Salmon Watershed Planning Profiles for the Fraser River Basin within the Nechako Habitat Management Area

L. B. Mac Donald, F. N. Leone, and D. E. Rowland

Department of Fisheries and Oceans
Fraser River Action Plan
555 West Hastings Street
Vancouver, BC V6B 5G3

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Canada

SALMON WATERSHED PLANNING PROFILES
for the Fraser River Basin within the
NECHAKO
Habitat Management Area

Prepared for:

DEPARTMENT OF FISHERIES AND OCEANS
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and
Habitat Management Unit
3690 Massey Dr.
Prince George, B.C. V2N 2S8

Prepared By:

L. B. Mac Donald [1], F. N. Leone [1] and D. E. Rowland [2]

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[1] Department of Fisheries and Oceans, 3690 Massey Dr. Prince George, B.C. V2N 2S8
[2] 2655 Fernwood Road, Victoria, B.C. V8T 3A1

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1.0 INTRODUCTION

This document presents background information and stream management objectives and strategies for the salmon bearing watersheds within the Fraser River basin portion of the Nechako Habitat Management Area (HMA). The HMA is depicted in Fig. 1 in the text and with additional attributes in maps at the back of this document (Fig. 2, 3, and 4). The format and content for these profiles were taken from the draft report published by the Department of Fisheries and Oceans and contributed to the Vanderhoof Land and Resource Management Plan (FRAP 1995c). Table 1 illustrates how the boundaries of the Nechako HMA and the Vanderhoof LRMP area differ slightly and which watersheds lie within their boundaries. The profiles which follow this introduction summarize salmon escapement information and the status of development activity and physiographic conditions within each watershed. This watershed-based resource information has been compiled from sources including published and unpublished documents as well as the personal experience and professional judgement of Department of Fisheries and Oceans (DFO) staff. This has enabled assessment of the watershed areas within the HMA as to the current management they require to ensure the conservation and development of fish habitat. Based on these assessments, specific objectives and strategies are prescribed to properly protect the salmon resources present.

It is intended that the information presented and the management objectives and associated strategies specified in this document be implemented within the HMA. The information will be updated, and the objectives and strategies re-evaluated, as circumstances dictate. The document is a valuable resource for DFO regional planning and habitat management. In addition, it will benefit provincial Ministries of Environment, Lands and Parks (MoELP), and Forests (MoF) by providing guidance for their management activities as well as provide direction to municipalities, resource development companies, other stakeholders, and First Nations with interests in the HMA. Related information can be found in the Recommended Vanderhoof Land and Resource Management Plan (LRMP) which may be obtained from the BC Ministry of Forests office in Vanderhoof. It is a sub-regional land-use plan which proposes management direction for Crown lands in the area. The area boundaries coincide with the boudaries of the Vanderhoof Forest District and include much of the Nechako HMA.

1.1 The Department of Fisheries and Oceans Vision Statement

DFO's Policy for the Management of Fish Habitat sets a long-term policy objective, namely the achievement of an overall **net gain** of the productive capacity of Canada's fish habitats (Department of Fisheries and Oceans 1986). Specifically, the intent of the policy is to "increase the natural productive capacity of habitats for the nation's fisheries resources, to benefit present and future generations of Canadians". It sets out three specific goals: fish habitat conservation, restoration, and development. The Guiding Principle of the fish habitat conservation goal is to achieve **no net loss** of productive capacity in relation to development activities. **No net loss** applies to habitat which:

- currently produces fish harvested in a subsistence, commercial or recreational fishery; or
- although not directly supporting fish, provides nutrients and/or supplies food to adjacent or downstream habitats or contributes to water quality for fish; or
- has been identified by DFO as a candidate for enhancement activities.

Table 1. Watersheds contained in the Nechako HMA and the Vanderhoof LRMP

Watersheds in both the HMA and LRMP	Nechako HMA only	Vanderhoof LRMP only
Endako River		
Nechako River		
Nithi River		
Ormond Creek		
Stellako River		
Uncha Creek		
Chilako River		
	Nautley River	Stuart River
	Nadina River	Fraser Lake
		Francois Lake

The second goal, fish habitat restoration, deals with the rehabilitation of the productive capacity of fish habitats in selected areas where economic or social benefits can be achieved through the fisheries resource. The third goal, fish habitat development, deals with the improvement and creation of fish habitats in selected areas where, again, fisheries resources production can be increased for the social or economic benefit of Canadians. These latter goals, restoration and development, will complement conservation efforts and contribute to a **net gain** of habitat.

In addition, DFO has identified seven measurable and achievable goals for sustainable fisheries development (O. Langer, pers. comm. 1994 in Webb et al. 1994). These goals are:

1. **Avoid irreversible human induced alterations to fish habitats.**
   Alterations to fish habitat that reduce its capacity to produce fish populations which cannot be reversed within a human generation are to be avoided.

2. **Maintain the genetic diversity of fish stocks.**
   No fish stock, regardless of its size, will be arbitrarily eliminated and, where possible, efforts to conserve and rebuild small and remnant stocks are to be made.

3. **Maintain the physical and biological diversity of fish habitats.**
   Physical and biological diversity of habitat provides fish with an opportunity to adopt alternative life history strategies, thereby providing protection from natural habitat variation.

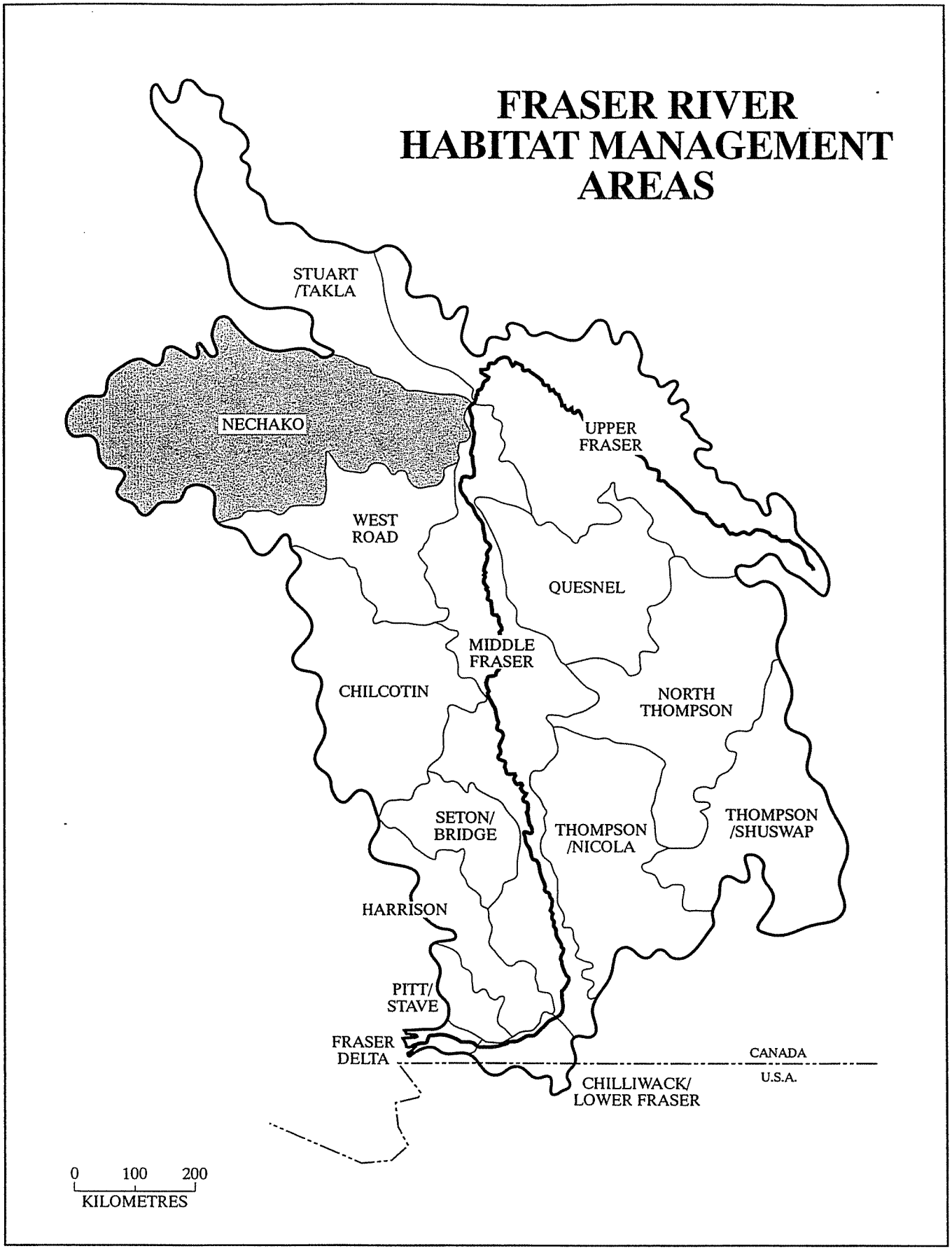
4. **Provide a net gain in productive capacity through proper habitat management.**
   Ecological limits control productive capacity of a stream system. Natural and self-sustaining production systems are preferred over semi-natural, artificial or non-self-sustaining systems.

5. **Maximize the value of commercial, sport, and aboriginal fisheries.**
   All market and extra-market values are to be considered, and measured in a way that permits comparison of competing users of the fisheries resources.

6. **Maximize the non-consumptive values of the fisheries resources.**
   Intangible and cultural values associated with fishery resources are to be given due consideration in decision making.

7. **Distribute fishery net benefits in a fair and equitable manner.**
   Local communities are to be involved in the decision-making process pertaining to habitat conservation, enhancement, and restoration, and particularly who is to benefit and who is to pay.

Figure 1. Nechako Habitat Management Area



1.2 General Objectives and Strategies for Salmon Resources

Table 2 presents general management objectives and strategies intended to satisfy the goal of protecting the salmon resource by ensuring that a net gain in the productive capacity of fish habitat is achieved. Watershed specific objectives and strategies are outlined in the Watershed Planning Profiles at the end of this report.

Table 2. General Objectives and Strategies for Salmon Resources.

Objectives	Strategies
· Maintain, rebuild and/or enhance salmon stocks.	· Apply sustainable fish harvest strategies.
· Maintain and/or enhance water quality and water quantity for instream uses.	· Conduct fish habitat inventories to identify fisheries sensitive/critical areas that require protection and site specific management actions.
· Maintain and restore watershed and stream channel integrity and stability.	· Assess present and potential development impacts in fisheries watersheds (Watershed Assessment Procedure) and implement integrated watershed management plans to minimize the cumulative impacts of land use activities.
· Ensure that the cumulative rate of development within specified watersheds (forestry, urbanization, agriculture, mining, etc.) does not adversely impact fish habitat.	· Identify watersheds or stream reaches that require enhanced management prescriptions.
· Ensure consistency in resource planning in: - administrative boundaries - hierarchial plans (strategic, operational) - management goals, objectives, strategies, and indicators.	· Determine adequate instream flows for fish.
· Protect streamside and riparian areas by providing adequate buffer zones and through proper riparian management.	· Restore degraded stream habitats through promotion of improved land management practices and through bank stabilization, revegetation and other stream restoration techniques.
· Provide an adequate level of monitoring that will ensure proper compliance and provide an evaluation tool for refinement of management strategies, prescriptions and resource targets.	· Monitor and enforce compliance to environmental standards/guidelines and evaluate their effectiveness.
· Maintain existing "No Staking Placer Reserve" designations.	· Enhance salmon habitat and stocks through specifically identified projects or activities.
· Ensure Forest Practises Code provisions are applied as a minimum standard in all watersheds.	
· Ensure other development guidelines such as the Land Development Guidelines, Placer Mining Regulations and Guidelines, Guidelines for Mineral Exploration and Reclamation, and Agriculture Guidelines are followed. (See List of Relevant Environmental Guidelines.)	
· Maintain the natural diversity of aquatic habitat elements.	

1.3 Monitoring Strategy

The development and implementation of a strategy for monitoring resource development and operational activities is crucial to ensuring that the effectiveness of fish habitat management policies is realized. Monitoring programs can be used to i) establish the baseline biophysical conditions within a watershed from which comparisons of the effects of future development can be made, ii) gauge both the effectiveness of management recommendations and the degree to which compliance with stated guidelines is attained, iii) provide the information required to evaluate the response of biophysical conditions within watersheds to various management prescriptions, and iv) provide direction for future planning.

DFO will employ compliance auditing of guidelines, standards and regulations and synoptic monitoring of management objectives, strategies and indicators in designated watershed planning units. Table 3 presents the specific monitoring strategies to be applied and the indicators to be used in measuring the success of the strategies.

2.0 OVERVIEW OF SALMON RESOURCES

The Fraser River basin portion of the Nechako HMA supports chinook (*Oncorhynchus tshawytscha*), sockeye (*O. nerka*) and to a much lesser degree, pink (*O. gorbuscha*) and coho (*O. kisutch*) salmon (DFO 1994). The major fish habitat types present in the HMA are spawning, migration, incubation and rearing habitat provided by the area's rivers, tributary streams and lakes. The Nechako River serves as an important migration route for the valuable sockeye runs that navigate through the HMA to spawn in the Stuart-Takla system which is located in an adjacent HMA. The estimated sockeye escapement for the Stuart drainage system in 1993 was 1,500,000 making the Nechako River a significant migration route. The combined landed value catch of sockeye produced in the Stuart/Nechako/Stellako/Nadina systems in 1993 was estimated at $25-$30 million. Chinook and sockeye have the greatest economic value of salmon in this area and make a significant contribution to the Pacific Coast commercial, Fraser River aboriginal, and, in the case of chinook, Straight of Georgia and Fraser River sport fishery (Fraser River Action Plan [FRAP] 1995a,1995b).

With respect to stock management policy for the Fraser River watershed, it has been known for some time that the basin has the potential to support more salmon than is presently the case. To restore all stocks to full potential, DFO proposes the following management strategies (DFO 1991):

- Increased escapement to spawning grounds through an intricate formula of fishing times and opportunities will be a primary tool.

- Resource enhancement techniques such as artificial spawning channels and small hatcheries will augment wild stock rebuilding. In some cases, enhancement will "kick-start" small fish populations to levels where they can be further increased through more conservative fishing management, eventually becoming self-sustaining.

- Vigorous protection of habitat and, wherever possible, rehabilitation of degraded habitat.

Species specific information, including current management strategies, for salmon present in the Nechako HMA are outlined below. Specific escapement targets are not given; stating a static target for a particular stream would not be appropriate given the variation in stock, cycle year, and expected returns. (A. MacDonald, pers. comm. 1995)

Table 3. Monitoring Strategies and Indicators.

Monitoring Strategies	Monitoring Indicators
· Monitor and assess management goals, objectives and strategies for the development activities identified. · Coordinate monitoring, compliance, enforcement and regulation of placer mining activities with the Ministry of Energy, Mines and Petroleum Resources. · Monitor application of Forest Practices Code (FPC) standards and field guides. · Monitor and evaluate mine development proposals to ensure water quality of salmon habitat is maintained. · Monitor application of the Land Development Guidelines with respect to urban development. · Monitor application of guidelines associated with agricultural activities. · Monitor other proposed development activities such as linear, hydro, etc. and conduct routine audits of performance compliance. · Monitor biophysical conditions such as soils, channel and terrain stability, and hydrology. · Monitor salmon population levels and distribution. · Monitor salmon habitat quality and quantity. · Monitor cumulative impacts of development using ECA, riparian condition, etc. · Monitor identified critical watershed features such as condition of non-natal tributaries. · Provide an assessment of watershed riparian condition to determine if the FPC riparian standards are adequate to maintain existing riparian attributes. · Cooperate with scientific research programs (i.e. Fish/Forestry interaction) in the HMA. · Cooperate with Watershed Restoration Program (WRP) monitoring programs.	· Habitat capacity, quality and quantity. · Compliance with environmental standards and guidelines. · Status of cumulative impacts. · Status of critical environmental variables such as flow, water temperature, sediment input, water quality, water demand/use. · Riparian condition. · Number, type and effectiveness of watershed restoration projects. · Restoration project comparative reviews. · Salmon escapement trends. · Catch levels (harvest rates).

Chinook Salmon

Escapement records (DFO 1994) show that chinook salmon spawn in all the major watersheds of the Fraser River basin portion of the Nechako HMA, the Nechako River having the largest escapement numbers. Other watersheds, although perhaps less significant in terms of absolute escapement numbers, are essential for the maintenance of genetic diversity of chinook stocks. It should be emphasized that chinook salmon juveniles rear in these systems for up to two years after emerging from the gravel (Hickey and Lister 1981). In particular, juvenile chinook utilize the tributary streams entering the mainstem rivers and seasonally flooded areas for rearing. These areas are therefore critical to the early life stages of the area's chinook salmon (Lister et al. 1981).

The 1985 Pacific Salmon Treaty committed management agencies in Canada and the United States to halt the decline of chinook spawning escapements and attain, by 1998, spawning escapement goals established by each nation. For Fraser River chinook, the current rebuilding goal (established in 1984) is a doubling of base period (1979-1982) escapement goals by 1998. This goal serves as an interim objective of the rebuilding plan (FRAP 1995b).

Sockeye Salmon

Escapement records (DFO 1994) indicate that sockeye salmon spawn in all the major watersheds of the Fraser River basin portion of the Nechako HMA except the Chilako River. The largest escapement is to the Stellako River, averaging approximately 109,000 in the period 1981-1992. Escapement to the Nadina River reached a maximum of 61,074 in the same period. The Nadina River supports two sockeye runs known as the early and the late runs. The early run is now considered virtually extinct due in part, it is believed, to log drives that occurred during the spawning period in the late 1950s and 1960s. The aboriginal food fishery utilize sockeye in these rivers.

DFOs current management strategy for the sockeye stocks in the Nechako HMA follows the general stock management policies and objectives for the Fraser basin. The interim goal on the dominant cycle for the Stellako stocks is an escapement of 300,000 (FRAP 1995a).

The Nechako River also serves as an important migration route for the valuable sockeye runs that navigate through the HMA to spawn in the adjacent Stuart-Takla system. The estimated sockeye escapement for the Stuart drainage system in 1993 was 1,500,000 making the Nechako River a significant migration route for these stocks. It is evident that the fish habitat present in the Nechako HMA is both highly productive and extensive. The habitat also supports a significant proportion of the Fraser River basin's salmon production, which is harvested by commercial, sport, and aboriginal fisheries. The Nechako River serves as an important migration route for adult and juvenile salmonids which navigate the river to access spawning grounds in the adjacent Stuart-Takla system just outside of the HMA boundary. The estimated sockeye escapement (including both the early and late runs) for the Stuart drainage system in 1993 was 1,500,000 making the Nechako River a significant migration route for these stocks. As a result, prudent management of development activities in the HMA is a high priority with DFO.

3.0 METHODOLOGY

The following sections describe the preparation of the Nechako HMA Salmon Watershed Planning Profiles.

3.1 Development of Assessment Criteria

The term "**sensitivity**," used in the Watershed Planning Profiles that follow this introduction, is applied in a broad sense to refer to a level of concern for those aspects of watershed features that can affect fish habitat and be altered by human activities. The watershed-based profiles presented in this document describe: i) watershed geographic and hydrologic information, ii) the historic and present status of salmon escapements, iii) present or proposed development, iv) existing biophysical conditions, v) sensitive watershed features, vi) areas of specific concern, and finally vii) recent watershed planning and/or project initiatives. The profiles then present specific management objectives and prescribe specific management strategies consistent with sustainable land, water and other resource use prevalent within a given HMA.

For each watershed profile, the focus of the assessment was on development types and associated attributes (e.g. industrial development [type], extent thereof [attribute]) and biophysical features (e.g. terrain). Human development activities and biophysical conditions play a key role in fisheries habitat; documentation thereof is a crucial step towards an assessment of habitat resource conditions. Specifically, the profiles considered:

1. General **watershed information** and **hydrology**. The primary source of general watershed and hydrologic information for this report is Rood & Hamilton 1995, and readers can refer to that document for an explanation of the methods used to derive the hydrologic data. All flow data are related to the stream mouth. The winter (November 1 to April 30) and summer (May 1 to October 31) months in which mean 7 day low flows occur most frequently are presented if the information is available. Selected hydrologic characteristics extracted from Rood and Hamilton (1995) are shown in Figure 2, map sleeve 1.

2. The **presence of salmon** within the watershed, and if present, the species, an assessment of the population trends including the historic maximum (and year, if available), the 1981 to 1992 average and maximum escapement, the 1969 to 1980 average escapement, and a comparison of the 1981 to 1992 average to the 1969 to 1980 average. The comparison was used as an indicator as to whether the population is static, increasing, decreasing, or if there is no trend. The rebuilding potential for the stock is presented as low, medium or high. The measure of rebuilding potential, developed by Hopwo (1994), is based on changes in escapement over time. "Low" indicates that the historic maximum is greater than the recent (81-92) maximum by 50% and significant potential to increase production exists. The extent of known (to 1994) salmon spawning distribution is presented in Figure 3, map sleeve 2. Migration and rearing areas, extensive throughout the HMA, are not shown.

It should be noted that the number of spawners estimated for a particular watershed planning unit was ***not*** significant to the analysis, only their presence. The escapement numbers are, therefore, presented for information only.

3. Past, present or proposed **developments** (e.g. forestry) within the watershed , including attributes typically associated with the particular development (e.g. percent logging). The development types and associated attributes considered were:

a) *Forestry* -	percent logging[1], equivalent clearcut area (ECA)[2] status, riparian condition/stream length impacted;
b) *Agriculture* -	extent, riparian condition/stream length impacted, water withdrawal, water quality;
c) *Urbanization* -	population level, extent, riparian condition/stream length impacted, water withdrawal, water quality;
d) *Placer mining* -	extent, water quality, riparian condition/stream length impacted;
e) *Other mining* -	extent, water quality;
f) *Industrial development* -	extent, water quality, stream/riparian impacts;
g) *Linear development* -	extent, stream/riparian impacts;
h) *Hydro development* -	extent, stream/riparian impacts;,
i) *Other developments* -	extent, stream/riparian impacts, and;
g) *Cumulative developments* -	consideration of the impact of all development activities.

4. **Biophysical conditions** within the watershed were determined by assessing the following biophysical features:
   a) *Soils*;
   b) *Terrain*;
   c) *Resistance to change*[3];
   d) *Hydrology*;
   e) *Channel stability*; and,
   f) *Significant environmental variables* - e.g. biophysical conditions resulting from

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[1] Percent logging is defined here as the total area of the watershed that has been logged i.e all cutblocks including those blocks with some hydrologic recovery (See Rood and Hamilton 1995). Figure 4, map sleeve 3, presents percent logging in each watershed. **N.B.** This information has been compiled to assist DFO staff in 'flagging' watersheds that have forest harvesting at a level (e.g. > 20% logging) that warrants particular attention. This in no way replaces a full watershed assessment procedure as provided for under the Forest Practices Code.

[2] Equivalent clearcut area (ECA) is a forest management term used to describe the total area within a watershed which functions in a similar fashion hydrologically to a clearcut opening, accounting for a recovery factor based on the stage(s) of forest regeneration.

[3] Watersheds vary in their ability to resist environmental changes resulting from human activities. The variability results from factors such as soil erodibility and watercourse hydrology. In the watershed profiles, a high level of concern was assigned to a watershed with little ability to resist change and conversely a low level was assigned to a watershed with good ability to resist change.

impoundment, nutrient enrichment.

5. The presence of **sensitive watershed features** which would require site or area specific attention such as:
   a) Sensitive physical features;
   b) Sensitive biological features; and,
   c) Unique features.

6. The occurrence of, or the potential for, **special considerations** which may have present or future impacts on development activities including:
   a) Stock management initiatives - i.e. manipulation of fisheries or escapement levels;
   b) Existing or potential fish habitat or fish population enhancement activities;
   c) Fish habitat or fish population restoration activities; and,
   d) Presence of a native, recreational or commercial fishery and its locale.

7. The undertaking of **recent watershed planning/project initiatives** by government agencies and/or other stakeholders.

3.2 Assignment of 'Levels of Concern' for Development Type and Attributes and Biophysical Features

After the available information was compiled and reviewed, a level of concern for fish and fish habitat, as it related to the potential for salmon resource impacts, was assigned to each development type and attribute, and each biophysical feature. The level of concern was rated either **low** or **high.**

A **low** level of concern served to indicate that, based on the available information, and assuming that standard management practises are applied, minimal impact to salmon populations or their habitat would be expected to occur. Standard management practice assumes that an acceptable level of protection for stream habitat and water quality will be provided. This will include, where applicable, standard practices such as the Forest Practices Code (range, timber, etc.), the Land Development Guidelines, placer mining regulations and guidelines, and Guidelines for Mineral Exploration and Reclamation. Following the Watershed Planning Profiles is a list of relevant environmental guideline publications. It is also assumed that routine auditing of development activities will be performed to ensure compliance with the prescribed standards.

A **high** level of concern would indicate that the particular watershed has a high probability for significant impacts on fish or fish habitat from present or proposed development activities or biophysical features.

It should be noted that the level of concern assigned was based on the best available information. Reclassification may be necessary as new information becomes available, or changes in either the physical habitat, rate of development, or status of the salmon populations occur.

4.0 RESULTS AND DISCUSSION

A total of nine salmon bearing watersheds were delineated for the portion of the Fraser River drainage located within the Nechako HMA. Detailed profiles follow this introduction. Table 4 presents a summary of these watersheds. In the 'development concerns' and 'biophysical concerns' columns, the numbers represent the sum of high levels of concern that have been assigned to the development types and biophysical features. These values could be a maximum 10 and 6 respectively. In the case of sensitive watershed features and special considerations, the values could be a maximum 3 and 6 respectively. The significance of the last column is discussed in Section 4.1.

Table 4. Results of the Salmon Watershed Planning Profiles by Watershed.

Watersheds	Salmon Present	Development Concerns	Biophysical Concerns	Sensitive Watershed Features	Special Considerations	Σ col 3-6*
1. Nechako River	✓	4	3	2	6	15
2. Chilako River	✓	4	3	2	5	14
3. Nautley River		1	0	2	1	4
4. Ormond Creek	✓	0	0	0	5	5
5. Stellako River	✓	0	0	2	5	7
6. Endako River	✓	3	1	2	5	11
7. Nithi River	✓	0	0	1	6	7
8. Uncha Creek	✓	1	0	1	4	6
9. Nadina River	✓	2	2	2	5	11

* Σ col 3-6 = the arithmetic sum of columns 3 to 6.

4.1 Prioritization of Watersheds

Prioritization of watersheds was determined based on the sum of high levels of concern for development types and biophysical features, identified sensitive watershed features, and identified special considerations. The sum is presented in column 7, Table 4 above. This method is an appropriate first effort to prioritize the watersheds in that it combines development and biophysical conditions, sensitive watershed features and special considerations that are considered to require special attention. Table 5 presents, in decreasing order, the four watersheds that have the highest number of concerns and features. It is envisioned that Tables 3 and 4 will assist in defining an implementation strategy for the Nechako HMA as well as assist the various stakeholders in allocating effort and resources in their planning processes. ***It must be stressed, however, that each watershed identified in these salmon watershed planning profiles, regardless of its ranking in Table 4 or appearance in Table 5, contains characteristics that require specific attention.***

Specific strategies have been assigned for each watershed based on the specific objectives identified,

in addition to the general objectives and strategies for salmon resources (Table 2). Implementing a monitoring program that incorporates the strategies and indicators outlined in Table 3 will enable auditing and evaluation of both specific and general strategies for a given watershed or local area within a watershed.

It is recognized that unforeseen conditions may arise either during or following the HMA process such as insect infestation, fire, floods, significant changes in salmon escapement or development plans which may necessitate reevaluation of both the priority of and appropriate management prescriptions for a particular watershed. If necessary, these occurrences will be dealt with by more detailed plans.

Table 5. Prioritization of Watersheds Requiring Additional Assessments or Inventories.

Priority	Watersheds	Rationale
1 (Σ= 15)	Nechako River	Agriculture, urbanization, hydro development/ diversion, cumulative development, several biophysical watershed sensitivities, and many special considerations.
2 (Σ=14)	Chilako River	Logging, agriculture, linear and cumulative development, some biophysical concern, several sensitive watershed features and special considerations.
3 (Σ=11)	Endako River	Agriculture, linear, mining and cumulative development, several sensitive watershed features and special considerations.
4 (Σ=11)	Nadina River	Logging, linear development, some biophysical concerns, several sensitive features and special considerations.

5.0 ACKNOWLEDGEMENTS

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