studies can be completed by personnel with on the job training. Projects generally require 2 technicians for a period of 3 weeks.
Non-Aerial Chinook enumeration	Several systems are too turbid to provide even a rudimentary assessment of adult escapement via helicopter counts. Need to develop mark-	Need for development of multi-year strategy whereby different streams would be identified for assessment and the feasibility of the various means for conducting alternative chinook	Cost of development of the strategy would be relatively small ~ 10K. Cost of subsequent mark-	Strategy will have to be developed by local technicians in conjunction with DFO stock assessment personnel. Mark recovery

<b>Project</b>	<b>Rationale and Description</b>	<b>Suggested Format and Action</b>	<b>Funding Source &amp; Amount (\$)</b>	<b>Staffing Requirements/ Timing</b>
	recapture/recovery programs on these systems to develop estimate of chinook usage and eventually, after several years of mark-recovery programs, develop correlative indexes for these streams to those that can be accurately estimated.	enumeration could be assessed for each.	recovery programs will be large.	programs can be accomplished by personnel with fish handling and stream enumeration experience (no. required will vary depending on the nature of program) accompanied by appropriate senior field staff.
Upper Fraser/McGregor Chinook Life History Studies	Major knowledge gap is understanding contributions/survivals/ behavioural differences of alternate life histories (imm. migrant vs late summer migrants vs yearling smolts for chinook). Several varying juvenile life histories for chinook have been documented in the upper Fraser/McGregor stocks. The consequences of these variances on chinook production subsequent to adult escapement, and on potential chinook escapement targets and enhancement strategies is presently unknown.	Feasible and likely favourable to partner with UNBC on this project. Requirement to develop a plan that outlines what the specific intended objectives of study would be in conjunction with DFO science/stock assessment personnel. Further requirement to develop refined study design that would likely be multiple years in duration.	Will vary depending on specific nature of study design. Funding sources could include university grants.	Will also vary depending on study design adopted. Specific senior research personnel overseeing and directing this project will likely be required to be postgraduate level biologist. Field related activities can be conducted by technicians with basic field training and some experience, depending on methodologies employed.
Upper Fraser/McGregor Chinook Enumeration Strategy	Likely the largest annual expenditure related to fisheries activities within the upper Fraser/McGregor subunit is the aerial enumeration program. Efficiencies and cost savings to	Until information from related activities described above is obtained, requirement to assess previous annual chinook aerial enumeration statistics to determine trends in flight timing, peak counts/spawning, spawning timing, annual escapement	Initial analysis described would have to be completed with the input of DFO stock assessment personnel and should	Analysis described likely required to be conducted by biologist working in conjunction with DFO stock assessment biologist.

<b>Project</b>	<b>Rationale and Description</b>	<b>Suggested Format and Action</b>	<b>Funding Source &amp; Amount (\$)</b>	<b>Staffing Requirements/ Timing</b>
	the program while increasing its efficacy are likely possible through the integration of the information to be obtained from the activities described above into a strategy to better “time” flights, reduce or cease flights on systems where count accuracy is not worthwhile and can be obtained via other means, and reduce the number of flights required based on refinement of flight times relative to knowledge of spawning behaviour.	trends between systems, duration of spawning, and peak counts vs. final/area under curve escapement estimate.	be funded by DFO.	
Willow Barrier/Chinook Enhancement Project	Mid and upper Willow watershed possess high quality spawning and rearing habitats that are not presently accessible to chinook. Evidence indicates chinook escapement could be increased considerably by providing access. Much of the groundwork assessing the plausibility and effects of the potential barrier modification has been completed. There is a need to develop a strategy to assess public and agency desire to pursue the implementation of the barrier modification.	Need to for interested parties to assess the rationale for the undertaking and DFO's commitment to the project, and develop subsequent strategies for furthering this initiative. As well, could also look towards artificial enhancement and outplanting of chinook (and possibly sockeye) above the barrier for a number of years to study colonization rates and resulting increases in escapement to the Willow.	Cost will be dependent on format of any related undertaking. Project basis would provide excellent opportunity for study team to assess habitat capability for chinook and therefore may be possible to attract university funding.	Number and qualifications of any staff required will be dependent on nature of project.
Bowron Sockeye Recovery Plan	Bowron Sockeye stock depressed below spawning and lake rearing habitat capability	Need for interested parties to meet to discuss common goals relating to stock. Subsequent need for development of	Likely required to be funded through AFS program 15,000	Coordination and completion of strategy development will require

<b>Project</b>	<b>Rationale and Description</b>	<b>Suggested Format and Action</b>	<b>Funding Source &amp; Amount (\$)</b>	<b>Staffing Requirements/ Timing</b>
	due to exploitative factors. Need to develop a strategy that includes the identification and analysis of the possible methodologies for increasing spawner escapements and recommends specific directions to pursue this objective.	strategy with technical and political components to achieve goals.		senior management personnel with input from biologist familiar with situation.
Land Use Regulation Efficacy Assessment	Strong support for conducting an ongoing program to monitor licensee compliance to existing forest harvesting regulations and also assess the congruence of these regulations with the Fisheries Act and the Fish Protection Act.	See Section on Information Requirements Common to All Subunits	See Section on Information Requirements Common to All Subunits	See Section on Information Requirements Common to All Subunits
Test Fishery/Fish Wheel Operation	In-season/river estimates of Fraser stock abundance and composition are being proposed to be developed throughout the Fraser watershed. The proposed location of tag recovery/application is presently downstream of the Nechako/Fraser confluences and this activity is therefore further expanded on within the Cottonwood Blackwater Subunit.	See Cottonwood/Blackwater Subunit	See Cottonwood/Blackwater Subunit	See Cottonwood/Blackwater Subunit



## **NECHAKO/STUART SUBUNIT**

### **Geographical Context**

The Nechako/Stuart subunit of the plan area incorporates the Nechako River watershed (Figure 2). Originating from the eastern aspect of the coastal mountains in Tweedsmuir Provincial Park, the Nechako flows east to Prince George where it joins the Fraser. The largest tributary to the Nechako, the Stuart River, flows from the north where it drains a network of large lakes (Stuart, Trembleur, and Takla) that received runoff from the Omineca, Driftwood and Frypan mountain ranges. In the 1950s the Aluminum Company of Canada Ltd. (ALCAN) initiated a large-scale hydroelectric generation project on the Nechako River approximately 250km upstream from its confluence with the Fraser, which included the construction of the Kenney Dam, an earthen filled blockage of the Nechako which resulted in the creation of a series of reservoirs upstream of the dam. The objective and result of the dam was the redirection of a portion of the Nechako through the coast range via a tunnel and into the Kemano River where it is utilized to generate hydroelectric power for Alcan's aluminum smelter. Access for anadromous fish was never available upstream of the area where the Kenney Dam is now situated and therefore salmon habitats were not obstructed by this development.

The area of the watershed is largely entirely within the Sub-Boreal Spruce (SBS) Biogeoclimatic Zone with lesser amounts of Engelmann Spruce-Subalpine Fir. Downstream of the Kenney dam the Nechako flows through the Nechako plateau, which is dominated by land uses that include agricultural development and forest harvesting. Industrial development within Stuart basin is overwhelmingly dominated by forestry, with harvesting and associated development occurring throughout the vast majority of the watersheds that drain into the basin. There is a history of mineral development in the area dating back to the 1930s, and specifically past mercury mining activities in the Pinchi Creek watershed have been identified as a concern in the past (Hickey et al. 1997).

### **First Nations Interest**

First Nation communities that occur within this subunit and/or possess Territories that include a portion of the area include the Lheidli T'enneh, Yekooche, Saikuz, Nak'azdli, Tl'azt'en, Takla, Stelat'en, Wet'suwet'en and Burns Lake First Nations. Of these the latter 7 are members of the Carrier Sekani Tribal Council based in Prince George. The Skin Tyee, Cheslatta and Nee-Tahi-Buhn First Nations also occur within this subunit.

## **Stocks Present**

The Nechako basin contains a wealth of resident and anadromous fish stocks. Major sockeye stocks originating from the area include the early and later Stuart, the Nadina and the Stellako. The Early Stuart sockeye stock is recognized as a distinct complex<sup>1</sup> in DFO's sockeye management strategy. The four-year cycle mean annual total run size (includes re-construction from all exploitation) for Early Stuart sockeye returns was approximately 340,000 fish based on 1960-1993 records (Table #6, Fraser River Action Plan 1995). The returns of the Early Stuart stock have been highly variable historically and recent returns have been generally consistently below those forecast. The Nadina stock spawns within the Nadina River and tributaries at the top end of Francois Lake and is managed as a portion of the Early Summer Fraser sockeye stock grouping. The Nadina includes an enhanced component due to a spawning channel constructed on the stream in the 1970s. Returns of the stock have been highly variable.

The late Stuart stock and Stellako stock are managed as a portion of the Summer Fraser sockeye stock grouping. The four year cycle mean annual total run size for Late Stuart stocks averaged 551,000 based on 1960-1993 records, and reached a peak recorded return of 5.5 million in 1993 (Fraser River Action Plan, 1995). Spawning escapement and total run size within the most recent cycle has generally been less than expected. The Stellako stock has demonstrated a recent trend in increased run size and spawner escapement, particularly for the historically less dominant cycle years.

All of the Nechako sockeye stocks are particularly important for First Nations food fisheries throughout the Fraser watershed and especially within their respective terminal areas where they are the only stocks returning. The Early Stuart sockeye are highly sought after due to their timing (first sockeye stock to enter the Fraser) and their characteristically high oil content. The Late Stuart has also been historically an important component of the commercial fishery due to its timing of entry into the lower Fraser in conjunction with the much larger Horsefly/Quesnel and Chilko sockeye stocks.

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<sup>2</sup> DFO manages the harvest and escapement of Fraser River sockeye stocks based on aggregates of sockeye stocks that have historically demonstrated similar dates of entry into the lower Fraser River. These aggregates of stocks are termed Complexes.

Table 6. Available data for spawner escapement and total adult return from brood year for the Early Stuart, Nadina, Late Stuart and Stellako sockeye stocks from 1956-1988 respectively.

<b>EARLY STUART</b>															
1992 CYCLE YEAR				1993 CYCLE YEAR				1994 CYCLE YEAR				1995 CYCLE YEAR			
Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio	Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio	Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio	Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio
1956	25,020	110,394	4.41	1957	234,850	1,222,936	5.21	1958	38,807	103,107	2.66	1959	2,670	20,835	7.80
1960	14,447	74,149	5.13	1961	198,921	255,842	1.29	1962	26,716	75,785	2.84	1963	4,607	92,554	20.09
1964	2,390	42,887	17.94	1965	23,045	417,211	18.10	1966	10,830	84,786	7.83	1967	21,044	339,693	16.14
1968	1,522	10,423	6.85	1969	109,655	1,375,594	12.54	1970	32,578	182,136	5.59	1971	95,940	431,210	4.49
1972	4,657	32,232	6.92	1973	299,882	1,341,984	4.48	1974	39,518	140,516	3.56	1975	65,752	224,052	3.41
1976	11,761	31,854	2.71	1977	117,445	761,059	6.48	1978	50,004	65,197	1.30	1979	92,746	107,905	1.16
1980	16,939	63,501	3.75	1981	129,457	350,141	2.70	1982	4,557	27,885	6.12	1983	23,867	190,779	7.99
1984	45,205	247,504	5.48	1985	234,219	1,196,979	5.11	1986	28,584	143,469	5.02	1987	146,567	526,938	3.60
1988	179,807	296,821	1.65	1989	384,799	1,297,000	3.37								
Average	33,528	101,085	6.09	Average	192,476	913,194	6.59	Average	28,949	102,860	4.36	Average	56,649	241,746	8.09

<b>LATE NADINA</b>															
1992 CYCLE YEAR				1993 CYCLE YEAR				1994 CYCLE YEAR				1995 CYCLE YEAR			
Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio	Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio	Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio	Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio
1956	18	4,108	228.22	1957	27,548	116,806	4.24	1958	635	5,083	8.00	1959	1,013	17,000	16.78
1960	29	1,178	40.62	1961	17,542	94,420	5.38	1962	1,683	12,045	7.16	1963	7,304	59,653	8.17
1964	209	7,735	37.01	1965	11,293	95,017	8.41	1966	1,724	34,010	19.73	1967	7,790	153,066	19.65
1968	1,249	49,963	35.20	1969	27,895	106,258	3.81	1970	3,929	29,884	7.61	1971	14,481	75,454	5.21
1972	2,554	10,728	4.20	1973	16,720	79,728	4.77	1974	3,730	12,482	3.35	1975	15,309	307,348	20.08
1976	1,625	7,257	4.47	1977	16,858	131,790	7.82	1978	2,584	31,250	12.09	1979	55,681	101,369	1.82
1980	3,017	21,372	7.08	1981	18,912	76,800	4.06	1982	2,349	6,762	2.88	1983	26,856	165,727	6.17
1984	7,070	36,042	5.10	1985	13,807	21,110	1.53	1986	3,545	20,878	5.89	1987	37,624	199,807	5.31
1988	8,744	43,043	4.92												
Average	2,724	20,158	40.76	Average	18,822	90,241	5.00	Average	2,522	19,049	8.34	Average	20,757	134,928	10.40

<b>LATE STUART</b>															
1992 CYCLE YEAR				1993 CYCLE YEAR				1994 CYCLE YEAR				1995 CYCLE YEAR			
Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio	Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio	Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio	Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio
1956	913	46,102	50.50	1957	368,364	1,329,884	3.61	1958	23,619	54,677	2.31	1959	8,225	7,392	0.90
1960	2,396	9,617	4.01	1961	410,887	778,478	1.89	1962	18,643	45,069	2.42	1963	3,222	12,049	3.74
1964	1,816	3,101	1.71	1965	214,943	1,124,519	5.23	1966	9,027	74,079	8.21	1967	1,629	16,556	10.16
1968	389	31,299	80.46	1969	207,014	1,625,590	7.85	1970	14,978	70,838	4.73	1971	1,535	66,770	43.50
1972	7,341	17,266	2.35	1973	214,230	606,161	2.83	1974	14,190	43,407	3.06	1975	14,229	196,849	13.83
1976	2,898	3,339	1.15	1977	146,459	1,349,459	9.21	1978	12,738	66,580	5.23	1979	31,918	6,854	0.21
1980	946	21,440	22.66	1981	249,494	2,033,901	8.15	1982	16,758	58,003	3.46	1983	2,246	19,456	8.66
1984	1,228	11,930	9.71	1985	274,620	3,174,851	11.56	1986	28,715	785,959	27.37	1987	6,472	221,909	34.29
1988	7,117	88,792	12.48	1989	575,697	5,600,000	9.73								
Average	2,783	25,876	20.56	Average	295,745	1,958,094	6.67	Average	17,334	149,827	7.10	Average	8,685	68,479	14.41

<b>STELLAKO RIVER</b>															
1992 CYCLE YEAR				1993 CYCLE YEAR				1994 CYCLE YEAR				1995 CYCLE YEAR			
Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio	Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio	Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio	Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio
1956	38,438	246,735	6.42	1957	38,522	615,843	3.94	1958	112,251	340,460	3.03	1959	79,305	541,420	6.83
1960	38,880	164,514	4.23	1961	46,863	147,402	3.15	1962	124,485	589,505	4.74	1963	138,794	727,926	5.24
1964	30,890	177,837	5.76	1965	39,385	243,651	6.19	1966	101,529	359,906	3.54	1967	91,480	550,524	6.02
1968	30,368	129,822	4.27	1969	49,211	253,245	5.15	1970	45,797	234,108	5.11	1971	39,691	509,267	12.83
1972	36,700	758,244	20.66	1973	30,404	77,458	2.55	1974	41,275	262,761	6.37	1975	175,941	1,750,824	9.95
1976	150,734	244,377	1.62	1977	23,047	249,656	10.83	1978	58,898	437,422	7.43	1979	290,042	623,912	2.15
1980	72,050	755,406	10.48	1981	21,826	285,896	13.10	1982	69,420	358,218	5.16	1983	121,692	1,216,211	9.99
1984	60,959	828,329	13.59	1985	42,099	618,151	3.99	1986	77,177	564,679	7.32	1987	211,085	642,400	3.04
1988	367,702	546,872	1.49												
Average	91,858	428,015	7.61	Average	36,420	197,163	6.11	Average	78,854	393,382	5.34	Average	143,504	820,311	7.01

Table 7. Spawner escapement to sockeye natal habitats within the Nechako/Stuart subunit from 1988-2002. "N.I." infers not inspected, blank cells indicate no information present within DFO database.

	Early Nadina River	Late Nadina River	Nadina Channel	Endako River	Stellako River	Nithi River	Ormond Creek	Early Stuart	Late Stuart
1988	567	794	0	0	367751	34	NI	182129	11459
1989	0	545	4395	0	43189	0	0	384819	575791
1990	0	360	5687	0	93928	0	0	97049	190060
1991	NI	5,000	56074	100	94931	NI	NI	141152	77322
1992		862	6866		97985			66037	23892
1993		1,000	8595		91443			688015	1805143
1994			2007		136797			29477	83384
1995		2,500	21506		122730			122787	34362
1996		8,908	29746		333172			88412	65898
1997		4,588	4911		55385			275538	907652
1998		760	2964		185697			32590	139421
1999		3,240	7120		138151	0	31	24532	62120
2000		159,529	34852	0	371564	583	0	89748	454478
2001		19,897	34852		151432	99	NI	170908	351827
2002		421	1504		322661	20	99	24637	34521

Chinook stocks are numerous but mostly smaller with the exception of two larger stocks in the mainstem Nechako and Stuart. All chinook stocks originating from natal habitats in this subunit are listed in the table below and are thought to be consistently less than 750 spawners annually, with the Stellako, Endako and Nadina Chinook stocks estimated at less than 200 spawners annually.

Table 8. Natal stream habitats for Chinook stocks occurring within the Nechako/Stuart Subunit and their corresponding DFO management units.

Drainage	Current Management unit
Nechako River	5.2 Summers
Stuart River	5.2 Summers
Stellako River	5.2 Summers
Nadina River	5.2 Summers
Endako River	5.2 Springs
Chilako River	5.2 Springs
Kazchek River	5.2 Summers
Kuzkwa River	5.2 Summers
Pinchi Creek	5.2 Summers
Tachie River	5.2 Summers

Table 9. Numbers of adult chinook enumerated in natal habitats within the Nechako/Stuart Subunit from 1991-2002.

	<u>1991</u>	<u>1992</u>	<u>1993</u>	<u>1994</u>	<u>1995</u>	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>1999</u>	<u>Peak Live</u> <u>2000</u>	<u>A.U.C.</u> <u>2000</u>	<u>Peak Live</u> <u>2001</u>	<u>A.U.C.</u> <u>2001</u>	<u>Peak Live</u> <u>2002</u>	<u>A.U.C.</u> <u>2002</u>
Chilako River	150	150	25	119	200	624	186	39	115	20	N/A	7	N/A	229	N/A
Endako River	200	10	20	200	125	167	43	191	171	160	N/A	275	N/A	292	N/A
Kazchek Creek								0 present	Present	Present	N/A	N/O	N/A	N.O	N/A
Kuzkwa River												215	N/A	300	N/A
Nechako River	2360	2498	664	1144	1689	2040	1954	1868	1917	N/A	3794	9331	5327	5546	3296
Pinchi Creek								2 present	present	45	N/A	14	N/A	Present	N/A
Stellako River								15	18	N/A	N/A	N/A	N/A	N.O.	N/A
Stuart River	7500	15000	1000	2420	3730	7415	6221	4642	3875	1875	N/A	1954	N/A	Present	N/A
<b>Totals</b>	<b>10210</b>	<b>17658</b>	<b>1709</b>	<b>3883</b>	<b>5744</b>	<b>10246</b>	<b>8404</b>	<b>6757</b>	<b>6096</b>	<b>2100</b>	<b>3794</b>	<b>11796</b>	<b>5327</b>	<b>6367</b>	<b>3296</b>

Adult coho have reportedly been observed in the Nechako (spawning) in the vicinity of a local (Bert Irvine's) residence a relatively short distance downstream of the dam. Confirmed juvenile coho captures have been documented from the Nechako River during juvenile salmonid sampling programs (Bailey, 2004). Distribution and usage by coho is otherwise unknown and there are no annual programs to assess stock presence or strength. Pink salmon also likely utilize the Nechako watershed during odd years as their presence has been noted in adjacent areas. There are no enumeration programs to assess pink salmon distribution of abundance in the Nechako.

While the Nechako white sturgeon stock is not anadromous by the nature of its life history in this watershed, this fish population is worthy of discussion here. The Nechako sturgeon have been classified as a distinct stock grouping of the Fraser River white sturgeon population, which is composed of at least 4 genetically distinct stocks in total (Smith et al. 2002). Several years of assessment activities on the Nechako have identified the stock as having suffered from a recruitment failure, likely related to the regulation of the Nechako River's discharge regime.

## **Ongoing Enumeration/Assessment/Management Activities**

### Sockeye Enumeration

Sockeye enumeration activities within the Nechako/Stuart watershed have included programs on all stocks present, including the Nadina, Stellako, early Stuart and late Stuart. DFO has and continues to maintain a fisheries camp at the Middle River outlet from Takla Lake, which has normally been manned from the April-October period for many years. During the last several years personnel from the Tl'azt'en fisheries program have become integrated into the programs that are carried out from this post. These programs include assessments of egg-fry survival through downstream fry capture programs on several spawning tributaries to Takla Lake and the Middle River, adult enumeration programs (fences, ground and aerial surveys) on many of the major spawning tributaries. This area and these activities encompass both early and late Stuart sockeye stocks as well as several Chinook spawning tributaries. The CSTC fisheries program has also integrated technical staff into early Stuart management activities including downstream fry capture programs (egg-fry survival assessment) and adult enumeration programs (fences, ground and aerial surveys). These programs have been focussed on tributaries to the Northwest Arm and northern portions of Takla Lake, including Dust Creek and the Driftwood River. The spawning grounds of the Early and Late Stuart sockeye stocks are somewhat spatially separated in that the early component spawns in numerous tributaries to Takla Lake, a few tributaries to Trembleur Lake, and several tributaries to the Middle River. The late component spawns mainly within the mainstem of the Middle and Tachie rivers and associated tributaries.

Adult enumeration efforts on the Stellako River sockeye stock have historically included a ground-based program of live counts and dead pitch/carcass recovery. In recent years the CSTC has played a larger role in these activities and now completes the ground-based counts and carcass recovery with direction from DFO and has also installed and manned a counting weir on the lower Stellako River for multiple years. Additionally, egg-fry survival has been monitored on the stream for the last decade. Nadina sockeye, which migrate through the Stellako River and Francois Lake and into the Nadina River possess earlier timing than the Stellako stock and include an enhanced component derived from a spawning channel that was constructed on the Nadina River in the early 1970s. Fish are counted into the spawning channel. Mainstem spawners are assessed in years of large returns via helicopter enumeration. Downstream fry programs (egg-fry survival) have been conducted within the channel for a number of years and in the mainstem of the Nadina River for at least two seasons when escapement exceeded 30,000 adults. The CSTC contributes technical personnel to both of these initiatives.

### Re-Colonization/Enhancement Projects

Ormond Creek, a tributary to Fraser Lake, was the target of re-colonization efforts by the CSTC fisheries program utilizing Stellako sockeye progeny. The original sockeye that were once present within the stream were extirpated several years ago as a result of beaver activity that completely impeded upstream fish access for several cycles. Re-introduction efforts were completed for four years and efforts related to stream clearance have been conducted annually by the CSTC Fisheries Program's technicians.

The Nithi River has been the focus of habitat enhancement activities for a number of years, which culminated in the installation of a flow control weir at the streams outlet from Borel Lake in 2000. The weir is designed to create more live storage within Borel Lake and is equipped with a base orifice that ensures a minimum flow is maintained throughout summer and winter low flow periods. This weir was designed and constructed in an effort to address portions of the lower Nithi River that were consistently becoming dewatered during summer and winter low flows resulting in the death of many juvenile rainbow trout. In addition, the stream previously provided natal spawning habitat for a sockeye stock and kokanee from Francois Lake. It is reported that neither of these species have been able to access suitable spawning habitat within the stream due to low flows and beaver activities for at least a 10 year period from 1990-2000. However, sockeye are normally noted within the lowest portions of the Nithi River and are likely "strays" from the Stellako stock and can likely not access suitable spawning habitat due to beaver activity. Thus far the weir has been successful in maintaining wetted habitat throughout the problem portion of the stream during the summer-fall low flow period, but the weir has not been manipulated in an effort to allow sockeye and kokanee to access the stream. An annual program for weir maintenance and adjustment has been developed and implemented and will continue to be refined to improve downstream habitat conditions (Toth, 2003). The CSTC Fisheries Program has undertaken management of the weir through the use of their AFS funds.

Multiple assessments of the value and feasibility of constructing a flow control weir on the Endako River's outlet from Burns Lake have been completed in the last several years (Shepert, 2004). The weir proposed to be constructed would increase live storage within Burns Lake and redistribute available discharge into the late summer to redress low flow issues which are known to effect a small Chinook population that spawns in the Endako River and tributary Shovel Creek. These assessments are presently continuing and are at the stage of public consultation. Should a weir be installed there will be a requirement for an annual program of maintenance and adjustment and subsequent monitoring of habitat conditions.

### Chinook Enumeration

Annual Chinook enumeration and associated activities on the Nechako mainstem spawning population are quite intensive and are completed as a portion of the Nechako Fish Compensation Program's (NFCP) suite of projects. These activities have included annual aerial enumeration, carcass recovery, redd residency assessment, and mark-recovery programs. In addition, egg to fry survival has also been monitored intensively through annual downstream juvenile Chinook capture programs. Adult Chinook enumeration programs on the Stuart River mainstem spawning population have also been completed on numerous years. These programs have also been completed/funded as a portion of the NFCP. The results of the Stuart programs have not been reliable and the program was not continued in 2003.

Adult Chinook assessment is mostly visual on other Nechako tributary populations, and includes one or two over-flights per year on the Chilako and ground-based surveys of populations that spawn in Middle River tributaries including Pinchi, Kazchek and Kuzkwa creeks. These surveys are completed as a portion of the activities focussed on sockeye enumeration, which are completed in this area jointly by technicians from DFO and Tl'azt'en. The Spruce City Wildlife Association has installed and manned a Chinook counting fence on the Chilako River in the past, but has not continued this operation in the last two years. The Chinook population in the Endako River, which flows into the Stellako River near Fraser Lake, is annually completed via ground-based programs conducted by the CSTC Fisheries Program. Annual enumeration of the other populations listed in Table 9 are poorly completed or not covered by any programs.

### Nechako Fish Compensation Program

Several of the annual activities identified and described above are implemented through an agreement between Canada, B.C. and Alcan that identified stock and habitat monitoring activities required on the Nechako River as well as specifying parameters regarding water releases from the Nechako Reservoir. This agreement is termed the "1987 Settlement Agreement" and the fisheries components of the Agreement are specified within the subsequently created Nechako Fisheries Conservation Program (NFCP). The annual activities commissioned under the terms of the agreement and the NFCP operations are overseen by representatives of the three parties to this agreement. The monitoring, research and enhancement components identified within this program were and continue to be focussed around assessing and monitoring specific physical and biological aspects of the watershed relative to the Kemano Completion Project, and the related long-term flows that would have resulted from this project. However, the Province of B.C. rejected the Kemano Completion Project in 1995 and drafted a new agreement between B.C. and



Alcan termed the 1997 B.C.-Alcan Agreement, which specified that water releases from the Nechako Reservoir would remain at their existing value. At present, the NFCP is conducting a review of their activities undertaken since 1987 to assess data collected and provide guidance to the future activities of the program in light of the cancellation of the Kemano Completion Project (NFCP Website).

#### Nechako White Sturgeon Recovery Initiative

The Nechako River contains a stock of white sturgeon that has been identified as being genetically distinct from the closest geographically related stocks, which occur in the upper and middle Fraser River. While not anadromous by nature in this portion of the watershed, Nechako sturgeon are considered within this plan due to the dire nature of their plight. They have suffered a failure to recruit juveniles into the population for several decades, resulting in an ageing population of adult fish, of which the reproductive viability is diminishing. The stock has been listed as “critically imperilled” by the Province and was reviewed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and listed as Endangered in the fall of 2003. The Nechako White Sturgeon Recovery Initiative (NWSRI), focussed on facilitating the recovery of this stock, was initiated in 2001 and continues to develop and research recovery options. This initiative includes a technical team and a quasi political/social consultative mechanism with representatives from surrounding communities, industry and all levels of government. The Carrier Sekani Tribal Council and Lheidli T’enneh Band have contributed resources to both “teams” of the initiative.

The NWSRI has undertaken a minimum amount of field activities to date. An assessment of sturgeon presence within the Stuart system was initiated by the CSTC in 2002 and is expected to continue in 2004 (Shepert, 2004). Other activities undertaken since 2001 have included tagging and monitoring radio tagged sturgeon, and several office based assessments of existing data for the purposes of determining factors affecting sturgeon recruitment. Activities related to this recovery initiative can be expected to continue and expand for the next several decades, and will likely include the construction and operation of a sturgeon hatchery in Prince George.

#### Food Fish Monitoring

Each First Nations community within the Nechako/Stuart subunit employs a food fishery monitor through the summer food fishery to issue permits to their community’s members, tally food fish catches and apprise fishers of fishery regulations. In addition, a food fishery monitor from Lheidli T’enneh periodically patrols the Nechako River from its confluence with the Fraser upstream to Isle Pierre for similar purposes.

### Temperature Monitoring Program

The CSTC Fisheries Program has annually conducted temperature monitoring of a select number of streams (approximately 10-15) for the last decade. This monitoring program is intended for continuation and expansion to additional streams and possibly parameters, including water level (stage). CSTC has technical personnel within their program to continue to solely manage and direct this program.

### Nadina River Spawning Channel

A spawning channel was constructed on the Nadina River in the early 1970s. This spawning channel was intended to increase the production of sockeye smolts from Francois Lake, which was thought to have a very high potential for producing sockeye smolts. Returns of the Nadina River sockeye stock have been highly variable and have in general not materialized in the numbers that were intended. The channel operations are presently managed by DFO and staffed by their personnel. A total of 1 permanent fulltime staff position is employed at the site and a total of 2-3 seasonal staff is employed at the operation annually.

### Habitat Protection

DFO employs several persons from their office in Prince George to liaise with proponents of developments with potential risks to aquatic habitats and fauna within this subunit. This includes the approximate commitment of 1 enforcement position and 1 habitat biologist..

### **Existing Capacity Summary**

All Federal habitat protection related obligations (enforcement and investigations related to the Fisheries Act, land use development plan review and assessment) undertaken within the Nechako/Stuart subunit are completed by staff from DFO's office in Prince George. As identified above and in table 10, this includes the dedication of 1 enforcement staff (C&P) and 1 habitat staff (HEB). The operation of the Nadina River spawning channel is also completed by DFO staff and contract employees. The CSTC provides technical assistance to specific seasonal projects at the channel. All adult Chinook and sockeye enumeration programs are managed by DFO stock assessment staff from Kamloops. All enumeration programs, with the exception of the Nechako and Stuart Chinook programs that are funded and managed by the NFCP, are operated with some component of their staffing supplied by First Nation communities within the respective area of each First Nation's program. There is no First Nations involvement within the NFCP or the activities conducted through the NFCP, which are presently contracted to private consulting firms. Other annual fisheries related activities discussed above are completed through the capacities within the Carrier Sekani Tribal Council and the TI'azt'en First Nation.

Table 10. A summary of the existing fish stock and fisheries management activities and associated roles presently supported by DFO, NGO and First Nations personnel within the Nechako/Stuart Sub-unit.

<b>Project</b>	<b>Present Responsibility</b>	<b>Funding Source &amp; Amount (\$)</b>	<b>Staffing Requirements/ Timing</b>	<b>Staff Skills</b>
Nechako Chinook (NFCP) Enumeration/Monitoring. Intensive program on the Nechako mainstem including redd residency observations, mark-recovery and aerial enumerations on adults and downstream juvenile emigrant monitoring.	Work is specified and managed through NFCP and awarded to contractors.	Funding is derived from NFCP.	Staffing presently derived through consultants. Staff requirements are dependent on season and programs operating. Late summer adult enumeration and spring juvenile assessment.	Aerial Chinook enumerators must have previous experience. Technicians completing redd residency can have on the job training. Downstream migrant program must be managed by individuals with post-secondary training and experience in similar work.
Early Stuart Sockeye Enumeration. Relatively large program based out of Middle River Camp and Bulkley House focussed on tributaries to Takla Lake and Middle River.	DFO Stock Assessment, Tl'azt'en and CSTC	Funding is derived from DFO stock assessment, Tl'azt'en and CSTC.	Approximately 15 personnel for approximately 6-8 weeks mid July-September.	Variety of projects including fences, stream walks, and aerial counts and biological sampling. Most training can be supplied on the job but personnel must possess reading/writing and data recording skills.
Late Stuart Sockeye Enumeration Relatively large program, based out of Middle River Camp and Tachie Camp, focussed on Middle River and tributaries and Tachie River and tributaries.	DFO stock assessment, Tl'azt'en	Funding from DFO stock assessment and Tl'azt'en	Approximately 15 personnel for approximately 6-8 weeks mid August to late September.	Variety of projects including fences, stream walks, and aerial counts and biological sampling. Most training can be supplied on the job but personnel must possess reading/writing and data recording skills.
Stellako Sockeye Enumeration. Program includes counting weir, carcass recovery, and visual counts (floats).	DFO stock assessment and CSTC	Funding from DFO stock assessment and CSTC	Approximately 6-7 personnel for approximately 6-8 weeks mid August to October.	Duties involve fence installation and maintenance and data collection (fish counting, identification), stream walks/floats, biological sampling. Manager and senior field personnel should have technical training and/or extensive experience.

*Strategic Plan for a Watershed Based Approach to Facilitating First Nations' Co-Management of the Anadromous Resources of the Upper Fraser Watershed*

<b>Project</b>	<b>Present Responsibility</b>	<b>Funding Source &amp; Amount (\$)</b>	<b>Staffing Requirements/ Timing</b>	<b>Staff Skills</b>
Downstream Sockeye Fry Programs. Fry production estimates generated on the Stellako, selected early and late Stuart spawning streams, and in Nadina channel on some years.	DFO stock assessment, CSTC and Tl'azt'en.	Funding from DFO stock assessment, CSTC and Tl'azt'en.	Approximately 9-10 personnel for 4-5 weeks late April to end of May.	Duties involve trap installation and maintenance, juvenile fish identification and counting/sub-sampling/marketing methods, data recording/management. Supervisors should have technical training and/or previous experience. Field assistants can receive on the job training.
Habitat and Enforcement. DFO's commitment of habitat (HEB) and enforcement (C&P) staff to land/water use monitoring and compliance. C&P Officers are responsible for conducting enforcement of Fisheries Act. HEB Biologist is responsible for review of development plans of various natures and CEAA applications.	Contributed from offices in Prince George	Core funding DFO Pacific Region. Approx. 200K	Nechako/Stuart subunit presently receives the approximate commitment of 1 C&P officer, largely for the purposes of enforcement of the Fisheries Act and related investigations. An additional commitment of a Habitat Biologist (HEB) is also contributed to this area to support C&P operations in the area and review various development plans and CEAA applications.	C&P Officers have specific technical diplomas and related enforcement officer training. Habitat Biologist has minimum bachelors degree and one year experience in related field.
Aboriginal FSC Fishery Monitoring. Majority of fishing effort takes place within the Nechako R., Nadleh R./Fraser Lake and Stuart and Takla lakes.	Catch monitors from CSTC member First Nations are hired by CSTC	Funding through CSTC and Tl'azt'en AFS programs.	Approximately 6 persons within Nechako subunit employed seasonally (July-September). Positions are part time.	Should have previous experience or on the job training/direction. Should be competent with data collection and management.
Temperature Monitoring Program.	CSTC Fisheries	Funding	Approximately 1 person	Requires experience with temperature

*Strategic Plan for a Watershed Based Approach to Facilitating First Nations' Co-Management of the Anadromous Resources of the Upper Fraser Watershed*

<b>Project</b>	<b>Present Responsibility</b>	<b>Funding Source &amp; Amount (\$)</b>	<b>Staffing Requirements/ Timing</b>	<b>Staff Skills</b>
Monitoring of stream temperature in approximately 10-20 streams within the Nechako basin.	Program	through CSTC AFS program	part time for 5 months/year	data logger deployment, maintenance, and data retrieval.
Endako Chinook Enumeration. Ground surveys of Chinook spawners in Endako and tributaries.	CSTC Fisheries Program	Funding through CSTC AFS program	Two person crew for approximately 10 days in September.	Crew leader requires knowledge of Endako system and previous experience with Chinook enumeration. Assistant should have basic technical skills.
Nithi Weir Management. Management and maintenance of Nithi River weir.	CSTC Fisheries Program, MoWLAP, DFO	Funding through CSTC AFS program	Requires approximately one person for two days per month throughout year.	Requires basic training that can be provided by CSTC staff. Must possess reading/writing skills and ability to collect and manage numerical data.
Nadina Spawning Channel. Annual operation of spawning channel.	DFO	Funded through DFO SEP	Requires 1 fulltime technician, 1-2 seasonal positions 4-6 weeks in spring, 3-4 positions for 4-6 weeks in fall.	Channel manager requires training and extensive experience in spawning channel management. Seasonal staff require experience and/or on the job training.

## **Fish/Habitat/Management Issues, Information/Capacity Gaps**

### Chinook Enumeration

DFO has indicated that there is a need for the development and implementation of an improved assessment methodology for Stuart Chinook. It has been indicated that this would be a large, complex and expensive undertaking. As financial means and human resource capacities are limited, it should be determined in consultation with DFO and First Nation's representatives how important more accurate Stuart Chinook escapement data would be relative to other necessary projects identified in this subunit. DFO has also identified a need for improved monitoring of Chinook status in other Nechako tributaries. As above, DFO and First Nation's technical representatives should develop a comprehensive plan for the monitoring of the stocks in question and the existing and short-term future status of enumeration programs on these and other Chinook stocks.

### Sockeye Enumeration and Run Size Forecasting

There is a large and proficiently collected body of data relating to long-term trends in adult sockeye escapement and egg-fry survival. To the knowledge of the author of this document, the last decade of this information has yet to be compiled into a report. This information should be compiled and analyzed for trends and for the purposes of determining if there is value in continuing with these programs. Interested First Nations and DFO should meet to discuss this opportunity and identify the status of this information and priorities for its analysis, and corresponding mechanisms for having priorities redressed.

Additionally, there have been limited amounts of work focusing on annual trends in sockeye smolt production and smolt condition and corresponding limnological characteristics from the Nechako sockeye stock's nursery lakes. This information is integral for assessing stock productivity potential and for being able to utilize adult enumeration information to accurately forecast potential returns. There is a need for First Nations' and DFO technical personnel to assess the requirements for this information. This assessment will require the completion of the analyses of the adult escapement and fry production information described above.

First Nation groups in this subunit have been successfully integrating their personnel into all sockeye enumeration programs. However, there is a need for these groups to continue to develop their technical capacity with respect to undertaking and managing the sockeye enumeration programs that are taking place within this area. First Nations within this subunit have expressed an interest in eventually undertaking some or all of these programs under contract to DFO and these parties should meet to discuss the potential benefits in undertaking this type of relationship.

### Coho Research

A multiyear plan should be developed to further assess the occurrence of coho within the Nechako River drainage. If coho presence is determined to be an annual event [i.e. a distinct stock(s)] there will be the need for the further refinement of annual enumeration programs, assessing habitat usage and determining distribution. The suggested methodology for initiating this work is juvenile surveys conducted through trapping in natal streams. This methodology has proven to be successful and cost effective in the Skeena watershed in assisting in delineating coho usage. Success of this methodology is dependent on any coho within this subunit possessing a life history that includes juveniles residing within their natal habitats for at least one year, which would be highly probable in this area. Coho related research and assessment within this subunit is especially important considering that Interior Fraser Coho Stocks have been formally listed by COSEWIC as Endangered.

### Sturgeon Recovery

The “crisis” faced by the Nechako/Stuart white sturgeon stock is being redressed through the Nechako White Sturgeon Recovery Initiative (NWSRI), which is presently Provincially driven. This Initiative parallels the structure for Recovery Planning specified by the newly legislated Species At Risk Act (SARA). The NWSRI presently has First Nations representatives participating within both the technical and social/political tables offered by the process. In addition, the CSTC Fisheries Program has completed some fieldwork related to research commissioned by the NWSRI. As of November 2003 the Nechako white sturgeon have been “listed” by the Committee On The Status of Endangered Wildlife In Canada (COSEWIC) as Endangered. Acceptance of this recommendation by the Federal Government is expected and the recovery and management of the stock will subsequently be subject to the guidelines specified by SARA. This may include additional funding to conduct activities related to the recovery plan for the stock. There is an opportunity for First Nations to further develop the capacities that are going to be required during the recovery process and thus fill the roles that have normally been filled by professional consultants.

### Beaver Impact Control

Due to the nature and characteristics of the terrain and climate of the Nechako plateau the area is capable of supporting a very high density of beavers. This is in part due to the small and low gradient nature of many of the tributaries to the Nechako River and its larger feeder streams. Since the inception of the CSTC's Fisheries Program in 1992, several streams within the Nechako basin that were known to once support spawning populations of sockeye and Chinook have been noted to sustain levels of

beaver activity that impede or completely block upstream fish access, and/or inundate and destroy valuable spawning habitats. DFO, CSTC and Tl'azt'en fisheries personnel that conduct ground-based adult enumeration activities in this area commonly breach beaver dams in an effort to improve spawning access and/or conditions for sockeye. In some areas such as the Nithi River and Ormond Creek, beaver impacts have extirpated sockeye from these streams in totality, resulting in the loss of these small stocks. Similar situations have likely occurred in many other streams that possess(ed) stocks that are not as closely monitored.

While many agency personnel are of the opinion that the apparent high density of beavers in the area is a natural occurrence, there are numerous factors that indicate that the high density of beavers within many of these areas is not necessarily the result of wholly natural factors. The first of these factors is the levels of use that First Nations people historically had for beavers in this area. They were highly valued for meat and for their skin. This pattern of usage would have been disrupted after first contact with Europeans when disease drastically reduced First Nations population sizes and later when subsequent impacts of European settlement disrupted First Nation's cultural patterns. Parallel to these occurrences would have also been considerable harvesting efforts on beavers for the purposes of the once lucrative fur trade. However, presently and within the last 20-30 years, due to disruptions in First Nations societal economies and sustenance use patterns and the curtailment of the modern fur trade due to declining demand and fur prices, the harvesting effort on beavers is likely only a fraction of what it has been since Carrier peoples first inhabited the area. Also, there are many anthropological events that have occurred in the last fifty years that have provided beavers with ecological advantages that have likely spurred their population growth and spread their distribution. This includes the widespread use of clearcut forest harvesting which has a tendency to result in the proliferation of deciduous species that beavers thrive on. In addition, increased peak flows, which also result from extensive clearcutting, result in an increase in in-channel and riparian deciduous growth benefiting beavers. As well, the decreased base-flows that can result from clearcut harvesting also benefit beavers in that streams can be more easily blocked (at least seasonally) for the purposes of dam construction and pond creation.

There is ample evidence to indicate that the thriving beaver populations within the Nechako basin are not necessarily a completely natural occurrence. The ongoing and increasingly problematic situation of habitat alteration and extirpation of stocks from their natal streams due to beaver activity is an issue that warrants a thorough examination of the plausible solutions. Interested parties should collude to explore feasible solutions and how they could be implemented.



### **General Issues and Opportunities**

The NFCP has been operating without the input and participation of any First Nations for several years. As the target programs of the NFCP evolve it would be a logical opportunity for First Nations to broach the subject of their involvement within this program's activities. This should include First Nations participating in the assessment of past work completed under the auspices of the program and the identification of the future activities of the program and possible participation in any resultant fieldwork. There is also a need to continue the pursuit of a flow control structure and subsequent mechanism to augment flow and habitat conditions within the Endako River. As well, there is a need to continue assessments of the Nithi River in relation to the flow control structure and the development of a schedule for discharge manipulation. The target should be the augmentation of flows to facilitate adult sockeye and kokanee access to suitable habitats within the system.

Table 11. A summary of the fish stock and fisheries management activities and related roles that, if undertaken, were identified as being potentially beneficial to the management of the anadromous resources of the Nechako/Stuart Subunit by either First Nations or Fisheries and Oceans Canada staff during this strategic planning process.

<b>Project</b>	<b>Rationale and Description</b>	<b>Suggested Format and Action</b>	<b>Funding Source &amp; Amount (\$)</b>	<b>Staffing Requirements/ Timing</b>
Stuart Chinook Enumeration	Previous program was not successfully designed and was not providing unbiased estimates. Need for accurate assessment of this substantial stock.	Need for interested parties to meet with DFO stock assessment to determine feasible methodologies and logistics of implementing.	Likely high cost. No source identified.	Program will have to be designed by stock assessment biologist and local biologist.
Chinook Enumeration	Poorly developed information on the many Chinook stocks in the subunit. Need for better enumeration data for known Chinook streams and determining unknown Chinook natal habitats.	Increased frequency of ground surveys on known Chinook streams and possibly juvenile surveys to determine distribution in candidate streams where Chinook presence has not been formally documented, but is suspected.	Can assess several streams for Chinook abundance for 20-25,000. Source not identified.	Crew of two for 8 weeks August-September. Training in fish identification, ground enumeration and juvenile trapping methodology.
Coho Assessment	Coho presence is known within this subunit but has not been investigated. Need for initiating survey of coho presence and distribution.	Develop study design around juvenile assessment methodology. Can be utilized to collect DNA and determine natal habitats. Once natal habitats have been identified can better focus adult assessments.	Can likely assess considerable area for coho presence for approx \$20,000. Source not known.	2 personnel with some technical training in fish identification, trapping methodology and data collection.
Sockeye Nursery Lake Study	Little work done in relation to monitoring characteristics of smolt output and nursery lake limnology. Information is required to assess productive capacity and determine escapement targets.	Interested parties to assess requirement for and value of this information and develop corresponding study design.	No funding source identified. Cost would be dependent on intensity of study and number of lakes to be studied.	Dependent on study design and methodologies utilized. Project manager would have to be biologist with extensive experience.
Analysis of Adult Sockeye Escapement	Several years of adult escapement data and downstream fry information that appears to have not yet been analyzed. Need to assess	CSTC to meet with DFO stock assessment to determine status of downstream fry and adult sockeye enumeration information collected on	Funded through CSTC AFS and/or DFO stock assessment.	Biologist with extensive experience with summarization and analysis of data of this nature will be

<b>Project</b>	<b>Rationale and Description</b>	<b>Suggested Format and Action</b>	<b>Funding Source &amp; Amount (\$)</b>	<b>Staffing Requirements/ Timing</b>
and Downstream Fry Production Data	this data for trends and determine if there is value in continuing these projects.	Stellako and early and late Stuart sockeye over the last decade. If required, collusion should occur between CSTC, TI'azt'en and DFO to assimilate data into a single report.	Depending on current state of data and analyses required, cost could vary from \$15-50,000	required to lead the project.
Nechako White Sturgeon Recovery Initiative (Stuart Assessment)	Long term initiative that will include research, assessment, monitoring and enhancement work. Opportunity for CSTC to attain/develop the necessary capacity to capitalize on these work opportunities and play a lead role in this initiative. Situation in Stuart will have an affect on First Nations food fishing rights.	CSTC and Lheidli to continue to contribute resources to initiative and develop required capacities. TI'azt'en should become directly involved. Stuart assessment, as per study design, should be re-initiated in 2004 and continued until required information is derived.	60,000+ per year depending on study size (funding secured for 2004, require annual funding source for long term.)	Lead field personnel will require post secondary training and extensive experience in fish handling. Majority of methodologies per sturgeon sampling will have to be provided as intensive on the job training.
Beaver Control Strategy	CSTC contributes significant resources to mitigate for beaver activity that is harmful to Chinook and sockeye spawner access. Need for an overall strategy to address this issue more effectively.	Interested parties from subunit need to meet to discuss common concerns and possible strategies. Likely inclusions in strategies may include incentive to trappers for increased trapping in key problem areas.	Strategy development (identify key problem areas and solutions) should cost no more that \$5,000.	Strategy should be developed by person with technical experience and writing skills.
Stream Temperature Monitoring	CSTC program already has include many years of monitoring specific streams. Data should be reviewed and assessed for decadal trends. Also should consider expansion of program to consider large-scale forest harvesting/salvaging relating to beetle infestation.	CSTC technical staff should undertake collation and review of all available data. Consideration for program expansion should be completed in consideration of watershed to experience extensive harvesting in next 5 years.	Funded through CSTC AFS budget and completed through existing resources. No additional costs.	Reporting and future program design should be completed through existing technical staff with input from water quality specialist and DFO/MoWLAP.
Miscellaneous	Enadako flow control project furtherance, Nithi flow regime	Many small projects that require the dedication of various amounts of an	Funded through CSTC AFS budget	Senior technical and management staff already

<b>Project</b>	<b>Rationale and Description</b>	<b>Suggested Format and Action</b>	<b>Funding Source &amp; Amount (\$)</b>	<b>Staffing Requirements/ Timing</b>
	refinement, furthering involvement in NFCP. Miscellaneous initiatives that require continuous advancement.	individual's time. Includes initiatives with technical and political agendas. CSTC should ensure staffing is dedicated to either initiate or bring to completion.	and completed through existing resources. No additional costs.	in place within program to undertake.

## **COTTONWOOD/BLACKWATER SUBUNIT**

### **Geographical Context**

This subunit includes the Fraser mainstem and all tributaries to the east bank of the Fraser River from the confluence of the Cottonwood River (including the Cottonwood watershed) upstream to the confluence of the Nechako and Fraser rivers and, all tributaries to the west bank of the Fraser River from the confluence of the Blackwater River (including the Blackwater watershed) upstream to the confluence of the Nechako and Fraser rivers. Major watersheds within this subunit include the Blackwater River (Westroad, Euchiniko, Baezaeko, Nazko rivers), the Cottonwood River (Swift River/Lightning Creek, Ahbau Creek) and Hixon Creek (Naver/Government creeks) (Figure 2). Land use within this area is dominated by forestry and related development with much smaller amounts of mineral exploitation, agriculture and urban development. Agricultural and urban development are largely limited to the valley bottom along the Fraser River. Terrain varies greatly within this subunit from mountainous areas in the headwaters of the Cottonwood River watershed to rolling hills and plateau terrain throughout much of the Blackwater River watershed. The Biogeoclimatic zone of the area is dominated by Sub-Boreal Spruce (SBS) with lesser amounts of Englemann Spruce-Subalpine Fir (ESSF) and Sub-Boreal Pine-Spruce (SBPS).

The Blackwater River watershed contains a wealth of historical values relating to First Nation villages and use sites as well as trading routes. Additionally, the stream is one of the few within the central interior that viably supports guided sport fishing businesses through a resident trout fishery. Much of the Blackwater drainage area is located within the heart of the mountain pine beetle infestation and forest harvesting is taking place at an accelerated rate in order to “salvage” infected stands. The Cottonwood River watershed has been the site of much mineral exploitation for over a hundred years and continues to see some continued use for this purpose. The watershed contains at least one abandoned mine site that has been identified as an environmental threat and continuing problem (Mac Donald et al., 1997).

### **First Nations Interest**

The Lheidli T'enneh First Nation's (Prince George) Territory extends south of Prince George to encompass the northeastern portion of the Blackwater River watershed and Hixon Creek watershed. The Lhoosk'uz Dene Government Administration (Kluskus Indian Band) Territory encompasses the mid to upper portions of the Blackwater watershed. The Nazko Band Government Territory also encompasses portions of the Blackwater River watershed. The Lhtako Dene Nation (Red Bluff Indian Band)

Territory includes portions of the Cottonwood River and Blackwater River watersheds. The latter three First Nation governments mentioned above are affiliated with the Carrier Chilcotin Tribal Council. The Nazko Band Government is the only one of the three that is engaged within the British Columbia Treaty Process.

### **Stocks Present**

The dominant anadromous fish stocks within this subunit are Chinook. As described in Table 12 below all major streams within the area provide natal habitat for stocks of Chinook. These Chinook have migratory and spawning timing that is similar to Chinook in the Upper/Fraser McGregor subunit and are managed as a portion of the spring component of Fraser Chinook stocks. As can be seen in Table 13 below, the Cottonwood and Blackwater river watersheds are the two largest producers of Chinook within the subunit and had past combined brood escapements in excess of 10,000 adults in the mid 1990s. In recent years a relatively severe decline in Chinook brood escapement to the Blackwater and Cottonwood watersheds has been noted.

Coho are known to occur within several of the streams within this subunit but their distribution, frequency of occurrence and numbers are not known. Aerial assessments of their presence in this subunit was attempted in a single year (2001) with very small numbers of coho being observed in the Blackwater (Nazko River) and Cottonwood (Ahbau Creek) watersheds (Michie, 2004).

The subunit does not provide natal habitat for any sockeye stocks. Pink salmon occurrence and distribution within this subunit is not known but is likely to include sporadic spawning within the lowermost portions of all major tributaries to the Fraser in odd years, analogous to pink salmon presence noted in the Upper Fraser/McGregor subunit.

Table 12. Natal stream habitats for Chinook stocks occurring within the Cottonwood/Blackwater Subunit and their corresponding DFO management units.

Drainage	Current Management unit
Blackwater and tribs (West Road Euchiniko, Baezaeko, Nazko, Snaking, Coglistiko rivers)	5.2 Springs
Cottonwood and tribs (Swift River, Lightning, Victoria, Sovereign, Umiti creeks)	5.2 Springs
Naver Creek (Hixon, Government creeks)	5.2 Springs

Table 13. Annual numbers of returning adult Chinook to natal streams within the Cottonwood/Blackwater Subunit for the period 1991-2002.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2000	2001	2001	2002	2002
										Peak Live	A.U.C.	Peak Live	A.U.C.	Peak Live	A.U.C.
Cottonwood River & tributaries	1000	2700	4470	4690	2100	1750	3329	2592	641	1208	894	781	911	1352	1062
Naver Creek	300	unk	250	250	150	150	777	994	57	231	84	240	197	281	107
Westroad River & tributaries	2500	2500	3200	6150	6050	4615	7206	3827	984	1600	806	1924	2058	1620	1508
<b>Totals</b>	<b>3800</b>	<b>5200</b>	<b>7920</b>	<b>11090</b>	<b>8300</b>	<b>6515</b>	<b>11312</b>	<b>7413</b>	<b>1682</b>	<b>3039</b>	<b>1784</b>	<b>2945</b>	<b>3166</b>	<b>3253</b>	<b>2677</b>

### **Ongoing Enumeration/Assessment/Management Activities**

The largest enumeration programs annually undertaken in this subunit are focussed on aerial estimations of Chinook brood escapement on the streams listed above. As with other natal Chinook habitats within the entire upper Fraser area, moves have been made in the last years to increase the “rigidity” and improve the standardization of aerial counts. Up to four flights have been conducted since 2000 to allow for the calculation of an “area under the curve” (AUC) estimation of total brood escapement. Due to budgetary constraints only two flights were completed in 2003, which will allow only for peak live counts. These counts are coordinated by DFO stock assessment staff from Kamloops and completed with the assistance of DFO staff from Quesnel and Williams Lake. On only a single occasion were aerial estimations of coho spawner presence assessed in this subunit, which confirmed limited presence within the Blackwater and Cottonwood watersheds. This work was completed by stock assessment personnel from DFO’s office in Kamloops. Additional aerial surveys of this nature are dependent on budgetary constraints. Odd year pink salmon presence is not assessed within this subunit.

Activities associated with anadromous fish habitat protection are completed by DFO habitat and enforcement staff. DFO staff from Quesnel and Prince George are responsible for this subunit. Habitat protection and enforcement activities in the Blackwater area are largely focused around forestry related development. This subunit receives the commitment of approximately 0.5 fulltime habitat staff and 0.5 fulltime enforcement staff. The Cottonwood River watershed has a long history of mineral exploitation and related habitat effects. Monitoring of existing and abandoned mine/exploration sites and proposed new sites is completed and administered by DFO and Provincial agencies. Forest licensee’s obligations to assess stream habitat for the purposes of applying “classifications” to streams to determine

reserve zones and allowable structures for road crossings are completed by professional consultants.

Food fishing activity within this subunit occurs within the Fraser mainstem and is concentrated on the area of the Red Rock Canyon downstream to Woodpecker rapids. This fishery is monitored by a Lheidli technician for the purposes of tallying catch and effort within the fishery, collecting scales, and informing fishers of regulatory changes. First Nations food fishing activity downstream of Woodpecker Rapids to the confluence of the Cottonwood River has not been observed and is suspected to be infrequent (Huber, 2004).

### **Existing Capacity Summary**

Capacity for the limited activities that are undertaken within this subunit related to its' anadromous resources are derived from DFO offices in Prince George and Quesnel. To the knowledge of the author no technical personnel from any of the First Nations with an "interest" in this subunit have undertaken any anadromous fish and fish habitat related works. There is a considerable amount of activity that has been undertaken within this area, and continues to be undertaken, related to forest licensee's requirements to satisfy environmental legislation. This work is presently completed by professional consultants. Monitoring of the First Nation food fishery within the Fraser mainstem in this area is completed by a technician from Lheidli T'enneh.



Table 14. A summary of the existing fish stock and fisheries management activities and associated roles presently supported by DFO, NGOs and First Nations personnel within the Cottonwood/Blackwater Sub-unit.

<b>Project</b>	<b>Present Responsibility</b>	<b>Funding Source &amp; Amount (\$)</b>	<b>Staffing Requirements/ Timing</b>	<b>Staff Skills</b>
Chinook enumeration. Blackwater, Cottonwood and Hixon/Naver. Streams are flown up to 5 times each to generate an area under the curve estimate. Flights are generally initiated on August 10 and continue to early September.	DFO stock assessment funds and completes this work.	DFO-Stock assessment. Approx. \$10-15,000 vast majority expended on helicopter time.	Staffing is generally provided through stock assessment in Kamloops with assistance from Prince George and Quesnel DFO. Daily requirements for observers ranges from 2-4/day for a period of 3 weeks.	Lead observer must have numerous years of experience in counting from helicopter (preferably specifically within this area). Second observer should have some experience.
Habitat and Enforcement. DFO's commitment of habitat (HEB) and enforcement (C&P) staff to land use monitoring and compliance. C&P Officers are responsible for conducting enforcement of Fisheries Act. HEB Biologist is responsible for review of development plans of various natures and CEAA applications.	Contributed from offices in Prince George and Quesnel.	Core funding DFO Pacific Region. Approx. 100K	Cottonwood/Blackwater Subunit presently receives the approximate commitment of 0.5 C&P officers, largely for the purposes of enforcement of the Fisheries Act and related investigations. An additional commitment of the approximate time of 0.5 Habitat Biologist (HEB) is also contributed to this area to support investigations in the area and review various development plans and CEAA applications.	C&P Officers have specific technical diplomas and related enforcement officer training. Habitat Biologist has a minimum bachelors degree and one year experience in related field.
Aboriginal FSC Fishery Monitoring. Vast majority of Lheidli's food fishing effort takes place within Fraser mainstem in this unit.	Lheidli T'enneh monitors fishery in Fraser mainstem upstream of Hixon.	Lheidli contribution in the range of \$20,000 for this monitoring.	Lheidli contributes 1 person for 3-4 months.	Personnel generally have experience in managing tabular data and boat operation.

### **Fish/Habitat/Management Issues, Information/Capacity Gaps**

The most evident information gap identified within this subunit by DFO personnel is information relating to coho distribution and use levels. As indicated above, there has been a single relatively intensive attempt to quantify coho use in this area, which was attempted by helicopter in 2001. Very small numbers of coho were observed in the Blackwater and Cottonwood watersheds. The lack of knowledge relating to these stocks is a reflection of the limited amount fisheries related work that takes place on these streams, particularly within the timeframe that adult coho would be suspected of being present. As well, the nearest documented coho stocks that occur within the Horsefly and Chilcotin rivers are known for their late date of entry into and spawning within these systems, when nearly all fisheries related activities cease due to ice-up. There are numerous methodologies that could be employed to begin the process of investigating coho distribution and usage within this subunit. In order to complete a preliminary assessment of coho distribution, juvenile assessments/surveys could be conducted throughout known suitable areas of spawning and juvenile rearing habitat. Any juvenile coho captures would assist in the development of knowledge surrounding the life history of these fish and possibly the collection of tissue samples for the development of stock markers. Based on the findings of juvenile surveys, further attempts at aerial enumeration of spawning adults could also be more efficiently attempted.

Chinook escapement to the watersheds of both the Cottonwood and Blackwater rivers has been observed to decrease significantly in the last decade. These declines are occurring in opposition to the general trend in Chinook escapement to nearby streams in the upper Fraser, which has been observed to be stable or increasing for nearly all other streams. The reason for these declines is not understood and should be investigated to determine constraining factors where possible. Additionally, little is known of the life history of Chinook within these systems, which should also be investigated.

As indicated above, the Blackwater River watershed is undergoing forest harvesting and related development at an accelerated rate due to the mountain pine beetle infestation in the area. Given the observed trend of declining Chinook escapement to this system and the absence of knowledge relating to suspected coho usage, efforts to define and protect critical spawning and rearing habitats for these species should be undertaken. As well, stream temperature monitoring and possibly discharge monitoring should be undertaken on several known tributaries with high anadromous fisheries values. This is especially important given the fact that the area is also being considered by government and industry for future intensive oil and gas exploration.

Related to the accelerated rate of forest harvesting within the Blackwater watershed and surrounding areas, there is likely an opportunity to conduct fisheries related assessments on behalf of forest licensees operating within the area. This is work that is likely presently being completed by professional consultants. However, many First Nations choose not to enter into this type of relationship with industry operating within their Territories as it is felt it may compromise their legal position with respect to Rights and Title.

A large information gap within the upper Fraser plan area identified by all parties to the UFFCA is the lack of test fisheries to refine run size estimates for upper Fraser sockeye stocks. The Fraser mainstem within this subunit is a migratory corridor for several stocks that originate for natal habitats within the Fraser and Nechako, including the Bowron, Nadina, early and late Stuart and Stellako stocks. The two largest stocks that originate from the upper Fraser, the Horsefly and Chilko stocks, have exited the Fraser to their respective natal streams at this point. Thus a test fishery within this portion of the river would provide estimates of in-river run sizes for the five stocks previously mentioned. Estimates of stock specific run sizes in this area would provide a mechanism to calibrate estimates from the Mission counting station and lower Fraser indices of stock composition, and thus possibly allow for more refined control of food fisheries for some distance downstream (i.e. openings and closures based on abundance). Similarly, it would also allow for better management of fisheries upstream of this point. Methodologies discussed have included hydroacoustic counting stations in combination with either a fish wheel or standardized gillnet sets to provide biological samples. Lheidli T'enneh is presently pursuing this initiative through their Treaty Table, as a test fishery of this nature is deemed to be relatively necessary for the effective implementation of a Harvest Agreement (sockeye allocation), which is contained within their Agreement in Principle Treaty settlement offer from B.C. and Canada. The issue of test fisheries is discussed more thoroughly within this plan within the Section entitled "Common To All Subunits."

Table 15. A summary of the fish stock and fisheries management activities and related roles that, if undertaken, were identified as being potentially beneficial to the management of the anadromous resources of the Cottonwood/Blackwater Subunit by either First Nations or Fisheries and Oceans Canada staff during this strategic planning process.

<b>Project</b>	<b>Rationale and Description</b>	<b>Suggested Format and Action</b>	<b>Funding Source &amp; Amount (\$)</b>	<b>Staffing Requirements/ Timing</b>
Cottonwood/ Blackwater Chinook Life History study	Major gap is understanding contributions/survivals/ behavioural differences of alternate life histories (imm. migrant vs late summer migrants vs yearling smolts for Chinook). Several varying juvenile life histories for Chinook have been documented in the upper Fraser/McGregor stocks and could also be displayed by Cottonwood/Blackwater chinook (life history is not known). The consequences of these variances on Chinook production subsequent to adult escapement, and on potential Chinook escapement targets and enhancement strategies is presently unknown.	Feasible and likely favourable to partner with UNBC on this project. Requirement to develop a plan that outlines what the specific intended objectives of study would be in conjunction with DFO science/stock assessment personnel. Further requirement to develop refined study design that would likely be multiple years in duration.	Will vary depending on specific nature of study design. Funding sources could include university grants.	Will also vary depending on study design adopted. Specific senior research personnel overseeing and directing this project will likely be required to be postgraduate level student. Field related activities can be conducted by technicians with some experience and on the job training, depending on methodologies employed.
Coho Spawner Distribution and Abundance	Little is known of coho usage of the streams within the Cottonwood/Blackwater subunit. Need to determine both distribution and abundance, and stock identification characteristics.	Should consider mid-summer juvenile surveys as per the Skeena to determine juvenile distribution and abundance. Would then tie into life history study and could be used to guide adult enumeration programs.	Will vary depending on study design adopted.	Will also vary depending on study design adopted.
Coho Life History Study	Nothing known of coho life history of any potential coho stocks in the area.	Should likely be a multi-year study developed in conjunction with DFO.	Dependent on study design adopted.	Project designer and overseer will require university education. Project field personnel should have at least technical diploma or

<b>Project</b>	<b>Rationale and Description</b>	<b>Suggested Format and Action</b>	<b>Funding Source &amp; Amount (\$)</b>	<b>Staffing Requirements/ Timing</b>
				previous experience and on the job training.
Land Use Regulation Efficacy Assessment	Strong support for conducting an ongoing program to monitor licensee compliance to existing forest harvesting regulations and also assess the congruence of these regulations with the Fisheries Act and the Fish Protection Act. Especially true in the case of the Blackwater where forest harvesting is being driven by beetle infestation.	Should develop monitoring program in conjunction with DFO, MoWLAP and possibly forest licensees. Should incorporate monitoring areas of high fisheries values. Could look beyond specific habitat parameters and at impacts of increased public access etc.	Dependent on study design adopted.	Project designer and project manager will require university education. Depending on study design, personnel can likely be trained in-field but should possess technical diploma.
Test Fishery/ Fish Wheel Operation	In-season/river estimates of Fraser stock abundance and composition are being proposed to be developed throughout the Fraser watershed. The proposed location of additional methods of abundance estimation is between Prince George and Quesnel. Methodologies to be employed are presently being assessed.	Lheidli T'enneh is presently working through the Treaty process with Canada at identifying a site and methodology to initiate counting/test fishery.	Cost will be high. Lheidli T'enneh presently pursuing feasibility study of this test fishery and possible implementation through Treaty Related Measures funding.	Conceptualization and design of fishery will have to be completed by senior technical personnel from all parties represented.

## **QUESNEL/HORSEFLY SUBUNIT**

### **Geographical Context**

This subunit includes the Quesnel River and all associated tributaries, including the major watersheds of the Horsefly River, Mitchell River, and Cariboo River. This watershed is the natal habitat of the commercially important Quesnel/Horsefly stock of sockeye, which utilize spawning habitats within the Mitchell and Horsefly rivers and several other tributary streams. This subunit also includes a small area on the west side of the Fraser opposite the confluence of the Quesnel River. The major watershed within this area is Baker Creek. Terrain within this area varies from the mountainous terrain (Cariboo Mountains) in the headwaters of the Mitchell, Cariboo and Horsefly rivers to rolling hills and ranching country within the lower portions of the Quesnel and Horsefly rivers. Biogeoclimatic zones within the area vary from Engelmann Spruce-Subalpine Fir (ESSF) to Interior Cedar Hemlock (ICH) within the mountainous terrain to Sub-Boreal Spruce (SBS) within the lower elevation areas and Interior Douglas Fir (IDF) along the subunit's southeast boundary. Land use within the area is dominated by forestry with considerable amounts of agricultural usage and mining as well. The aquatic resources of the area help to support a significant amount of tourism in the area. Numerous lodges are located on Quesnel Lake and other smaller surrounding lakes and the Horsefly River supports several angling guides with its' rainbow trout fishery.

### **First Nations Interest**

The Lhtako Dene Nation (Red Bluff Indian Band – Carrier Chilcotin Tribal Council) and the Canim Lake Indian Band, Soda Creek Indian Band, and the Williams Lake Indian Band (all members Cariboo Tribal Council) all possess territories that contain portions of this subunit. Sockeye produced within the Quesnel system contribute to the First Nations food fishery throughout the Fraser downstream of the Quesnel River confluence.

### **Stocks Present**

The area provides natal habitat for sockeye, Chinook, pink salmon and coho. The sockeye stock within this area is generally known as the Quesnel or Horsefly stock and spawns mainly within the Horsefly and Mitchell rivers with juveniles rearing in Quesnel Lake. There are numerous smaller stocks that spawn in tributaries to this system. As the timing of both the Mitchell River and Horsefly River stocks is similar the stock is managed by DFO as a portion of the “summer” Fraser sockeye complex, although the timing of the Mitchell stock tends to be later than the Horsefly. There was a concentrated effort to rebuild this stock over the last several decades after its numbers were decimated by migration impediments (Table 16). This rebuilding was facilitated by the construction of a spawning channel on the Horsefly River in 1989.

The contribution of this enhancement project is small relative to the natural production of the system on its dominant years, and was designed for a capacity of 11,700 females with an expected resulting return of 180,000 adults. The channel was initially intended to only be operated on non-dominant years but has been operated annually in the recent years. The Horsefly and Quesnel rivers have also been the targets of works to improve fish access. Since 1988 the stock has continued to build on all of its cycle years (Table 17).

Table 16. Available data for spawner escapement and total adult escapement for Horsefly River and Mitchell River sockeye stocks from 1956-1988 and 1960-1988 respectively.

<b>HORSEFLY RIVER</b>															
1992 CYCLE YEAR				1993 CYCLE YEAR				1994 CYCLE YEAR				1995 CYCLE YEAR			
Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio	Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio	Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio	Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio
1956	81	2,553	31.52	1957	220,990	976,515	4.42	1958	1,798	3,396	1.89	1959	65	165	2.54
1960	292	1,475	5.05	1961	295,964	1,223,026	4.13	1962	1,073	6,700	6.24	1963	83	956	11.52
1964	254	2,797	11.01	1965	359,371	1,614,217	4.49	1966	1,611	7,342	4.56	1967	119	1,761	14.80
1968	695	484	0.70	1969	270,022	1,496,320	5.54	1970	1,345	20,339	15.12	1971	171	747	4.37
1972	108	1,392	12.89	1973	253,388	1,983,829	7.83	1974	4,459	18,336	4.11	1975	193	1,713	8.88
1976	298	1,233	4.14	1977	473,803	3,577,209	7.55	1978	7,377	186,251	25.25	1979	511	5,896	11.54
1980	308	2,446	7.94	1981	682,515	8,311,088	12.18	1982	36,012	455,947	12.66	1983	2,036	35,801	17.58
1984	894	5,470	6.12	1985	1,113,172	10,953,292	9.84	1986	150,640	1,823,168	12.10	1987	16,795	83,346	4.96
1988	6,832	11,657	1.71												
Average	1,085	3,279	9.01	Average	458,653	3,766,937	7.00	Average	25,539	315,185	10.24	Average	2,497	16,298	9.52

<b>MITCHELL RIVER</b>															
1992 CYCLE YEAR				1993 CYCLE YEAR				1994 CYCLE YEAR				1995 CYCLE YEAR			
Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio	Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio	Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio	Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio
1960				1961	2,677	21,598	8.07	1962	65	16	0.25	1963			
1960				1961	6,601	17,884	2.71	1962	5	587	117.40	1963			
1964				1965	5,335	52,955	9.93	1966	142	120	0.85	1967			
1968				1969	8,939	144,443	16.16	1970	0	0		1971			
1972				1973	24,673	177,596	7.20	1974	0	0		1975			
1976				1977	42,396	328,409	7.75	1978	1,237	10,465	8.46	1979			
1980				1981	66,106	1,475,563	22.32	1982	3,829	103,732	27.09	1983			
1984				1985	204,579	1,581,320	7.73	1986	30,827	225,892	7.33	1987			
1988															
Average				Average	45,163	474,969	10.23	Average	6,018	56,802	26.90	Average			

Chinook are known from the Cariboo River (above and below the fishway), the Quesnel River and Horsefly River, as well as Baker Creek on the west side of the Fraser. The largest Chinook stock within this subunit is the Quesnel River stock, spawning in the outlet of Quesnel Lake (Table 19). These Chinook stocks belong to two management units as per Table 18 below. As can be seen from table 19 this subunit produces a significant number of Chinook annually.

Table 17. Total estimated sockeye spawner escapement to the Quesnel/Horsefly Subunit from 1988-2002.

	Horsefly Channel	Horsefly River	Mitchell River	Total
1988	0	19775	3371	27034
1989	23300	1462605	233836	1874833
1990	29274	398468	42129	488266
1991	18815	19754	7690	46259
1992	2124	6777	NI	8901
1993	17891	1650033	687651	2620707
1994	19597	468771	132696	669178
1995	16263	164230	35190	216063
1996	11892	23648	6946	42499
1997		929960	513479	1858809
1998	24934	743122	299920	1179252
1999	5974	133417	46141	189360
2000	1156	34472	27040	63782
2001	0	1816693	920267	3510845
2002	0	na	969571	na

Table 18. Natal stream habitats for Chinook stocks occurring within the Quesnel/Horsefly Subunit and their corresponding DFO management units.

Drainage	Current Management unit
Quesnel River	5.2 summers
Upper Cariboo	5.2 Springs
Lower Cariboo	5.2 Summers
Horsefly River	5.2 Springs
Baker Creek	5.2 Springs

Table 19. Annual numbers of returning adult Chinook to natal streams within the Quesnel/Horsefly Subunit for the period 1991-2002.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Peak Live	A.U.C.	2001	Peak Live	A.U.C.	2002	Peak Live	A.U.C.
Baker Creek	400	250	300	250	250	150	292	420	47	282	301	268	228	420	292			
Upper Cariboo													407	N/A	198	N/A		
Cariboo River	1551	1000	2480	2000	817	1850	1800	936	573	744	506	503	428	1097	809			
Horsefly River	500	400	200	4154	185	400	115	43	137	174	N/A	281	N/A	380	81			
Quesnel River	4400	3375	5028	1549	3073	3100	3185	4906	1620	1718	1839	2418	2943	5520	5467			
<b>Totals</b>	<b>6851</b>	<b>5025</b>	<b>8008</b>	<b>7953</b>	<b>4325</b>	<b>5500</b>	<b>5392</b>	<b>6305</b>	<b>2377</b>	<b>2918</b>	<b>2646</b>	<b>3877</b>	<b>3599</b>	<b>7615</b>	<b>6357</b>			



Coho are of significant interest within this subunit as there are numerous stocks of 50-2000 fish escapement. McKinley Creek (Horsefly River tributary) is a Canada/US Pacific Salmon Treaty escapement indicator stock, which is enumerated annually for returning adults via a fence program. Visual surveys of adult coho are conducted from the ground on a number of tributaries to Horsefly and Quesnel lakes, and aerially on the Mitchell River, Penfold Creek, Horsefly River, and Summit and Blue Lead creeks. The size and remoteness of the area over which coho spawn within this subunit, as well as the inherent difficulty in enumerating adult coho in their spawning streams, make enumeration of these stocks difficult. As well, these stocks generally possess migratory and spawning timing of late October-November, which coincides with ice-up of spawning streams and further impedes the effective enumeration of these stocks. Table 20 below presents the streams that have been recently enumerated and the corresponding number of coho observed. DFO's stock assessment branch has increased the intensity of aerial and ground-based surveys in this subunit as well as attempting to standardize annual counting programs on each of the target streams.

Table 20. Numbers of adult coho observed within spawning stream within the Quesnel/Horsefly subunit from 1999-2001. Cells remaining blank were years in which the corresponding stream was not inspected. "NI" specifies not inspected, "NO" specifies no coho observed, and "I" infers inspected.

<b>Stream</b>	<b>1998 Estimate</b>	<b>1998 Trend Estimate</b>	<b>1999 Estimate</b>	<b>1999 Trend Estimate</b>	<b>2000 Estimate</b>	<b>2000 Trend Estimate</b>	<b>2001 Estimate</b>	<b>2001 Trend Estimate</b>
Beaver Creek			25	N.I.	8	NI	N.I	NI
Blue Lead Creek			N.O.	N.I.	N.O.	NI	N.O.	NI
Edney Creek							9	N.I
Horsefly Mainstem	85	NI					796	
Little Horsefly River							135	N.I
McKinley Creek	790	I	212	212	223	223	1989	1989
Mitchell River	52	I	228	N.I.	480	NI	452	NI
Moffat Creek			N.O.	N.I.	NI	NI	9	NI
Penfold Creek			N.O.	N.I.	68	NI	92	NI
Summit Creek	54	NI	N.O.	N.I.	92	NI	24	N
Tisdale Creek							9	N.I
Wasko Creek							24	N.I

### **Ongoing Enumeration/Assessment/Management Activities**

There are a number of fisheries related initiatives that are annually conducted within this subunit. These include large-scale terminal spawner escapement enumeration programs on the Quesnel/Horsefly sockeye stock, aerial and ground enumerations of Chinook stocks, ground based (visual and fence) counts of several coho stocks, the operation of the Horsefly spawning channel, the operation of the Quesnel River hatchery (now under the control of UNBC) and numerous other smaller initiatives. An estimated \$450,000 is annually expended on sockeye, Chinook and coho enumeration programs within this subunit. Annual sockeye enumeration programs on the Horsefly and Mitchell rivers are likely the largest and most costly fisheries related activities undertaken in the subunit. These programs are conducted during each cycle year of this sockeye stock with the exception of the lowest cycle, dependent on budgetary constraints. Sockeye enumeration programs on the Quesnel system involve intensive mark-recovery programs, enumeration fence counts, stream walks/drifts and in some cases aerial counts.

Coho enumeration on Mckinley Creek, a tributary to the Horsefly River, is completed by fencing the system. This coho stock is an Indicator Stock under the Pacific Salmon Treaty. Other coho enumeration is conducted through aerial enumerations and stream walks. Chinook enumeration is accomplished through aerial overview flights and float counts on the Horsefly river. Habitat protection and enforcement related to the Fisheries Act is pursued within this subunit by DFO staff from offices in Quesnel and Williams Lake.

### **Existing Capacity Summary**

The Cariboo Tribal Council (CTC) has had an active fisheries program for several years. The CTC contributes personnel to the sockeye enumeration programs on the Horsefly and Mitchell rivers, the Chinook aerial enumeration program, aerial counts and ground surveys for coho enumeration, and they operate the McKinley Creek coho fence under contract to DFO. The CTC has been actively integrating technical personnel into sockeye enumeration programs on the Horsefly and Mitchell rivers for the past several years and have a target of occupying 50% of the employment positions created by these annual sockeye enumeration programs. Senior/head field staff for sockeye enumeration programs are DFO stock assessment staff from Kamloops. The operation of the Horsefly River Spawning Channel, which is operated annually, is contracted out from DFO to a private firm. The Quesnel River Hatchery (previously operated by the Salmonid Enhancement Program) has not functioned for the purposes of salmonid enhancement for several years. The hatchery

has recently been acquired by the University of Northern British Columbia and is intended to be utilized for the purposes of aquatic research.

There are a number non-government organizations (NGOs) that are active in the promotion fish and fish habitat stewardship. Possibly the most notable of these is the Baker Creek Enhancement Society, which has focussed its' efforts on restoring and protecting habitats within Baker Creek. The group has operated on funding received through a variety of federal and provincial programs and private donations. As well, the Quesnel River Enhancement Society has also undertaken a number of fisheries related initiatives in recent years. The level of Provincial and Federal funding available to support NGOs in their pursuit of fish and fish habitat stewardship has dwindled in recent years. The Cariboo Tribal Council also undertake fish management activities within the Williams Lake River, San Jose River and Churn Creek. These activities are discussed within the Chilcotin/Chilko subunit.

Table 21. A summary of the existing fish stock and fisheries management activities and associated roles presently supported by DFO, NGOs and First Nations personnel within the Quesnel/Horsefly Sub-unit.

<b>Project</b>	<b>Present Responsibility</b>	<b>Funding Source &amp; Amount (\$)</b>	<b>Staffing Requirements/ Timing</b>	<b>Staff Skills</b>
Chinook enumeration. Small program within Quesnel/Horsefly subunit. Approximately 5 streams are flown up to 5 times each to generate an area under the curve estimate, although the number of flights varies depending on budget. Some smaller streams are enumerated via ground/walking surveys. Flights are generally initiated on August 10 and continue to early September. Float counts take place on the Horsefly river,	DFO stock assessment funds and completes the project. Observer assistance provided by Cariboo Tribal Council technicians.	DFO-Stock assessment ~15,000-20,000	Staffing is generally provided through stock assessment in Kamloops with assistance from Quesnel/Williams Lake DFO personnel. Daily requirements for observers is 2/day periodically for a period of 3 weeks.	Lead observer must have numerous years of experience in counting from helicopter (preferably specifically within this area). Second observer should have some experience.
Sockeye enumeration. Large program within Horsefly and Mitchell rivers in most years. Conducted via aerial and ground surveys and mark recapture programs.	DFO stock assessment funds and directs this work. Technical personnel are provided by the CTC and they have employment targets they are working towards.	DFO stock assessment's commitment is dependent on cycle year and budgetary restrictions. Can approach \$300,000.	Approximately 20 field personnel are employed when the full suite of enumeration programs are being conducted. Seasonal positions range in duration from 4-8 weeks.	Senior project personnel have post secondary training and several years of experience. Field personnel range in experience and training.
Coho Enumeration Several streams are surveyed for coho by helicopter, float counts and ground surveys.	Aerial enumerations are conducted by DFO stock assessment staff. Flights are dependent on available budget. Ground surveys and float counts are conducted by DFO and CTC staff.	DFO stock assessment's commitment is dependent on budgetary constraints and weather conditions. In the range of \$5,000-\$10,000 which is	Staff for aerial enumerations is provided by DFO. Ground surveys and float counts are conducted by CTC and DFO technicians.	Lead ground and aerial observers should have considerable experience in counting coho spawners and preferably previous experience on the stream being enumerated.

*Strategic Plan for a Watershed Based Approach to Facilitating First Nations' Co-Management of the Anadromous Resources of the Upper Fraser Watershed*

<b>Project</b>	<b>Present Responsibility</b>	<b>Funding Source &amp; Amount (\$)</b>	<b>Staffing Requirements/ Timing</b>	<b>Staff Skills</b>
		largely helicopter time.		
McKinley Creek coho fence	Contract for the operation of this fence is held by the CTC. Technical personnel supplied by the CTC.	Funding provided via DFO, Pacific Salmon Treaty.	Fence operations required 4 persons for 7-8 weeks.	Project manager is CTC biologist. Field staff must have experience with fence operations and data management.
Horsefly River Spawning Channel Operation	Contracted out from DFO to consultant.	Funding from DFO.	Channel has been run annually in recent years.	Facility manager must be experienced in channel operations. Technicians can have various levels of experience and training.
Quesnel River Hatchery (DFO) Recently taken over by UNBC for the purposes of providing a facility to conduct research.	University of Northern BC	UNBC, budget unknown.	Presently unknown, but will depend on research being conducted.	Facility manager's training and experience will be dependent on ongoing research and use of the facility.
Cariboo River Fishway Maintenance Vertical slot fishway constructed mainly for improving access for Chinook.				
Habitat and Enforcement. DFO's commitment of habitat (HEB) and enforcement (C&P) staff to land use monitoring and compliance. C&P Officers are responsible for conducting enforcement of Fisheries Act. HEB Biologist is responsible for review of development plans of various natures and CEAA applications.	Contributed from offices in Quesnel and Williams Lake.	Core funding from DFO Pacific Region.	Quesnel/Horsefly subunit presently receives the approximate commitment of two C&P officers, largely for the purposes of enforcement of the Fisheries Act and related investigations. An additional commitment of one Habitat Biologist	C&P Officers have specific technical diplomas and related enforcement officer training. Habitat Biologist has minimum bachelors degree and one year experience in related field.

*Strategic Plan for a Watershed Based Approach to Facilitating First Nations' Co-Management of the Anadromous Resources of the Upper Fraser Watershed*

<b>Project</b>	<b>Present Responsibility</b>	<b>Funding Source &amp; Amount (\$)</b>	<b>Staffing Requirements/ Timing</b>	<b>Staff Skills</b>
			(HEB) is also contributed to this area to support C&P operations in the area and review various development plans and CEAA applications.	
Aboriginal FSC Fishery Monitoring	Completed by food fish monitors from respective First Nation communities.	Funding for these positions is provided through AFS funding.	Positions require filling during food fishery (July-September).	Monitors should have experience in tabular data management and specific training relating to fishery monitoring/census techniques.

## **Fish/Habitat/Management Issues, Information/Capacity Gaps**

### Coho Enumeration

Coho within this subunit are thought to be near the upstream most extremity of their distribution in the Fraser watershed. As mentioned above, due to the large and remote nature of this subunit as well as the late timing of these fish, the logistical constraints related to their effective and thorough enumeration are many. DFO has identified a need for many aspects of information about coho from this subunit. This includes further information relating to general coho life history from streams in this area and tissue/DNA samples to further refine stock units. Also, a need was identified for more ground and aerial assessments to determine coho presence and utilization (timing and abundance), across a wider range of watersheds. This requirement for additional information relating to coho distribution, escapement and stock identification should be considered as a single project with multiple components.

### Chinook Enumeration

Chinook enumeration within natal habitats within the Quesnel/Horsefly subunit is conducted via aerial surveys and float counts on the Horsefly river. Several of the streams within the subunit such as the Cariboo River lack sufficient water clarity so as to provide reliable estimates of escapement from year to year using aerial surveys. There is a need to conduct Chinook spawner escapements via additional methods so as to provide an index to assess the degree of error within the aerial surveys. Work of this nature is discussed more thoroughly within the Upper Fraser/McGregor subunit where much larger aerial Chinook enumeration programs are undertaken. To address this issue in the Quesnel/Horsefly subunit the CTC should discuss the need for such action with DFO stock assessment staff and develop plans to implement any identified projects as resources become available.

### Land Use Monitoring

Land use within this subunit by area of impact is dominated by forest harvesting. However, significant amounts of agricultural development has also occurred and is generally confined to the valley bottoms adjacent to streams where direct fish habitat impacts can readily occur. As with all other subunits, a need has been identified to assess the efficacy of land use regulations in relation to the protection of fish habitat and the intent of the Fisheries Act. This need was largely identified by First Nation groups. In particular there was concern expressed over new forestry practices coming into effect that are seen to have reduced stringency around environmental components. Interested parties within the UFFCA should discuss this concern more thoroughly and determine possible courses of action. This is discussed more thoroughly later in this plan in Section "Common To All Subunits."

### Test Fishery

The most prominent information gap within the Quesnel/Horsefly subunit identified by the Cariboo Tribal Council was the need for a test fishery (estimator of abundance) on the large Horsefly/Quesnel sockeye stock. There is presently no estimator of abundance for this stock or any other sockeye stock upstream of Mission and final escapement numbers for this stock normally come from terminal enumeration programs generated from spawning tributaries. The lack of a method of run size estimation upstream of the Mission hydroacoustic station restricts the calculation of a definitive estimate of in-river escapement and enroute mortality until stocks have reached terminal areas. As total spawner escapement of the stock group is generated through mark-recoveries conducted in spawning areas, determinations of “under or over escapement” do not occur until the stock has completed migration to terminal areas. Thus, it is generally too late for management actions that may have been instituted in the interests of conservation and/or capitalizing on surplus escapements. This makes the determination and subsequent declaration of an Escapement Surplus to Spawning Requirements (ESSR) on this stock very difficult. The CTC wishes to see the determination of surplus sockeye escapements to the Quesnel River possible prior to the completion of terminal enumeration programs. This will allow for potential commercial harvesting opportunities of any such surpluses within the Quesnel River or Quesnel Lake, prior to the runs entry into spawning tributaries. It is recommended that the CTC, other interested parties and DFO meet to discuss common information requirements related to any test fishery implemented and the plausible format of a suitable test fishery. The need for and concept of test fisheries in the upper Fraser plan area are discussed more thoroughly in the Section entitled “Common To All Subunits.”



Table 22. A summary of the fish stock and fisheries management activities and related roles that, if undertaken, were identified as being potentially beneficial to the management of the anadromous resources of the Quesnel/Horsefly Subunit by either First Nations or Fisheries and Oceans Canada staff during this strategic planning process.

<b>Project</b>	<b>Rationale and Description</b>	<b>Suggested Format and Action</b>	<b>Funding Source &amp; Amount (\$)</b>	<b>Staffing Requirements/ Timing</b>
Coho Life History	Very little is known of natal stream residency by juveniles and other components of the life history of Quesnel/Horsefly subunit coho stocks. This information could be valuable in terms of assessing the importance of streams for coho production and identifying and protecting critical habitats.	Need for interested parties to collude to identify specific information requirements, project objectives and range of streams to be included within this study.	Source will have to be determined. Amount is dependent on study design adopted.	Senior project personnel should have postsecondary training in biology. Depending on study design, field personnel could have variety of experience and training levels.
Coho Enumeration	Present enumeration program within the subunit includes ground (float counts, stream walks and a single fence) and aerial enumeration of a number of streams. DFO has identified the need to expand this program over a broader range of streams.	Need for CTC to collude with DFO stock assessment personnel to determine specific project objectives and corresponding methodologies and streams to be included in project.	Source will have to be determined. Amount is dependent on study design adopted.	Stream walkers should have specific experience or training in coho spawner enumeration
Coho DNA	Poorly developed stock identification parameters for coho populations within this subunit.	The requirement for this information should be incorporated into planning related to the above two initiatives.	Funding source will have to be identified. As tissue samples should be able to be accomplished within the above two projects, costs of collection should be minimal.	Intended to be competed in combination with the two projects above. Requires minimal training.
Chinook Enumeration	Chinook enumeration all presently done via aerial surveys and some walks. Some streams too turbid to provide accurate estimates of spawners via aerial method.	Need for interested parties to discuss this issue and determine any required actions relating to completing mark-recovery or other options for cross referencing aerial enumeration of spawners.	Funding source will have to be identified. Amount required will be dependent on format of any activities to be undertaken.	Skill level and number of individuals will be dependent on study design and size.

<b>Project</b>	<b>Rationale and Description</b>	<b>Suggested Format and Action</b>	<b>Funding Source &amp; Amount (\$)</b>	<b>Staffing Requirements/ Timing</b>
Land Use Regulation Efficacy Assessment	Strong support for conducting an ongoing program to monitor licensee compliance to existing forest harvesting regulations and also assess the congruence of these regulations with the Fisheries Act and the Fish Protection Act. Also a need identified to monitor, assess and redress land and water use related to agriculture in this subunit.	Requirement for concerned parties to meet with DFO HEB personnel and determine viability of colluding on monitoring and assessment program, determine possible format of program and roles and responsibilities.	Funding source will have to be determined. Amount will be completely dependent on format of any initiative(s) implemented.	Skill level and number of individuals will be dependent on design and size of any program implemented.
Quesnel Sockeye Test Fishery	CTC wants to implement a test fishery to determine estimates of run size for the Quesnel stock within the upper Fraser area and preferably within the Quesnel River. In-season/river estimates of Fraser sockeye run abundance and composition upstream of Mission have been identified as an information gap for all upper river stocks.	Requirement for CTC, other interested parties and DFO to meet to discuss specific data requirements common to all parties and plausible mechanisms and methods to collect. Test fishery could range from an index developed from food fishers catch and effort, to standardized daily net sets, to a hydroacoustic station or other counting device.	Funding source will have to be determined but costs should be at least partially covered through the sale of fish from the test fishery. The cost of the initiation and operation of any test fishery will be dependent on its format.	Skill level and number of individuals will be dependent on design and size of any program implemented

## **CHILCOTIN/CHILKO SUBUNIT**

### **Geographical Context**

This subunit includes all tributaries to the Fraser River from the confluence of Deadman Creek upstream to the confluence of Narcosli Creek, including the Narcosli watershed. The major watershed within the subunit is the Chilcotin River, which includes the tributary sub-basins of the Chilko River, Taseko River and Chilanko River. Other relatively large watersheds included within this subunit are Narcosli Creek and Churn Creek. The area provides the natal habitats of the commercially important Chilko sockeye stocks, many large stocks of Chinook and several stocks of coho. The terrain within this subunit is dominated by the semi-open grasslands and pine forests of the Chilcotin plateau. However, with portions of the headwaters of the Chilcotin watershed originating from the eastern margin of the coast range, the area also includes rugged mountainous areas. Biogeoclimatic zones within the area include a mix of Sub-Boreal Spruce (SBS), Sub-Boreal Pine-Spruce (SBPS), Interior Douglas-fir (IDF) and Bunchgrass (BG). The majority of the area is utilized for free-range cattle grazing as well as some intensive crop cultivation in valley bottom areas. Forest harvesting is also intensively practiced in a large proportion of the area. The largest urban centre in the subunit is Williams Lake. The subunit receives significant tourism usage due to its wealth of resident fish resources, wildlife, scenery and history.

### **First Nations Interest**

First Nations Communities and Territories that encompass portions of this subunit include Alexandria, Alexis Creek, Stone, Tl'etinqox-t'in and Xenigwet'in First Nations Governments, whom are all members of the Tsilhoqot'in National Government (Tribal Council). Additionally, the communities and/or Territories of the Canim Lake, Canoe Creek, Soda Creek and Williams Lake Indian Bands, which form the Cariboo Tribal Council, also occur within this area. As well, the Toosey Indian Band and Ulkatcho First Nation, two members of the Carrier Chilcotin Tribal Council, are located within this subunit. The southern-most occurring First Nation within this subunit is the High Bar First Nation.

### **Stocks Present**

Salmon stocks within this subunit include the Chilko sockeye stock group, substantial stocks of Chinook that spawn in the Chilko River between Chilko Lake and the Chilcotin River, the Taseko River, and other smaller stocks in the Chilcotin River above and below Chilcotin Lake, and in Elkin Creek and Narcosli Creek. Coho within this subunit are known to include stocks that spawn within the Chilcotin River

and Chilko River, as well as several smaller tributary streams. The Chilko Lake sockeye stock group consists of three distinct stocks consisting of the Chilko River stock which spawns in the Chilko River downstream of the lake, the Chilko Lake stock which spawns in the upper portion of Chilko Lake and the Taseko Lake stock, which spawns in tributaries to Taseko Lake.

Table 23. Available data for spawner escapement and total adult escapement for the Chilko River sockeye stock from 1956-1988 respectively.

<b>CHILKO RIVER</b>															
1992 CYCLE YEAR				1993 CYCLE YEAR				1994 CYCLE YEAR				1995 CYCLE YEAR			
Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio	Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio	Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio	Brood Year	Number of Spawners	Total Brood Return	Return to Spawner Ratio
1956	646,906	2,435,670	3.77	1957	138,464	138,228	1.00	1958	120,104	433,371	3.61	1959	463,060	2,212,583	4.78
1960	426,546	1,053,335	2.47	1961	39,101	69,453	1.78	1962	77,713	985,562	12.68	1963	998,231	1,206,303	1.21
1964	238,272	2,040,082	8.56	1965	35,335	158,944	4.50	1966	209,619	889,200	4.24	1967	174,715	1,999,484	11.44
1968	413,862	2,461,877	5.95	1969	70,902	402,283	5.67	1970	135,388	688,611	5.09	1971	157,193	602,388	3.83
1972	562,650	1,938,682	3.45	1973	55,675	213,743	3.84	1974	109,563	600,641	5.48	1975	199,739	1,482,168	7.42
1976	361,752	1,610,869	4.45	1977	49,539	195,909	3.95	1978	143,402	1,187,209	8.28	1979	234,924	1,544,062	6.57
1980	467,812	4,010,336	8.57	1981	34,360	201,347	5.86	1982	239,903	1,494,185	6.23	1983	329,220	1,541,062	4.68
1984	452,618	406,639	0.90	1985	71,435	609,392	8.53	1986	281,771	4,287,627	15.22	1987	239,601	2,877,466	12.01
1988	254,668	3,009,429	11.82												
Average	425,010	2,107,435	5.50	Average	61,851	248,662	4.39	Average	164,683	1,320,801	7.60	Average	349,585	1,683,190	6.49

Table 24. Sockeye spawner escapement to the Chilko system 1988-2002. Blank cells indicate no data existed within data base, "NI" indicates not inspected, "\*" infers numbers number is included within Chilko River estimate.

	Chilko River	S. End Chilko Lake	Chilko Channel	Taseko Lake	Total
1988	250495	110608	4687	11138	376928
1989	56994	20128	1525	65	78712
1990	823339	*	9974	NI	833313
1991	1019116	*	20508	NI	1039624
1992	508582	*	7081	970	516633
1993	556466	*	5399	NI	561865
1994	489857	*	1904	270	492031
1995	539269	*	8486	1840	549595
1996	989508	*	*	1470	990978
1997	985743	*	7511	325	993579
1998	880944	*		400	881344
1999	891922	*		1160	893082
2000	759163	*		3000	762163
2001	669867	*		1000	670867
2002	385042	*	*	1300	386342

This stock grouping enters the lower Fraser in early August and is managed by DFO as a portion of the summer aggregate of sockeye stocks. The Chilko stock group has had total run sizes in excess of 4 million fish (Table 23). Fertilization of Chilko Lake was conducted for a four year period during the 1990s resulting in larger run sizes in subsequent brood years (Table 24).

Chinook stocks within this subunit spawn in the Chilko River between Chilko Lake and the Chilcotin River, in the Taseko River, with smaller stocks spawning in the Chilcotin River above and below Chilcotin lake, and in Elkin Creek and Narcosli Creek. Timing of entry of these stocks into the Fraser and, in some case spawning timing, varies slightly and the stocks are identified as either spring or summer stocks for the purposes of DFO's Chinook management policies (Table 25). Total annual Chinook spawner escapement to natal streams within this subunit ranged from approximately 10,000 to 22,000 through the period 1991 –2002 (Table 26). The largest Chinook stock within this subunit is the Chilko River stock.

Table 25. Natal stream habitats for Chinook stocks occurring within the Chilcotin/Chilko Subunit and their corresponding DFO management units.

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Drainage	Current Management unit
Chilko River	5.2 summers
Upper Chilcotin	5.2 Springs
Lower Chilcotin	5.2 Springs
Taseko River	5.2 Summers
Elkin Creek	5.2 Springs
Narcosli Creek	5.2 Springs

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Coho within this subunit include stocks that spawn within the Chilcotin River and Chilko River. Coho are also known to occur within several tributaries to these streams and the Williams Lake River. Coho presence and distribution throughout this subunit has only recently begun to be pursued and monitored by DFO's stock assessment personnel (Table 27).

Pink salmon occur (odd years) within this unit but their distribution and numbers are not intensively monitored. Some counts of pinks are completed in the Williams Lake River and its' tributaries and in Churn Creek. The Chilcotin River also contains a steelhead stock. These fish are considered to be the northerly most occurring steelhead population in the Fraser watershed. Annual returns of the stock are

consistently small (i.e. <1000 fish) as calculated from lower Fraser chinook test fishery (Bailey, 2004).

Table 26. Annual numbers of returning adult Chinook to natal streams within the Chilcotin/Chilko Subunit for the period 1991-2002.

	1991	1992	1993	1994	1995	1996	1997	1998	1999	Peak Live 2000	A.U.C. 2000	Peak Live 2001	A.U.C. 2001	Peak Live 2002	A.U.C. 2002
Narcosli Creek	300	500	250	350	250	150	757	254	161	145	145	383	223	129	74
Chilko River	7400	11168	6343	5665	10461	17000	16272	14549	8920	9171	9671	10891	12599	11027	13060
Chilcotin River (Lower)	3140	2486	3100	6354	3480	2285	4000	1636	2896	2971	2337	1574	1498	2092	2147
Chilcotin River (Upper)	unk	unk	200	450	262	735	360	617	285	229	204	243	283	523	504
Elkin Creek	600	540	450	508	786	1250	806	651	417	394	344	458	240	420	418
Taseko River	N.I.	N.I.	200	N.I.	N.I.	600	500	225	present	Present	N/A	Present	Present	Present	N/A
<b>Totals</b>	<b>11140</b>	<b>14194</b>	<b>10293</b>	<b>12977</b>	<b>14989</b>	<b>21870</b>	<b>21938</b>	<b>17678</b>	<b>12518</b>	<b>12765</b>	<b>12556</b>	<b>13166</b>	<b>14620</b>	<b>14062</b>	<b>16129</b>

Table 27. Numbers of adult coho observed within spawning stream within the Chilcotin/Chilko subunit from 1999-2001. "NI" specifies not inspected, N.O. specifies n no coho observed and "I" infers inspected.

Stream	1999 Estimate	1999 Trend Estimate	2000 Estimate	2000 Trend Estimate	2001 Estimate	2001 Trend Estimate
Chilko River	344	N.I.	152	NI	892	NI
Minton Creek	N.O.	N.I.	NI	NI	NI	NI
Taseko River	N.O.	N.I.	NI	NI	NI	NI
Williams Creek	N.O.	N.I.	N.O.	NI	6	NI

### **Ongoing Enumeration/Assessment/Management Activities**

Annual enumeration of Chinook within this subunit is done solely based on aerial over flights. A minimum of two and preferably three-four over flights per stock are conducted when budgets allow. Enumeration of coho stocks within the subunit has only been initiated in recent years and is generally conducted via aerial over flights, two when possible, of the Chilko and Chilcotin rivers and additional flights if budgets and conditions (ice-over) permit. Enumeration of Chilko Lake/River sockeye spawning escapement is conducted annually via an intensive mark-recovery program whereby spawners are tagged in the Chilko River and carcass/tag recoveries are

accomplished via walking and boating surveys of the Chilko River and lake. Taseko Lake sockeye spawner escapement is estimated annually utilizing an index accomplished via visual observations and carcass recoveries from the lake and selected tributaries.

Pink salmon and other stocks occurring within the Williams Lake River watershed and Churn Creek are enumerated by stream walks conducted by technicians from the CTC and DFO. These enumerations could prove to be highly important in the future as they are on the only active programs assessing pink salmon escapement in the upper Fraser.

Activities associated with habitat protection and anadromous resources are completed by DFO habitat and enforcement staff from the Williams Lake office. Habitat protection and enforcement activities in this subunit are largely focused around forestry related development and agricultural related impacts. DFO's approximate commitment of Enforcement personnel to this area amounts to approximately 1 person/year. DFO's commitment of habitat personnel to the subunit is approximately 1 person/year.

### **Existing Capacity Summary**

All Chinook, coho and sockeye escapements conducted within this subunit are coordinated and funded by DFO's stock assessment section in Kamloops. Managing/coordinating personnel also come from this office. The TNG Fisheries program contributes staffing to enumeration activities in the Chilko/Chilcotin system and conducts an extensive monitoring program on food fisheries occurring on the Fraser mainstem and Chilcotin River. The CTC fisheries program conducts enumeration programs on smaller tributaries in this subunit including the Williams Lake and San Jose rivers and Churn Creek. Enforcement activities related to the Fisheries Act are completed by DFO staff from Williams Lake, which include habitat and enforcement staff.

Table 28. A summary of the existing fish stock and fisheries management activities and associated roles presently supported by DFO, NGOs and First Nations personnel within the Chilko/Chilcotin Sub-unit.

<b>Project</b>	<b>Present Responsibility</b>	<b>Funding Source &amp; Amount (\$)</b>	<b>Staffing Requirements/ Timing</b>	<b>Staff Skills</b>
Chinook enumeration. Chilcotin, Chilko and Taseko rivers and Elkin and Narcosli creeks. Streams are flown up to 4 times each to generate an area under the curve estimate. Flights are generally initiated on August 10 and continue to early September.	DFO stock assessment funds and completes this work. Chilko Chinook are a PST indicator stock.	DFO stock assessment Approx. \$15-20,000 vast majority expended on helicopter time.	Staffing is generally provided through stock assessment in Kamloops with assistance from other DFO offices (Prince George, Quesnel, Williams Lake). Daily requirements for observers is 2/day for a period of 3 weeks.	Lead observer must have numerous years of experience in counting from helicopter (preferably specifically within this area). Second observer should have some experience.
Coho enumeration Has focussed on the Chilcotin, Chilko and Taseko rivers and several smaller streams in the past few years. Streams have been flown twice in the past, possibly more or less depending on budgetary issues.	DFO stock assessment funds and completes this work.	DFO stock assessment Approx \$0-5,000 vast majority expended on helicopter time.	Staffing is generally provided through stock assessment in Kamloops with assistance from other DFO offices (Prince George, Quesnel, Williams Lake). Daily requirement for observers is 2/day for 1-2 days.	Lead observer must have numerous years of experience in counting from helicopter (preferably specifically within this area). Second observer should have some experience.
Sockeye enumeration Large program on Chilko River and Lake conducted annually.	DFO stock assessment funds and completes this work.	DFO stock assessment ~\$250,000	Staff of 8-12 depending on run size and timing. Duration of seasonal positions is 3-6 weeks.	Senior technical staff generally have post secondary training and several years of experience. Junior field staff can have on the job training.
Habitat and Enforcement. DFO's commitment of habitat (HEB) and enforcement (C&P) staff for enforcement of Fisheries Act. HEB Biologist is responsible for review of development plans of various natures and CEAA applications.	Contributed from offices in Williams Lake	Core funding DFO Pacific Region. Approx. 200K	Subunit presently receives the approximate commitment of 1 fulltime and 1 seasonal C&P officer. An additional commitment of 1 habitat personnel is also contributed to this area.	C&P Officers have specific technical diplomas and related enforcement officer training. Habitat Biologist has a minimum bachelors degree and one year experience in related field.
Aboriginal FSC Fishery Monitoring. Fisheries occur within the Fraser River mainstem and Chilcotin River	First Nations with fisheries within this subunit self-monitor.	Financial contribution is from First Nations through AFS	5-6 individuals for 2 months to cover the entire area.	Personnel generally have experience in managing tabular data and knowledge of census techniques and fishery.



### **Fish/Habitat Management Issues, Information/Capacity Gaps**

The largest information gap identified by DFO for this subunit is the lack of an intensive Chinook indicator stock program. Plausible modes of filling this information gap were identified as including the application of coded wire tags (CWTs) to emigrant Chilko chinook, in combination with a downstream juvenile emigrant population estimate and a mark-recapture spawner estimate. Also tied to the spawner estimate would be a cross calibration of escapement assessment methods. At present, Chinook enumeration on nearly all stocks within this subunit is conducted via overview flights. There is a need for interested parties to meet and develop budgets and study designs related to each component of this indicator stock program and determine possible roles and responsibilities for, and coordination of, each undertaking, prior to petitioning funding from available sources. It should be noted that the Chilko Chinook stock is a Pacific Salmon Treaty Indicator Stock for which Canada has enhanced responsibility for accurately enumerating.

With respect to coho within the Chilcotin/Chilko subunit, a need for additional ground and aerial assessments to determine presence and utilization (timing and abundance) across a suite of stocks was identified. These are analogous to the information requirements identified within the Quesnel/Horsefly and Cottonwood/Blackwater subunits where the information relating to coho stocks within these areas is poorly developed as yet. There is a need for interested parties to meet and discuss priority objectives for such an initiative within this subunit and develop a related study design.

Habitat assessment and restoration has been identified as a priority within the Williams Lake River watershed. Fish access and habitat is presently frequently limited by issues relating to low flow. As well, water quality has also been identified as being an issue. This watershed has been heavily impacted by urbanization and agricultural development, including large amounts of cleared and hardened areas, related water quality issues and extensive riparian damage. Anecdotal evidence exists to suggest that this watershed once supported much larger populations of several salmonid species. Existing habitat assessment information and summaries of past habitat restoration undertakings within the watershed should be collected and reviewed as the first step towards identifying a strategy for this undertaking.

As with the other large sockeye stocks occurring within the upper Fraser plan area, the lack of an index of run size in the upper Fraser for the Chilko sockeye stock has been identified as an issue. Run size estimates derived from the Mission hydroacoustic station in the lower Fraser have proven to be inaccurate estimator of the Chilcotin

sockeye stock on a number of occasions. The lack of a method of run size estimation upstream of the Mission hydroacoustic station does not allow for confirmation of the Mission estimates or a more definitive estimate of in-river escapement and enroute mortality until the stock reaches terminal spawning areas. As total spawner escapement of the stock group is generated through mark-recoveries in spawning areas, determinations of “under or over escapement” do not occur until the stock has completed migration to terminal areas. Thus, it is generally too late for management actions that may have been instituted in the interests of conservation and/or capitalizing on surplus escapements. Discussions regarding plausible mechanisms and methodologies to create an estimate of run size prior to the fish reaching terminal areas have included the use of a First Nation dip-net fishery that occurs within the Farwell Canyon on the Chilcotin River, and subsequent development of index of run strength through fishers catch and effort. Interested parties should meet to discuss this and other options and determine a course of action for developing a means of estimating run size/strength prior to all fish reaching terminal spawning areas.

Table 29. A summary of the fish stock and fisheries management activities and related roles that, if undertaken, were identified as being potentially beneficial to the management of the anadromous resources of the Chilcotin/Chilko Subunit by either First Nations or Fisheries and Oceans Canada staff during this strategic planning process.

<b>Project</b>	<b>Rationale and Description</b>	<b>Suggested Format and Action</b>	<b>Funding Source &amp; Amount (\$)</b>	<b>Staffing Requirements/ Timing</b>
Chinook Indicator Stock	Presently no indicator stock within this subunit to provide an annual index of Chinook escapement. All enumeration of Chinook completed aurally only. Suggested that program required to redress this data gap could include tagging juveniles, generating downstream emigrant population estimate and mark-recovery on adults.	TNG, DFO and other interested parties collaborate on project objectives and study design and define roles and responsibilities and investigate plausible funding sources.	Dependent on study design but will be expensive >\$100,000.	Project manager should have post secondary technical training. Seasonal staffing requirements and their specific training will vary dependent on study design.
Coho Spawner Distribution and Abundance	Information regarding coho distribution and density within the streams within the Chilcotin/Chilko subunit has only recently been developed. Need to determine additional information about both distribution and abundance.	Interested parties to collude on project objectives and study design. Will likely include additional ground and aerial surveys of streams identified as high potential coho streams and possibly juvenile surveys.	Will vary depending on study design adopted.	Project manager should have post secondary technical training. Number and types of field staff required will vary depending on study design adopted.
Land Use Regulation Efficacy Assessment	Strong support for conducting an ongoing program to monitor licensee compliance to existing forest harvesting regulations and also assess the congruence of these regulations with the Fisheries Act and the Fish Protection Act. Also interest in assessing/monitoring the above in relation to range and water use in this subunit.	Should develop monitoring program in conjunction with DFO, MoWLAP and possibly forest licensees. Should incorporate monitoring areas of high fisheries values. Could look beyond specific habitat parameters and at impacts of increased public access etc.	Dependent on study design adopted.	Project designer and project manager will require university education. Depending on study design, personnel can likely be trained in-field but should possess technical diploma.

<b>Project</b>	<b>Rationale and Description</b>	<b>Suggested Format and Action</b>	<b>Funding Source &amp; Amount (\$)</b>	<b>Staffing Requirements/ Timing</b>
Williams Lake River Watershed Restoration	Watershed has been impacted by various land use and development leading to water quality/quantity and habitat issues. Fish access and habitat is impaired during low flow years.	Interested parties need to meet to discuss project objectives and priorities. First step should be collection of all previous assessment and fisheries related works that have been undertaken within the watershed.	Will vary depending on assessment and subsequent restorative works identified as being required.	Dependent on works identified and undertaken. Instream or near-stream works must be prescribed and supervised by a qualified individual. Field staff can have varying degrees of training. Dependent on works and size of stream, work can be labour intensive.
Chilko Sockeye Run Size Estimator	A need has been identified for a mechanism to assess Chilko sockeye run strength upstream of Mission. This is intended to allow for more accurate in-season run strength estimates to allow corresponding management decisions to be implemented.	Need for interested parties to determine feasible mechanisms, methodologies and sites for test fishery.	Will vary dependent on structure of test fishery design.	Will be dependent on technical nature of any methodology adopted for implementation.

## **COMMON TO ALL SUBUNITS**

### **Fish/Habitat/Management Issues, Information/Capacity Gaps**

There were a number of fish and fisheries management related activities that were identified by several of the parties petitioned for the purposes of the development of this plan as being required to be undertaken within the upper Fraser area. These commonly identified capacities or information gaps and the identified/required action to redress them are discussed below.

#### Affecting Exploitative Factors

It is inherently understood by the Alliance parties and within the context of this plan that many of the factors that contribute to the ongoing depressed state and/or impede the rebuilding of many upper Fraser anadromous stocks is their interception in marine and lower river commercial, sport and food, social and ceremonial (FSC) fisheries. Exploitative issues related to upper Fraser stocks within all subunits encompassed by this plan, require the development and implementation of an effective mechanism to reduce exploitation on troubled stocks if the intent is to rebuild stocks to historic levels and/or to habitat capacity. This will be a social strategy rather than a technical strategy, requiring the petitioning of DFO to alter fisheries management policies. However, this position can be forwarded much more effectively and credibly with the scientific evidence that the implementation of this WBC-M plan can achieve. This issue is relevant to all of the subunits within this plan and is worthy of a strategic plan of its own.

#### Upper Fraser Commercial Fishery Development

Many upper Fraser First Nations have identified as desire to derive economic benefits from sockeye (and in some cases Chinook) stocks that either utilize natal habitats within their territories or migrate through their territories. At present in the upper Fraser only the Lheidli T'enneh First Nation has negotiated a commercial fishery/Harvest Agreement, which is included within an as yet unendorsed Treaty Settlement (Agreement in Principle). The feasibility of this component of the Treaty Settlement (fishery) has been assessed for the last three seasons. At present, other First Nations in the upper Fraser are not afforded any legal economic development opportunities related to fish resources. Under such circumstances, the only feasible option for upper Fraser First Nations to pursue a commercial harvest of salmon is through the declaration of Escapements Surplus to Spawning Requirements (ESSR), whereby the number of fish of a particular stock return in numbers deemed in excess of the number required to fill the available spawning areas. The declaration of an

ESSR must be made by a DFO official. Such declarations generally bring with them imposing political ramifications.

At present, the major impediments to Upper Fraser First Nations being afforded commercial fishing opportunities through the available process described above are as follows:

- Escapements of upper Fraser sockeye stocks have in general returned in numbers insufficient to allow for the declaration of an ESSR. DFO fish management objectives equate to an attempt to avoid allowing stocks to “over escape” by exploiting them at high rates in marine and lower Fraser commercial fisheries. Minimum escapement goals have not been determined for many of the stocks, further complicating the declaration of an ESSR. DFO is under no obligation to manage for brood escapements in excess of conservation objectives.
- In-season run size and stock composition estimates are not available to declare ESSRs prior to terminal enumeration programs.
- DFO has, in the past, been hesitant to declare an ESSR due to the potential political ramifications associated with the perception by some that an “over escapement” equates to poor management on DFO’s part.
- Additionally, DFO also faces political ramifications associated with allowing terminal harvests whereby First Nations or other groups are allowed to commercially benefit from fish that could have been captured in and benefited the marine/lower river commercial industry.
- Palatability and thus the economic value of sockeye from the interior are not generally held in high regard, largely due to ignorance. This argument is commonly utilized by the coastal commercial fishing industry in opposition to the idea of near-terminal harvests.

Given that it is highly probable DFO fishery managers will be facing additional conservation related constraints relating to small stock conservation, reduced exploitation on larger stocks originating from the upper Fraser (Chilko, Quesnel/Horsefly, Stellako, Nadina, late Stuart) should be the result. This may result in commercially harvestable surpluses of these stocks reaching terminal areas in the upper Fraser with greater frequency in the future. It is thus in the best interest in

upper Fraser First Nations to prepare to capitalize on this result. The logical first steps in this preparation would be to redress the points discussed above. Once it is apparent that the prophecy of more frequent harvestable surpluses reaching terminal areas will be realized, it must be reconciled between upper Fraser First Nations and DFO that declarations of ESSR fisheries will be forthcoming when numbers warrant it. Upper Fraser First Nations and DFO need to work on establishing minimum escapement goals for all upper Fraser sockeye stocks in order to ensure terminal harvest opportunities do not impact conservation goals. Additionally, it would be advantageous for upper Fraser First Nations to resolve amongst themselves how any harvestable surpluses will be shared, in particular within near terminal areas where multiple communities occur. As this is largely a political undertaking, the nature in which it could be undertaken is not discussed further within this plan.

#### Test Fishery/In-Season/River Enumeration Mechanism

Common to all subunits discussed within this plan, there is a need to establish a “test fishery” within one or more areas within the upper Fraser area (i.e. the area incorporated within this planning exercise). This test fishery has been deemed to be required by the Alliance parties and would be utilized to assess and/or contribute to the following:

- Accuracy of marine and lower river stock composition estimates.
- Accuracy of lower River test fishery indices and hydro-acoustic counting mechanisms.
- Stock migratory timing and estimates of en route mortality rates and levels of First Nations' and in-river sport fishery harvests.
- Generate the real-time information on stock status that is necessary to allow surplus declarations and implement or “trigger” near-terminal harvests.
- Generate the real-time information on stock status that is necessary to open and close commercial fisheries negotiated through future Treaty or Interim Measures agreements.

Consideration for the establishment of the mode and mechanism for this initiative would have to be completed in the forum of the Alliance with participation from DFO's stock assessment personnel.

Respondent's rationales for the requirement for a test fishery within the upper Fraser area varied slightly, but all identified a test fishery as being a high priority. For the purposes of this discussion, the term “test fishery” is referring to a mechanism(s) to determine sockeye run strength and possibly stock composition. Rationales ranged

from the inability to determine an Escapement Surplus to Spawning Requirements (ESSR) prior to terminal enumeration (when the fish have lost their economic value), to the inability to manage food fisheries around conservation concerns, to the inability to plan for and implement Harvest Agreements from both logistical and conservation perspectives. As well, it was also expressed that an in-river/season run size and/or stock composition mechanism within the upper Fraser would also assist fishery managers in improving the accuracy of the timing of food fisheries and possibly commercial fishery openings and closures to improve the potential for meeting escapement targets. Required locations for test fisheries were suggested as being the Chilcotin River, the Quesnel River, and the Fraser River upstream of the Quesnel River confluence.

Test fisheries within the Chilcotin and Quesnel systems would provide in-season estimates of run size for two stocks that are commercially important. Depending on the nature of the mechanism employed, such a test fishery could be useful in comparing/confirming run size estimations derived from lower river test fisheries and assessing enroute harvest/mortality. Neither the Chilcotin or Quesnel/Horsefly systems have had an in-season run size estimator upstream of Mission and have relied on terminal enumerations of fish on or near spawning areas to determine total escapement. These programs have involved intensive mark-recaptures and aerial counts and have been very expensive to conduct. A mechanism of run size estimation and assessment of stock composition within the Fraser mainstem upstream of Quesnel and downstream of the Nechako would allow for an estimation of run strength for the Nadina, early and late Stuart, Stellako and Bowron sockeye stocks as well as possibly some Chinook stocks.

As these are undertakings that have ramifications on all upper Fraser First Nations they should be developed and implemented with the input of all interested parties. A factor that should be considered when assessing the cost of the implementation of these test fisheries is that they may eventually allow for a reduction in the intensity of costly terminal enumeration programs that are presently implemented on upper Fraser stocks. Additionally, the partial offsetting of the costs of these programs should be considered through the sale of some fish, which would also assist in the feasibility assessment of the palatability of these fish and the development of markets for near-terminally captured fish. It is suggested that a subcommittee of UFFCA participants be created to focus on the conceptualization and implementation of test fisheries within the upper Fraser.



### Life History Studies

The requirement to initiate and/or collect further information with respect to the life history components of Chinook and coho stocks within the upper Fraser area was implicit for all subunits. UFFCA participants could far more effectively and efficiently undertake a study of the required nature that encompassed multiple stocks throughout the plan area rather than focusing on only a single stock or area. Groups that are interested in undertaking work of this nature should collude on a overall study design.

### Land/Water Use Assessment and Monitoring

A need for the monitoring of licensees' and range and water lease/license holders' compliance with accepted forest and range practices, as well as the efficacy of legislation and regulations governing these tenure holders and their activities, relative to the protection of aquatic resources, was identified throughout the upper Fraser plan area. This may have even more relevance as the province moves toward devolvement from the monitoring of licensees' activities and towards new standards for forest practices and a greater reliance upon the industry for "policing" its' environmental compliance. Additionally, as many licensees are attempting to gain various levels of environmental and social "certification" accreditations, First Nations in particular are well placed to move into a role of compliance monitors. Strategies need to be developed to explore this opportunity and potential modes and mechanisms for implementation.

Forestry related development and cattle grazing/agriculture are the largest and most expansive land use activities that have taken place and continue to occur within the upper Fraser plan area. Nearly every substantial watershed within the area, with the exception of some within parks, has had some level of development. First Nations and provincial and federal agencies have all expressed concern in relation to issues of forest resource extraction and the associated/accompanying development in relation to the protection of aquatic resource values. There is a requirement to monitor and test the efficacy of land and water use legislation and associated regulations in terms of their compatibility with the Federal Fisheries Act and the Provincial Water, Fish and Range Acts. Specific areas where the congruency and compatibility of accepted forest and range practices, and the overriding legislation protecting aquatic resources, require assessment are in the areas of water temperature regime, discharge regime and peak flow indices, turbidity and suspended sediments, and direct and indirect channel/habitat alteration.

### Watershed Restoration

There are very limited funds available for the undertaking of watershed restoration related activities. The province has initiated the implementation of its Living Rivers Strategy, which will encompass a watershed restoration component, however, initial indications are that funding levels for the program will be small. Funding is also available for restoration activities through the Forest Investment Account (FIA), which are the public monies that are accumulated from the stumpage fees licensees pay for cutting timber. The industry has a high degree of control over the expenditure of these funds, which are distributed to individual licensees based on their rate of cut. The provincial policies related to the allowable investment of these FIA funds contain no aspect of a social agenda, as its predecessor (Forest Renewal) did. Therefore, in order for First Nations to petition licensees to expend “their” FIA funds on restoration activities that are seen as a priority they must work directly with the licensees.

There is a need for the development of a process to identify anadromous salmonid habitat within each subunit that has been damaged, evaluate and prioritize these habitats for restoration related activities, and identify and pursue the most feasible avenues for funding the work. A process similar to this was completed by the province in most areas several years ago and it should be easily adaptable to selecting anadromous habitats without recreating the identification and evaluation processes.

Table 30. A summary of the fish stock and fisheries management activities identified by either First Nations or Fisheries and Oceans Canada staff during this strategic planning process that, if undertaken, would be potentially beneficial to the management of the anadromous resources of all subunits within this plan area.

<b>Project</b>	<b>Rationale and Description</b>	<b>Suggested Format and Action</b>	<b>Funding Source &amp; Amount (\$)</b>	<b>Staffing Requirements/ Timing</b>
Development of Upper Fraser Sockeye ESSR/Commercial Fisheries	Upper Fraser First Nations wish to accrue economic benefits from sockeye stocks originating from the plan area. Harvesting can occur more effectively on targeted strong stocks in or near terminal areas and reduce the negative consequences of mixed stock fisheries. Also, it is expected marine and lower Fraser commercial fisheries may become more restricted as conservation related issues are dealt with, thus potentially creating "surplus" escapements of sockeye on some stocks.	At present only Lheidli T'enneh has negotiated (through BC Treaty Process) a legal commercial fishery/Harvest Agreement on sockeye (presently only in feasibility assessment stage). Other First Nations wishing to pursue commercial sockeye fishing opportunities will need to discuss and/or negotiate agreements between themselves and with applicable agency personnel. This will largely be an undertaking of a political nature. Further, much work is required to assess and develop suitable markets for any future harvests. Recommendations within this plan include committee formation and strategic plan development.	Funding could come from First Nation Governments or could be sought from private business partners or Aboriginal business development corporations.	Suggested format of initiating includes the development of a related strategic plan. Individual(s) to develop would require unique array of training and experience.
Upper River Test Fisheries (in-season/river run size and stock composition index).	Presently there is no mechanism available to estimate run strength upstream of the Mission hydroacoustic station. Further, there is no mechanism to assess in-season stock composition upstream of the lower Fraser River. Implementing mechanisms for assessing run strength in the upper Fraser would allow for the more timely openings and closures of First Nation food fisheries and potentially commercial fisheries throughout the Fraser. The net benefit to this end would be an opportunity to assess run strength relative to estimates at Mission and improve	Lheidli T'enneh is presently working through the BC Treaty Process (with the Pacific Salmon Commission) to identify options for the development of a run size estimating mechanism in the Fraser mainstem between Quesnel and Prince George. Intentions are to obtain stock composition from either food/commercial fishery or a fish wheel. There is an additional need for run size estimation mechanisms in the Quesnel and Chilcotin/Chilko rivers. Programs should be developed with the input and	Dependent on mechanisms employed, costs could be very high to minimal. Run size estimating mechanisms could range from the development of indices based on food fishery effort and catch to echosounding stations. Any and all programs undertaken should be at least partially self-funding in that a portion of the cost of any test fishery is offset by fish sales.	Dependent on format of run size/stock composition estimating program designed and implemented.

<b>Project</b>	<b>Rationale and Description</b>	<b>Suggested Format and Action</b>	<b>Funding Source &amp; Amount (\$)</b>	<b>Staffing Requirements/ Timing</b>
	chances at meeting or exceeding escapement targets for individual stocks.	participation of all Alliance parties.		
Chinook and Coho Life History Studies	Need for stock-specific information relating to upper Fraser coho and Chinook life history strategies. This need is generally common to all subunits. Such studies could be potentially more effectively and efficiently undertaken through the partnering of multiple parties' resources.	Form subcommittees within the participating Alliance parties and DFO science and stock assessment personnel as well as possibly UNBC. Determine goals, and objectives of study(s), assign responsibilities and determine where funding will be petitioned.	Will be dependent on nature of study design and mode of implementation.	Project developers and manager(s) will have to be university graduate level. Key field personnel should have technical diploma.
Land/Water Use Assessment and Monitoring	Efficacy of existing legislation and regulations surrounding the protection of aquatic resources relative to existing and evolving modes of land and water use and resource extraction is in question. Many groups have noted an apparent degradation or alteration of habitats and ecosystems overtime due to activities within their Territories. There are presently no programs, other than Water Survey of Canada stream discharge monitoring stations and annual Provincial snow pack monitoring, within the plan area that are focussing on long-term monitoring of components of aquatic ecosystems.	UFFCA parties need to collude with interested agencies and parties to identify watershed specific objectives of any such program. As identified above, physical aspects of monitoring are suggested to include water temperature regime, discharge regime and peak flow indices, turbidity and suspended sediments, and direct and indirect channel/habitat alteration. Any such program should also have a strong focus on the monitoring of biological components of ecosystems as well.	Costs for such a program could be extremely high, depending on intensity and ecosystem components selected for monitoring (i.e. watershed objectives). Sources of funding for such endeavours are very minimal. First Nations could explore relationships with licensees related to product and operative certification and related "environmental" and "First Nations" components of certification criteria.	Number of staff and staff skills will be dependent on format of any initiative implemented. Any consideration of such programs should be developed in consideration of scientific and TEK.

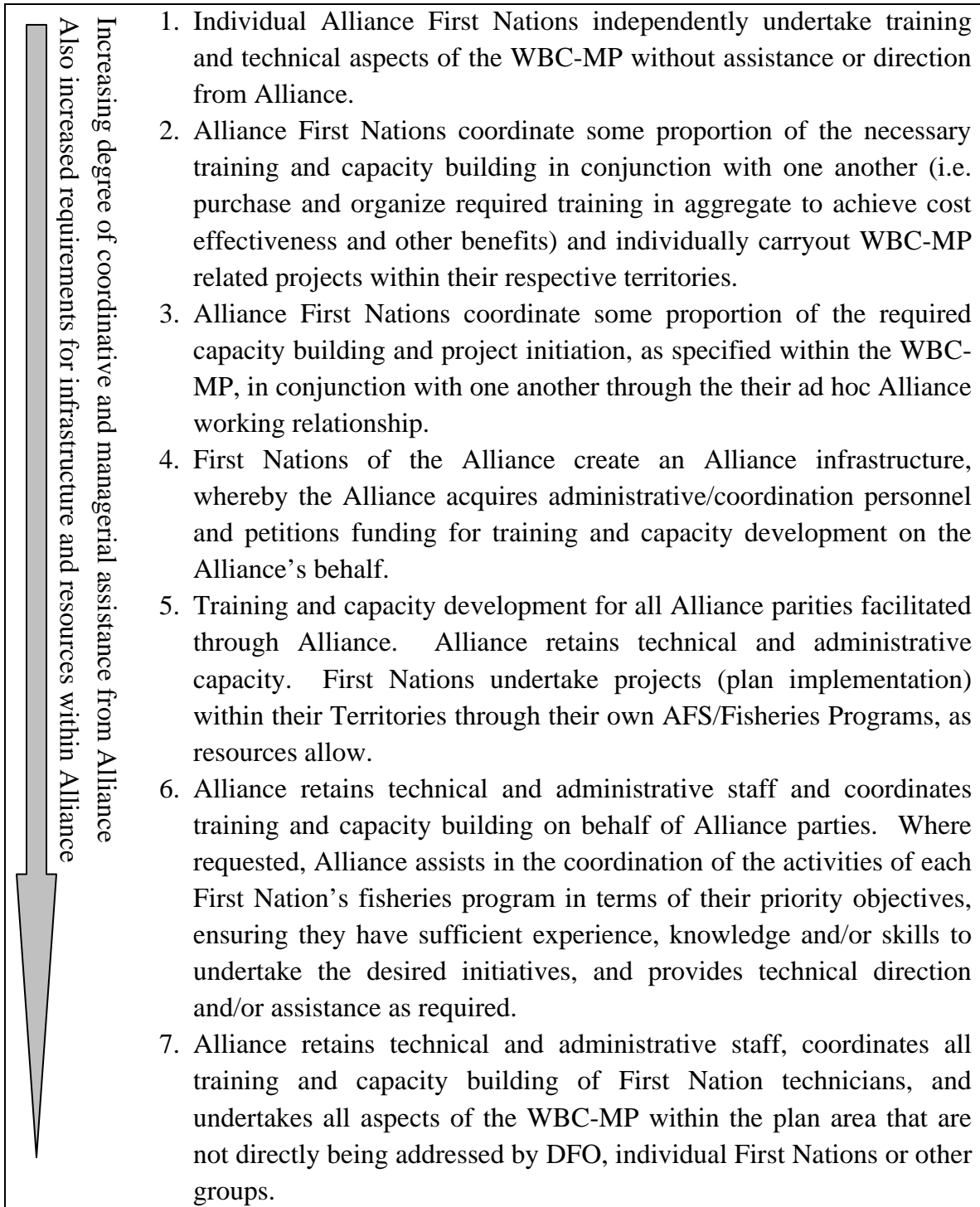
## **CO-MANAGEMENT PLAN IMPLEMENTATION**

Numerous high priority issues have been identified for redress within this plan, each occurring within a specific First Nation's Territory. Additionally, it is also evident that there are considerable fisheries related capacities within each subunit that are presently fulfilled with minimum participation from First Nations personnel. As it is highly unlikely that sufficient funds could potentially become available to undertake all of the initiatives (training, capacity development and specific projects) identified within the plan within the immediate foreseeable future, it is suggested that the capacity development needs and projects identified within the plan be prioritized and corresponding initiatives be undertaken as resources become available. This includes both financial resources and personnel from the applicable First Nation groups with suitable capacities to undertake individual projects. The recommended role that the UFFCA should "play" in the implementation of the components of this plan are explored below. As well, suggested priorities for the Alliance to pursue are also outlined and discussed.

### **Alliance "Role"**

The "role" of the Alliance in the implementation of this Watershed Based Co-Management Plan (WBC-MP) could potentially take many feasible forms. Two possible extremes, as seen by the author, would be the complete responsibility for the coordination and management of the WBC-MP being placed on the Alliance, or conversely, at the opposite extreme, each of the individual First Nations could be responsible for their own training and capacity development and subsequent completion of the portions of the WBC-MP that occur within their respective Territories. These two extremes would obviously require differing levels of infrastructure within the Alliance, as would the many options for implementation strategies that exist in between these two extremes. Theoretically plausible examples of how the WBC-MP could be implemented by the Alliance and/or its' member First Nations are provided in the diagram below.

While each of these possible modes of implementation has its own inherent benefits and drawbacks, the author believes that there are far more benefits to be accrued by the First Nations of the Alliance, in terms of cost savings and the overall effectiveness of the implementation of the plan, from a more centralized delivery and coordination mechanism. Similarly, sentiments along this vein have been expressed since the onset of UFFCA forum discussions surrounding the development and implementation of the WBC-MP, and were in general the rationale for the conceptualization of a body such as the Alliance and the drafting of this strategic plan.



As discussed previously, the Alliance does not presently have any infrastructure or a formal legal definition as an entity. This has yet to be addressed by the First Nations that have attended Alliance forums but has been discussed. Based on the author's

believes that the implementation of this plan could be attempted with a higher potential for success if undertaken via a central agency (i.e. the Alliance) the following sections suggest the structure and infrastructure that the “Alliance entity” would require in order to function in a manner analogous to the 6<sup>th</sup> example posed in the diagram above.

The remainder of this plan outlines plausible means by which portions of this plan could be implemented, including where applicable resources could be sought, how required training could be attained, and how a coordinative capacity, via the Alliance, would assist and direct implementation of the plan.

### **Legal Status**

In order for the Alliance to retain staff and perform the recommended functions as identified within this plan (i.e. petition for and administer funds on behalf of the Alliance parties), the UFFCA should become formalized as a legal entity. The suggested entity would be a registered non-profit society operating from a reserve of one of the Alliance First Nations. This would allow the organization to accrue additional tax exemption benefits. It may not be necessary for the registered entity to be operated from a reserve as the Alliance’s clientele would be entirely First Nations. Legal expertise would be required to register as a non-profit society and a legal opinion as to whether the Alliance would be required to operate “on-reserve” could be obtained at that time. Estimated costs of registration as a non-profit society is \$1200-1500 when utilizing the services of a lawyer, which is recommended in this case.

### **Board Governance**

As the Alliance entity will be an organization acting on the behalf of the upper Fraser First Nations (and DFO) that participate in the Alliance, the parties to the UFFCA will require a mechanism of governing and directing this entity. The recommended structure would be a board of directors appointed by some means from the UFFCA participants. Associated board constitutions and other formal documents required in some cases by law, and in other by practicality, will be required to be developed on behalf of the UFFCA via some means. As non-profit organizations acting on behalf of groups of First Nations are not uncommon (PGNAETA, Tribal Councils, FRAFS, etc.), much of the required materials should be transferable from analogous organizations with suitable modifications as desired by the Alliance parties.

### **Financial Administration**

If the Alliance parties opt for the suggested organizational format and mode of implementation recommended within the plan, the Alliance will either require an

internal mechanism that allows the Alliance to administer funds or an agency to administer funding on its behalf. In either instance it would be beneficial for the Alliance to attain status as a legal entity, as described above, as it will be necessary to obtain suitable banking accounts to administer any funds received. Actions that are required relating to formalizing the UFFCA as an entity, as described above in Board Governance, will also be required to allow the UFFCA to administer funding.

### **Co-Management Initiative Staffing**

The recommended Alliance infrastructure includes personnel with both technical training and knowledge and strengths in the area of coordination. The need for this position(s) to be of full or part-time nature will be codependent on the amount of funding that the Alliance can initially secure and the degree of participation of Alliance parties in undertaking portions of this plan. Brief descriptions of the recommended personnel “types” and their associated initial duties are described below. The ideal scenario would be if an individual with both these skills and technical training and knowledge could be identified and hired. It should be reiterated that this outlines the recommended Alliance staffing for the short to medium-term (i.e. immediately to March 31, 2005) for the pursuit of the short-term recommendations of this plan. Depending on the rate at which various aspects of the plan can be implemented and the nature of the mode of implementation chosen by the Alliance parties, additional technical staffing will be required. As well, there are additional pursuits and potential functions that the parties to the Alliance may wish to see the Alliance undertake in the future, which would require additional “initiative specific” staffing.

#### Coordinator

The successful implementation of this endeavor is dependent on the support and coordination provided by the Alliance. The recommended Alliance staffing includes both coordinative and technical expertise. It is recommended that the priority staffing position for the Alliance be an individual whose primary skill set is in the coordination functions required, as opposed to strictly technical knowledge and abilities. The recommended initial priority activities of this position are as follows:

- Facilitate the Alliance parties in the development of the necessary board governance structure to direct and control the Alliance “entity.”
- Develop suitable Alliance infrastructure to administer funding.
- Pursue program funding on behalf of the Alliance.
- Coordinate training program development and delivery.



- Assist Alliance First Nations with technical aspects of their fisheries programs, in relation to the implementation of this plan, as requested.
- Provide a coordinative role for the UFFCA meetings (organization, minute collection and distribution, follow-up).
- As directed by the Alliance parties and/or board structure, develop UFFCA TORs and MOUs regarding Alliance function.

### Biologist/Technician

The specific tasks of capacity development and associated scientific endeavors identified within this plan will require that the Alliance maintain personnel to support that various Alliance parties in these training and technical initiatives. However, as identified above, unless a suitable individual can be retained that possesses both the technical and coordinative capabilities, the coordinative capacity is recommended to be the priority (for the short-term). This is assuming that the funding initially available to the Alliance will be too minimal to support two positions. If the ability to attain both capacities exists, they should both be retained as it will expedite the implementation of the plan. The short-term priority tasks of the proposed technical position are as follows:

- In conjunction with DFO and First Nation technical personnel, determine highest priority issues within the plan for redress.
- Develop implementation plans and associated budgets for priority initiatives.
- Identify short and long-term capacity needs for priority implementation plans.
- Research and/or develop suitable means of capacity development for First Nation groups and deliver where required.
- Participate as required, in the execution and completion of technical programs related to this plan.
- Assist Alliance First Nations, as requested, with technical components of their fisheries programs.
- Liaise with DFO and First Nation groups to assess/promote the need for, and develop, mentoring programs to facilitate First Nation's capacity development related to roles presently fulfilled by DFO staff.
- Liaise with First Nation's education coordinators, DFO staff, and academia to facilitate long-term education/career planning and suitable support structures for First Nation candidates.
- Liaise with DFO and First Nations groups to assess progress related to plan implementation.

It should be noted that this technical position and the associated recommended tasks of the position are exclusive of any duties related to consultation or roles that would be analogous to those presently fulfilled by FRAFS personnel. It has been discussed within UFFCA forums that technical capacity to perform such roles may be required within the UFFCA infrastructure, but as this issue is not considered within this plan, these potential duties of this technical role are not discussed here.

### **Training and Capacity Development Priorities**

Initial priority training requirements for core personnel from First Nation's fisheries programs have been identified within this plan as follows:

1. "Recognized" technical training for field personnel: Depending on individuals existing level of training/education, this training is recommended to consist of the Malaspina University's Fisheries Field Technician Training Program. This is a 5 week intensive classroom and field based training program that will provide participants with exposure to many realms of aquatic resource management and related issues. Course components can be altered to include local area content, which would be recommended if the course was to be delivered in the upper Fraser. The course can normally be delivered to 15-16 participants.
2. Management and leadership training for program managers and supervisory staff: Intent is to provide perspective program managers and senior program staff with the skills necessary to perform management requirements related to their AFS programs and staff supervisory skills. There are numerous courses offered by educational institutions throughout B.C. Recommendation would be for DFO and UFFCA staff to collude on course components and content and develop suitable mechanisms for delivery "in-house".

It is further recommended that improved linkages between fisheries program managers and educational coordinators within First Nations be developed. This should include the development of relationships between those acting as mentors, education coordinators, and UFFCA staff. This is for the purposes of targeting First Nation individuals that have identified specific career goals within the fisheries field and ensuring they receive the support and guidance required for them to achieve their objectives.

Additionally, mentoring programs are recommended to be utilized as a potentially useful mechanism for developing capacities within First Nations personnel for pursuing and eventually occupying positions within DFO, or those analogous to DFO.

DFO has indicated they are amenable to the development of this type of opportunity in relation to some of their capacities. The most common and stable fisheries related capacities within the upper Fraser are habitat and enforcement positions. At present there are no First Nations personnel working in these capacities, despite the fact that DFO has had an ongoing Aboriginal Recruitment component to their hiring strategy. The potential for an increased role of First Nations and First Nations personnel should be explored specifically in relation to habitat-related capacities.

The many large-scale annually or regularly occurring fisheries management activities outlined in the Subunit Technical Summaries above are managed by DFO's Stock Assessment Division in Kamloops. They presently occur with varying degrees of participation of First Nations personnel. In few instances have First Nations developed sufficient capacity to undertake more or less "sole" management of components of the enumeration program occurring within their respective Territories. If various First Nation groups wish to pursue a greater degree on involvement in and/or eventual management of these programs, a strategy needs to be developed encompassing the following:

Sustainability of the Opportunity:

DFO's Stock Assessment Division is facing budgetary cutbacks over the next year. It should be ascertained as to what the level of DFO's commitment is to continuing funding and operation of each program being considered.

Agreement with DFO:

First Nations groups need to meet with DFO officials to ensure there is a willingness on the Department's part to integrate seasonal employment positions to First Nations personnel as they become competent to undertake available opportunities. Agreements should be developed, specific to each operation or facility, which dictate First Nations capacity development and hiring targets for a year-to-year timeframe. Agreements should also consider options including subcontracting components of specific DFO operations and programs to First Nations groups over applicable timeframes.

Capacity Assessment:

First Nations fisheries program managerial personnel, First Nations Education Coordinators and DFO staff need to collude to outline the various capacities required to fulfill employment targets and identify individual groups responsibilities in this regard, and suitable candidates.

**Capacity Development:**

Agreements with DFO should include mentoring components to ensure suitable managerial type capacities are developed as suitable candidate personnel are identified. This should include career path guidance and associated off-season support to ensure individuals are pursuing educational and training requirements as needed. First Nations fisheries program managerial staff need to be intensively involved so as to plan for and provide any required technical and practical training to personnel being targeted for integration into DFO facilities.

The involvement of UFFCA staff in facilitating all components of the suggested strategies listed above is inherently assumed.

**Budgetary Projections**

The following provides an estimate of the financial resources required to support the Alliance infrastructure necessary to administer, coordinate and manage the implementation of this plan, as well as an estimate of the costs required to attain the necessary training and capacity development. These costs are completely co-dependent on the funding that can be secured by the Alliance in order to implement the plan. These projections are therefore based upon the model suggested above whereby the Alliance secures Coordinative and Technical capacities to implement the short-term plan components.

Item	Description	Estimated Year 1 Cost \$
Coordinator	To undertake activities outlined above. Costs inclusive of benefits/mercs.	80,000
Coordinator Travel	Travel to various First Nations communities, project sites, and required meetings. \$1000/mon.	12,000
Biologist	To undertake activities outlined above. Costs inclusive of benefits/mercs.	70,000
Biologist Travel	Travel to various First Nations communities, project sites, and required meetings. \$1000/mon.	12,000
Office Equipment	Provision of office furniture, computers and associated infrastructure (lease or purchase)	10,000
Office Space	Provision of office space and associated utility costs estimated @ 700/mon.	8,400
Training	Purchase and/or development of required technical training and managerial programs. (Note, portion of these costs are included in those funds petitioned through the BC Capacity Initiative)	60,000
		\$252,400

Again, it should be reiterated that this budget is only relevant to the implementation of the capacity development components of this plan. Depending on any additional funds being received to implement the technical projects identified, additional technical capacities may be required in order to assist First Nations with these initiatives as required.

### **Scientific Information Gaps and Technical Issues**

There are numerous scientific information gaps and technical issues identified by First Nation and DFO respondents through this planning process that are discussed within the Subunit Technical Summaries above. As the related technical projects and/or actions that would be required to redress these issues are wholly dependent on available funding, their pursuit is not thoroughly discussed here. Recommended issue specific actions are summarized within the tables following each Subunit Technical Summary. Many require further planning and collusion between interested First Nations parties and DFO personnel in order to determine plausible study design options and personnel requirements and costs. It is suggested that the parties to the UFFCA develop a subunit specific prioritization process for these issues. It is intended that the UFFCA staff described above would facilitate these processes. Further, if particular First Nation groups wish to pursue identified technical endeavors through their existing AFS funding, it is anticipated UFFCA staff would also be available to assist with related planning, liaison and some technical functions.

### **Potential Revenue Sources**

At present, there are limited financial resources available through government funding programs to support project specific initiatives such as those identified within this plan. However, there are several sources of funding available to support training and educational endeavors for First Nations persons as well as provide employers with funding for wages or wage subsidies for employment based training endeavors. Some potential funding sources of both of the types described above that could be utilized to support the implementation of this plan are discussed below.

### **AAROM Program**

The Federal government has initiated a program termed the Aboriginal Aquatic Resource and Oceans Management Program (AAROM), which focusses on funding the endeavors of First Nations working together, such as the UFFCA. This program is targeting financial support to Aboriginal groups that are working together to obtain access to technical, scientific and administrative expertise in order to facilitate their

participation in decision making processes used for aquatic resource and oceans management. Funding through this program has been pursued on the Alliance's behalf by DFO for the 2003/04 fiscal year and a total of \$22,000 have been received, which are to be expended partially on components of this plan.

#### Aboriginal Training Funding

There are several agencies that specialize in supporting training and employment initiatives for First Nations. The most prominent in the Prince George to Williams Lake area is the Prince George Nechako Aboriginal Education and Training Agency (PGNAETA) and the Cariboo-Chilcotin Aboriginal Training and Education Center (CCATEC). They fund endeavors such as those proposed within this plan, including contributing financial resources to candidate training and capacity building, cost sharing of employment positions for candidates, formal college and university tuition costs, and provide some aspects of career path guidance. They provide funding to all First Nations within their area of responsibility and the respective First Nations are responsible for expending the funds within the constraints surrounding the PGNAETA and CCATEC programs. In addition, the agency has funding programs for training and wage subsidies targeting specific types of First Nation clients. These funds are accessed through proposal submission.

#### Contributions from individual group's AFS budgets

As the Alliance is recommended to become an organization that coordinates training initiatives on the behalf of, and provides technical support and direction to, upper Fraser First Nations, it may be beneficial for groups to contribute a portion of their AFS budget to the Alliance. As many groups receive funding and/or undertake activities on a scale that does not require the retention of fulltime technical/professional personnel, this may be the most cost effective mechanism to retain the required expertise. Similarly, Alliance parties could target portions of their AFS funding and training dollars towards an Alliance infrastructure and the implementation of portions of this plan.

#### B.C. Capacity Initiative

2003/04 was purportedly the last year of this funding for the B.C. Capacity Initiative program, but the program has now been extended. The initiative has provided funding up to \$75,000/year to First Nations and up to \$200,000/year to regional groups of First Nations working together for the purposes of capacity development. The "regional" category of funding for groups of First Nations working in partnership (such as the Alliance) does not affect individual First Nations from applying for funding for their own initiatives. A proposal was submitted on behalf of the Alliance in January 2004 for a total of \$126,000 for the purposes of purchasing Malaspina

University's Fisheries Field Technician Training Course and having it delivered within the upper Fraser. Funds petitioned would also cover some aspects of participant's costs and the costs of Coordinating position for 7 months. Notification regarding the success or failure of this proposal will not be provided until late March.

#### Pursue Court Ordered Payments

In many instances in the area of the upper Fraser watershed, individuals and/or companies are charged with violations of the Federal Fisheries Act or relevant Provincial Acts. These violations and associated court ordered fines can range from hundreds of dollars to the hundreds of thousands of dollars. In some instances courts are awarding portions of these payments to conservation and/or stewardship related groups to support their work. The UFFCA should petition the necessary Provincial and Federal Government agencies to determine if this avenue of revenue generation may be feasible for the purposes of supporting the UFFCA's implementation of this plan.

#### **Annual Initiative Review**

The activities conducted in pursuit of the implementation of this plan should be documented in an annual report, as an Addendum to this plan, which should be completed in early March of each year. This report should describe and summarize the following:

- Training initiatives undertaken and their results.
- Work training and mentoring programs undertaken and their results.
- Any post-secondary enrollment related to mentoring positions.
- Financial reporting as per any funds received by the Alliance.
- Projects undertaken, completed and/or their status relative to this plan.
- Recommendations for improving modes of implementation.

Completion of the report prior to the end of the fiscal year will assist Alliance parties with their necessary annual planning, relative to this initiative and plan, for the following year. It should be the responsibility of the Alliance coordinator/staff to compile this report, analyze the report relative to the objectives of the plan, and report-out to Alliance parties.

#### **STRATEGIC PLAN SUMMARY**

It is evident that there are numerous fisheries related roles within the upper Fraser area that are presently being fulfilled by with minimal participation of Aboriginal personnel. Similarly, there are many seasonal programs within the upper river where

First Nations technicians have become incorporated into these programs, generally through their First Nation's AFS programs, but few examples where First Nations have developed sufficient capacity to undertake a leadership or management role in these initiatives. There are therefore numerous opportunities for First Nations persons to obtain appropriate training/capacity and work experience in order to eventually play larger and more prominent roles in all fisheries related activities being undertaken within their Territories.

Additionally, there have been numerous scientific information gaps identified relating to anadromous resources in the upper Fraser area that require redress. In many cases the science-based concerns of First Nations and DFO are congruent. There are therefore many areas where a cooperative approach between First Nations and DFO, in relation to undertaking the initiatives identified in this plan, would work well. It is apparent that there are numerous projects that could and should be implemented in order to develop or improve science relating to stock management and thus there are many opportunities for First Nations to develop capacities related to these projects and accrue the resulting employment and other benefits.

As well, upper Fraser First Nations share a number of commonalities amongst one another in terms of their historical and present-day role as stewards of the upper Fraser anadromous resources, their strong cultural identity to these stocks, and their future aspirations for the resource. These commonalities are reflected in this plan, as there were many areas where all or many First Nation respondents identified similar issues with the management of the resource and similar interests in specific management directions they wished to see pursued. A large issue identified for pursuit by all upper Fraser First Nation respondents was the development of terminal or near terminal economic-based harvesting opportunities for upper Fraser stocks that demonstrate sufficient surplus escapements. These commonalities and the subsequent issues identified for redress within this plan provide a unique opportunity for upper Fraser First Nation groups to work together through the UFFCA in order to achieve their objectives.

In summary, the recommendations for implementation of this plan has 4 basic components that can be considered as separate but connected and highly dependent on one another. These components can be described as follows:

1. Alliance becoming an entity with staffing and capacity: Successfully sequestering funding to formalize as a legal entity and develop the associated



infrastructure required to implement components 2 and 3, and eventually 4, below.

2. Training of First Nations personnel: Necessary to develop the capacity to undertake the projects identified within the plan and eventually attain the qualifications necessary to fill and occupy staffing positions analogous to DFO's capacities within the plan area:
3. Development and facilitation of mentoring/training, work experience programs with DFO (and possibly other agencies and organizations): In conjunction with component two above, develop mentoring, training and work opportunities within existing fisheries related capacities in the upper Fraser in order to develop required capacities and work experience.
4. Undertaking of projects identified within the plan: Will have to be accomplished as financial resources become available and personnel become sufficiently trained to undertake specific projects. Are many issues and opportunities identified for pursuit that require further planning and strategizing, which can be initiated immediately.

## **RECOMMENDATIONS**

The broader scale (one year) recommendations for the Alliance parties to pursue in order to facilitate the implementation of this plan are thoroughly described above under the heading of Co-Management Plan Implementation. The shorter-term activities (January – April 2004) that are recommended for immediate pursuit are provided in point-form below.

- Pursue funding to undertake the following recommendations as soon as possible. This has been initiated by DFO, who have applied for AAROM funding on behalf of the Alliance (complete). An additional proposal to the B.C. Capacity Initiative should be developed upon the program issuing a proposal call (complete).
- If external funding cannot be secured by the Alliance within the short-term, the Alliance should explore mechanisms of securing funding through internal means (i.e. the parties to the Alliance) via individual groups AFS funds, or training dollars.
- Upon securing appropriate funding, hire coordinative staff on short-term basis (until sufficient funds can be obtained to secure longer-term contracts with staff). Initial duties of any staff should be as follows:

- ✓ Facilitate the Alliance parties in the development of the necessary board governance structure to direct and control the Alliance “entity.”
- ✓ Develop suitable Alliance infrastructure to administer funding.
- ✓ Pursue program funding on behalf of the Alliance.
- ✓ Provide a coordinative role for the UFFCA meetings (organization, minute collection and distribution, follow-up).
- ✓ As directed by the Alliance parties and/or board structure, develop UFFCA TORs and MOUs regarding Alliance function.

This initial role would not likely have to be on a fulltime basis, but if sufficient funds can be secured, additional duties as described above under the heading of Coordinator could also be fulfilled.

Recommended key short-term activities for the Alliance to pursue internally include the following (these can be carried out with or without the assistance of Alliance technical support):

- Provide support to a coordinative position and the associated duties to be carried out on behalf of the Alliance, as described above.
- Identify priority information gaps for redress within each of the geographical subunits within this plan.
- Complete preliminary assessment of means of redressing these gaps (preliminary study designs and associated logistical considerations) and associated means of funding (combination of AFS funds, training dollars, Alliance funding and/or inkind support, DFO funding).
- Identify associated priority training and capacity development needs and associated avenues.
- Work towards the establishment of desired mentoring positions within DFO.
- Develop means of selecting candidates for various training and capacity development initiatives, project staffing and associated logistical considerations.

## **ACKNOWLEDGEMENTS**

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