ANNUAL REPORT

April 1, 1994 - March 30, 1995

NECHAKO FISHERIES CONSERVATION PROGRAM

(A joint Program of the Government of Canada, Alcan, and the Province of British Columbia)

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CONTENTS

BACKGROUND

In 1980, Alcan Aluminium Limited proposed to use the remaining portion of its water rights to divert water from the Nechako River to expand its hydro-electric facilities to produce power for additional aluminium smelting facilities in northwestern British Columbia. To establish appropriate fisheries conservation measures and stock monitoring projects, several years of scientific and engineering studies were undertaken by the federal government and Alcan.

In September 1987, Alcan Aluminium Limited, the Government of Canada and the Province of British Columbia signed an agreement for the conservation of Nechako River chinook salmon and the protection of migrating sockeye salmon populations in the Nechako River. Known as the 1987 Settlement Agreement, this agreement led to the establishment of the Nechako Fisheries Conservation Program (NFCP). The NFCP is structured on two levels; the first is a Technical Committee responsible for planning, designing, recommending and carrying out projects and; the second is a Steering Committee responsible for overall program direction and budget approval.

Under the NFCP, in river conservation strategies are developed, tested, implemented, monitored and, if required, revised. Specific water releases from the Nechako Reservoir are made for fisheries conservation purposes. In addition, the monitoring of fish stock and habitat performance, testing and implementing instream and/or side channel remedial measures and conducting applied research studies have been carried out since the beginning of the NFCP.

The 1987 Agreement included the requirement that Alcan develop a cold water release facility at Kenney Dam, if they were to lower Nechako River flows from current levels. The facility would provide control over flow and water temperature in the Nechako River to protect salmon. Until this facility was constructed, Alcan would continue to release the appropriate amount of water through the Skins Lake Spillway, as set out in the 1987 Agreement. Construction of a cold water release facility at Kenney Dam would also require construction of a channel across the Cheslatta Fan to prevent erosion of fan materials and subsequent deposition in downstream salmon habitat.

During 1987-1988, the first year of the NFCP, operating procedures and a program framework were developed. Field projects for the first year of an initial five-year plan began in 1988. Annual reports are available for each of the program years.

Construction of the Kemano Completion Project (KCP) initiated in 1988 was halted by Alcan in 1991 as a result of the uncertainty created by a federal court decision which set aside the 1987 Settlement Agreement. That decision was overturned by the Federal Court of Appeal in 1992 and leave to appeal that decision was dismissed by the Supreme Court of Canada in February 1993, confirming the legal validity of the 1987 Settlement Agreement.

In January 1993, the Province of British Columbia directed the British Columbia Utilities Commission (BCUC) to conduct a public review of the Kemano Completion Project. From April 1, 1994 until June 1994 the Nechako Fisheries Conservation Program Technical Committee was involved in preparing and presenting a document to the BCUC outlining the mandate of the NFCP and the progress to date of the program.

On January 23, 1995, the Province announced that it would not allow the Kemano Completion Project to proceed. The work of the NFCP continues with respect to the other aspects of the 1987 Settlement Agreement.

INTRODUCTION

This Annual Report for 1994/95 covers Year 7 of the Nechako Fisheries Conservation Program. It describes the operations and structure of the NFCP, the development of program and its various components. The report provides the rationale and review of field projects--the remedial measures, monitoring of stock and habitat performance and applied research projects undertaken. It also includes approved projects for Year 8 of the NFCP. A summary chart presents a review of all projects carried out since 1987.

PROGRAM OPERATIONS

The Nechako Fisheries Conservation Program has a two-tier committee structure. The Technical Committee is responsible for planning, designing, recommending, and carrying out annual and long-term projects to achieve the NFCP Conservation Goal. This committee consists of a representative from each of the signatory parties to the Agreement and one independent member.

The Steering Committee is responsible for overall program direction and budget approval. It consists of senior members of the three signatory parties.

The NFCP is subject to approval by the Steering Committee and is based on the deliberations of the Strangway Working Group; technical specialists from Fisheries and Oceans, Alcan and the Province of British Columbia. This group identified a program of measures and a plan of implementation which would provide an acceptable level of certainty for the conservation of chinook salmon and protection of migrating sockeye salmon in the Nechako River.

PROGRAM DEVELOPMENT

In 1987/88, the Technical Committee developed an initial pre-construction plan under which project activities would be carried out. The time frame was initially identified as the time available until the expected change from short-term to long-term flows. Due to delays of the Kemano Completion Project (KCP), the pre-construction plan was modified, taking advantage of the delay to conduct additional remedial measures pilot tests, extend monitoring programs, to collect additional pre-KCP data and continue baseline data acquisition.

The Technical Committee is involved in the ongoing development of an Strategic Framework. This framework will become an integral part of the long-term plan of achieving the fisheries objectives of the Settlement Agreement.

The NFCP will exist until sustained achievement of the Conservation Goal can be demonstrated. In order to establish this, long-term monitoring of chinook stocks will be undertaken to continuously assess stock status.

Remedial Measures

One component of the NFCP is a number of remedial measures involving the design and testing of site specific measures such as in-stream habitat improvements, side channel development, stream fertilization techniques and measures to control sediment in the river; all of which are undertaken to achieve the conservation of chinook and sockeye salmon populations.

Monitoring

The second component of the NFCP involves developing and implementing monitoring programs on stock and habitat performance which have the capability to detect changes in physical and biological parameters, measuring the efficacy of remedial measures and collecting baseline data.

Applied Research
A third component of the Program involves identifying and implementing applied research programs which will aid in the overall understanding of Nechako River chinook life history.

Strategic Framework

A strategic framework is used by the Technical Committee to direct the overall plan. It focuses on specific and measurable elements of habitat and chinook ecology. The framework provides guidelines for testing and executing remedial measures, the monitoring of stock and habitat performance and research into the ecology of Nechako River chinook.

As part of the Strategic Framework an evaluation framework was initiated in 1992/93 by the Technical Committee to assist in the interpretation of results for cause and effect linkages between physical and biological field projects. This will make it possible to establish decision points or levels of change where action should be taken and whether or not progressive procedures should be put into place. This is an essential element of the long-term planning and evaluation processes.

The results from each monitoring project will be interpreted in conjunction with data collected on physical parameters and other biological projects on the Nechako River.

Comparison on both annual and five-year stock cycle changes in the values being measured among, for example, fry emergence success, juvenile outmigration and the number of adults returning to the system, will be possible through the use of the evaluation framework. Changes in these values when compared to the baseline data, may suggest tertiary monitoring programs targeted at specific areas, such as the intergravel environment or other life history phase of Nechako River chinook salmon. Changes detected may also initiate additional remedial measures.

Flow Charts

Under the strategic framework, the Technical Committee designed three flow charts to assist in the understanding of how committee activities are directed. These include:

The Decision Chart used in the evaluation of selection, implementation and success of Remedial Measures (Appendix A.1).

The NFCP Early Warning Monitoring Program used to assess trends reflected by monitoring programs targeted at juvenile chinook life histories, and to suggest action to be taken in response to these trends (Appendix A.2).

Assessment of the Conservation Goal which presents an assessment of achievements and shows the extrinsic and intrinsic factors that may affect Nechako River chinook production (Appendix A.3).

First Nation Involvement

First Nations have been involved in the NFCP for the past seven years. Since the beginning of the program First Nations technicians have worked with the crews on the field projects, with the long-term goal of assuming crew management responsibility on field projects. The majority of their work is carried out on monitoring projects, including carcass recovery on the Nechako and Stuart rivers, juvenile outmigration, fry emergence, and habitat complexing.

Meetings and Reports

The Technical Committee provides information on the Nechako Fisheries Conservation Program through an annual report and technical reports on all of the projects conducted. This year this included the preparation and presentation of a report on the NFCP to the British Columbia Utilities Commission Public Review of the Kemano Completion Project.

In Year 7 of the NFCP, (April 1, 1994 to March 31, 1995) the Technical Committee convened 14 meetings.

Annual reports for 1988/89, 1989/90, 1990/91, 1992/93, and 1993/94 are available and provide detailed information on specific projects and test results of remedial measures, habitat and stock monitoring and applied research. A survey report on 1991/92 projects is also available.

PROGRAM COMPONENTS

Remedial Measures

All remedial measures are biologically sound, durable, consistent with other effective techniques, cost effective, and in agreement with Fisheries and Oceans Habitat Management Policy. Projects to test and evaluate appropriate measures to protect against any change in the chinook salmon habitat following implementation of the long-term flow regime have been a focus of the first seven years of the NFCP work.

There are three stages of remedial measures. These were identified in the Settlement Agreement and have been developed in accordance with the Department of Fisheries and Oceans Habitat Management Policy.

Several first-stage (Level A) measures will be put in place in preparation for the long-term flow regime. The first stage represents a set of measures that, if properly applied, should be sufficient to ensure conservation of the chinook stock. First-stage measures to ensure maintenance of the target population fall under three main categories: flow design changes, instream habitat modifications and off-channel modifications.

The second stage (Level B) represents a set of additional measures that could be implemented in the event that the first stage measures prove inadequate. These could include additional habitat alterations and access to new habitat.

The third stage (Level C) represents the ultimate fall-back position in the event that implementation of first and second stage measures are proven inadequate. These measures could include anything from a spawning channel to incubation of Nechako River chinook eggs at an existing hatchery, a hatchery on the Nechako River, compensation for lost production by implementing appropriate measures in other systems, or maintenance of Nechako River stock gene pool at some other hatchery.

Characteristics of natural cover already existing in the river were incorporated into habitat complexes constructed over the past 7 years. Several types of habitat complexes have been tested, assessed, modified and reassessed for structural integrity and juvenile chinook utilization to help define the characteristics of the complexes required to meet the needs of Nechako River chinook. Rail debris catchers are proving the most durable of the instream habitat complex types.

Results from biological sampling indicate that the habitat complexes are well used by fry during May and June. There is also continued evidence that the complexes are used as overwintering habitat by chinook.

Local plants were collected and planted in a stream bank revegetation pilot project initiated in 1991 at two test sites - one along the Nechako River and one on a tributary stream. One of the sites is no longer available due to changes in the tributary streams course. Plant growth on the remaining site will continue to be monitored.

The summer temperature monitoring program continues to manage water temperatures in the Nechako River above the Stuart River to protect migrating sockeye salmon.

The annual water allocation was again managed by the NFCP to achieve the most beneficial flows for fish.

Habitat and Stock Monitoring

To assess the overall success of the NFCP, studies on habitat and salmon stock performance are needed. To date, efforts have been directed at establishing monitoring projects throughout the program which would expand the existing database. Monitoring studies were targeted at three life history phases of Nechako River chinook salmon.

The primary monitoring measure for chinook salmon is the number of adult chinook returning to the Nechako River to spawn. To help assess whether the Conservation Goal is being achieved, adult spawning enumeration of chinook is undertaken to determine the number of adults returning to the Nechako River. Enumeration and carcass recovery is also conducted in the Stuart River as a control in a river unaffected by flow change and with fish stocks of similar life history patterns. This provides an opportunity to compare relative numbers of returning adult chinook salmon. In support of this, various population characteristics such as age structure, sex ratio, length and egg retention in females are also measured.

There is a four to five-year delay before adults return to spawn. Thus, monitoring of juveniles is important because data collected can provide an early indication of life cycle stresses. Secondary measures include juvenile outmigration monitoring to provide an early warning of any productivity changes in the system, and annual monitoring of fry emergence to develop an index of egg/alevin survival.

Tertiary measures to monitor parameters that may affect habitat quality include physical monitoring of gravel quality, ice conditions and temperature.

The primary monitoring measure for sockeye salmon is the summer water temperature management at the confluence of the Nechako and Stuart rivers.

Preparation of a strategic framework is being developed to allow a synthesis and trend analysis of the data acquired over the first seven years of the NFCP.

Applied Research

Applied research involves studies which will increase current knowledge in specific areas of chinook ecology.

Research on overwintering juvenile chinook populations examined winter abundance and distribution within the Nechako River. Knowledge of the relative contribution of the overwintering chinook to the total recruitment is necessary in order to better understand the life history of the Nechako River stock. A primary publication of these investigations over the years of the program, including all reports, is being finalized.

Research into predator/prey relationships has been conducted to identify predators, define the potential risks posed to chinook populations, and determine what, if any, action may be required. The resulting report on fish and bird predation and chinook availability has been published.

Research to gain an understanding of the effects of temperature (cooler water released from the Kenney Dam Release Facility) on invertebrate production and fish growth was initiated in 1993/94. The data from this work is currently being analyzed.

Year 7 - Project Summary
Year 8 - Approved Projects

This report provides a description of all projects carried out in Year 7 (1994/95) and of all projects approved for Year 8 (1995/96) of the Nechako Fisheries Conservation Program.

Each project is presented with the rationale for the activity, accompanied by a brief review of 1994/95 work and the proposed project activity for the next year.

YEAR 7: PROJECT SUMMARY (1994/95)

REMEDIAL MEASURES

FLOW MANAGEMENT
- Cheslatta-Murray Hydrologic Data Collection
- Allocation of Flows
- Summer Water Temperature Management

IN-STREAM HABITAT COMPLEXES
- Physical Assessment of In-Stream Habitat Complexes
- Biological Assessment of Habitat Complexes

RIPARIAN RE-VEGETATION

HABITAT AND STOCK MONITORING

ADULT PROGRAMS
- Adult Spawner Enumeration
- Adult Carcass Recovery

INCUBATION ENVIRONMENT
- Gravel Quality and Dissolved Oxygen Monitoring
- Fry Emergence
- Winter Physical Conditions

JUVENILE OUTMIGRATION

TEMPERATURE MONITORING/PHYSICAL DATA COLLECTION

EVALUATION FRAMEWORK/TREND ANALYSIS

APPLIED RESEARCH

JUVENILE CHINOOK OVERWINTERING BEHAVIOUR

PREDATION AND COMPETITION

TEMPERATURE EFFECTS

YEAR 8: APPROVED PROJECTS (1995/96)

REMEDIAL MEASURES

FLOW MANAGEMENT
- Cheslatta-Murray Hydrologic Data Collection
- Allocation of Flows
- Summer Water Temperature Management

IN-STREAM HABITAT COMPLEXES
- Physical Assessment of In-Stream Habitat Complexes
- Biological Assessment of Habitat Complexes

HABITAT AND STOCK MONITORING

ADULT PROGRAMS
- Adult Spawner Enumeration
- Adult Carcass Recovery

INCUBATION ENVIRONMENT
- Gravel Quality and Dissolved Oxygen Monitoring
- Fry Emergence
- Winter Physical Conditions

JUVENILE OUTMIGRATION

TEMPERATURE MONITORING/PHYSICAL DATA COLLECTION

EVALUATION FRAMEWORK/TREND ANALYSIS

APPLIED RESEARCH

PREDATION AND COMPETITION

TEMPERATURE EFFECTS

FLOW MANAGEMENT

Cheslatta-Murray Hydrological Data Collection

RATIONALE

To make the best use of the annual water allocation from the Nechako Reservoir, it is necessary for the NFCP to know the magnitude and timing of inflows from the Cheslatta-Murray lakes watershed.

PROJECT SUMMARY 1994/95

As requested by the NFCP, the data collection program was discontinued and the water level recorder and climate station were removed at the end of June 1993. Inflow measurements were not analyzed in 1994/95.

APPROVED PROJECT 1995/96

In 1995/96, it is proposed that data collected and compiled from the Bird Creek monitoring station and snow courses throughout the watershed be analyzed to determine the relationship between the volume of runoff from the Bird Creek sub-basin and the Cheslatta-Murray Lakes watershed. This analysis will start with comparisons of the snow water contents measured at Bird Creek, and volume and peak rate of runoff within the sub-basin. The relationship between the two parameters will then be used to predict inflow volume into the Bird Creek watershed, then extrapolated to the entire Cheslatta-Murray basin.

Allocation of Flows

RATIONALE

Managing the annual water allocation to the Nechako River is designed to benefit fish in the river and achieve the fisheries Conservation Goal of the Settlement Agreement. To meet objectives for flow control in the Nechako River, necessary adjustments must be made regarding Skins Lake Spillway releases.

PROJECT SUMMARY 1994/95

The annual water allocation was again managed by the NFCP Technical Committee to achieve the most advantageous flows for fish.

Skins Lake Spillway releases were scheduled and the spring and summer mean monthly flows were monitored by recording mean daily releases from Skins Lake Spillway and mean daily flows at the gauging station on the Nechako River below Cheslatta Falls. Reservoir releases from Skins Lake Spillway and flow in the Nechako River are shown in Figures 1 and 2.

The release from Skins Lake Spillway was increased to approximately 49.0 m^3/s in mid April 1994 and maintained until early July 1994 when the release was further increased for the summer cooling flows. On August 18, 1994, the spillway release was reduced to 14.2 m^3/s to achieve the fall spawning flows in early September. The spillway release was then increased to 31.5 m^3/s on September 2, 1994 and maintained to achieve the annual water allocation for 1994/95. No forced spill occurred at Skins Lake Spillway during 1994.

APPROVED PROJECT 1995/96

In 1995/96, flow allocation will again be managed by the NFCP to best utilize available water. Preliminary snowpack information indicates that it is unlikely that a forced spill will be necessary in 1995/96.

Figure 1

COMPARISON OF ACTUAL AND SETTLEMENT AGREEMENT - SKINS LAKE SPILLWAY RELEASES

(January to December 1994)

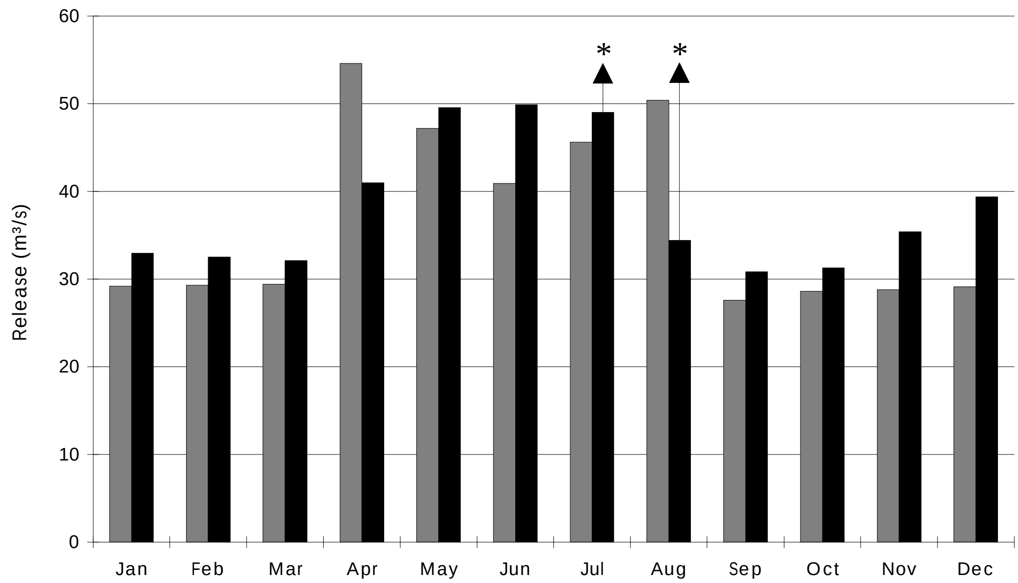
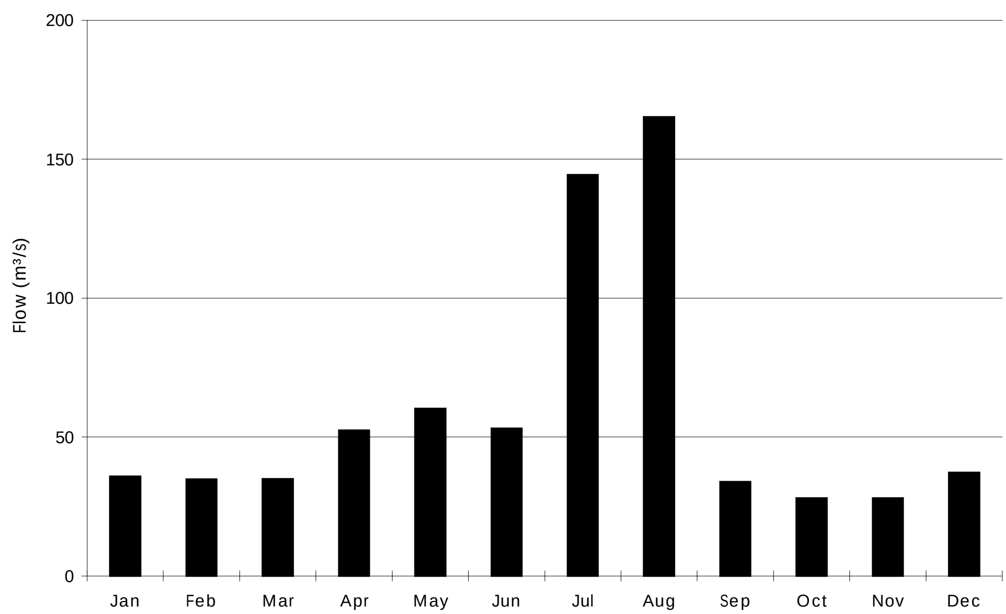


Figure 2

actual flows in nechako river below chelslatta falls

(January to December 1994)



* Additional Flows as Determined to be Required for Cooling Purposes

SETTLEMENT AGREEMENT SHORT TERM RELEASES
Mean Annual Release 36.8 m^3/s

ACTUAL RELEASES (1994)
Mean Annual Release 38.2 m^3/s

Summer Water Temperature Management

RATIONALE

To protect sockeye salmon during their migration within the lower Nechako River, it is necessary to manage river water temperatures.

Nechako River flows and water temperatures are managed through releases from the Skins Lake Spillway. This is done in an attempt to maintain mean daily water temperatures at or below 20°C in the Nechako River upstream of the Stuart River at Finmoore. Management is carried out through a computer-based program defined in the Settlement Agreement. The program protocol uses a trend analysis developed from five-day meteorological forecasts to schedule releases from the Skins Lake Spillway.

PROJECT SUMMARY 1994/95

The Water Temperature Management Program was again followed in 1994/95. Mean daily water temperatures exceeded 20.0°C for 10 days. Temperatures reached a maximum of 21.1°C on July 30. During this time, flow in the Nechako River below Cheslatta Falls was at the maximum allowable level of 283 m^3/s, and thus no further action could be taken.

The average flow in Nechako River below Cheslatta Falls was approximately 227 m^3/s during the water temperature control period. Increases in releases from Skins Lake Spillway above base flows from July 19 to 22, July 28 to 30, August 4 to 5 and August 11 to 12 resulted in flows at Cheslatta Falls at, or near 283 m^3/s. Mean daily water temperatures averaged 19.4°C (range 17.9°C to 21.1°C) during the water temperature control period.

APPROVED PROJECT 1995/96

The 1995/96 project will follow the same protocol and will be conducted in a manner consistent with previous projects.

IN-STREAM HABITAT COMPLEXES

Physical Assessment of In-Stream Habitat Complexes

RATIONALE

Cover habitat provides refuge for fish from fast-flowing water and predators, yet still allows them access to food in the river. Habitat complexing will be constructed in the Nechako River to supply important cover habitat for rearing juvenile chinook salmon. Installation of habitat complexes will manage the risk to chinook stocks associated with changes in the amount of instream cover habitat after the shift to the long-term flow regime.

The physical assessment of different habitat complexes pilot tested in the Nechako River aids in the identification of the types of structures most suitable for the rearing requirements of juvenile chinook.

PROJECT SUMMARY 1994/95

In 1994/95, physical assessment and photographic/video documentation of the habitat complexes was conducted to provide a chronological record of the effects from winter conditions and summer cooling flows. I n general, rail debris catchers providing simulated log jam structures continue to be durable although some debris loss is taking place in Reach 4. Debris bundle complexes are less durable than debris catchers.

APPROVED PROJECT 1995/96

In 1995/96, monitoring will continue.

Biological Assessment of Habitat Complexes

RATIONALE

Assessment of fish usage of the man-made habitat complexes will identify the most beneficial types of habitat complexes. These complexes must provide habitat for all life history phases of Nechako River juvenile chinook but not contribute advantageous rearing conditions to non-salmonids.

PROJECT SUMMARY 1994/95

Results from 1994/95 assessments continue to indicate good usage of the habitat complexes. Initial assessments suggest that up to 74% of the chinook enumerated during May and June within Reach 2 and 42% in Reach 4 were associated with the habitat complexes. Enumeration was conducted by snorkeling. Furthermore, there is continued evidence that suggests that the complexes were utilized as overwintering habitat.

APPROVED PROJECT 1995/96

Assessment will continue in 1995/96 and will include assessments in May and June, reflecting periods of maximum use observed during summer rearing flows. In addition, there will be assessments in November to investigate potential overwintering utilization. Controls and complexes constructed in previous years will be assessed for use by juvenile chinook. The 1995/96 data will demonstrate the level of utilization of complexes in a year of low recruitment resulting from low spawner numbers in 1994. This data will be used as a comparison with the previous year which also had low spawner numbers.

RIPARIAN RE-VEGETATION

RATIONALE

Riparian stabilization or re-vegetation of stream banks in North America is increasingly used to protect against bank failure and cattle grazing. Trees and shrubs not only provide protection against erosion, but also create refuge for fish and provide food in the form of terrestrial insects and leaf litter which drop from the canopy.

Several failing banks have been identified on the Nechako River. It may be desirable to stabilize these banks using simple riparian revegetative techniques. Reduced levels of erosion contribute to the protection of spawning, incubating and rearing habitat for chinook salmon.

PROJECT SUMMARY 1994/95

Monitoring of the revegetation test banks continued in 1994/95. The Nechako River mainstem bank is demonstrating mixed results from the different planting techniques. While some applications continue to grow, much of the revegetated area is no longer growing. Although the stream channel at the tributary site changed course during 1994, the vegetative plots continue to grow.

ADULT PROGRAMS

Adult Spawner Enumeration

RATIONALE

The number of adult chinook salmon returning to spawn in the Nechako River is the primary indicator regarding the overall state of the Nechako River chinook salmon stocks and signifies achievement of the Target Population.

PROJECT SUMMARY 1994/95

In 1994, nine aerial counts on the Nechako River were taken between August 26 and October 7. Aerial counts and residence timing provided an escapement estimate of 1144 spawners. The Stuart River chinook carcass recovery project documented 2420 returning spawners.

APPROVED PROJECT 1995/96

The 1995/96 project on the Nechako River will employ similar methods to those of previous years.

The tagging and carcass recovery project on the Stuart River will be overseen by DFO personnel to ensure the application of a reproducible methodology in 1994.

An analysis, conducted by DFO, of the 1994 returns to the upper Fraser River will be available.

Adult Carcass Recovery

RATIONALE

The analysis of data from adult carcasses collected near the spawning grounds provides life history information on freshwater and marine components of Nechako River chinook salmon. This information aids in interpreting enumeration results and in indicating which brood years have contributed to the spawning population. It also aids in the determination of the success of juvenile rearing strategies and the quality of spawning habitat and condition of spawning fish. Data on age at return and egg deposition will also enable results from other monitoring projects to be interpreted.

PROJECT SUMMARY 1994/95

The adult chinook carcass recovery program provided biological data on size, sex, age, life history and egg retention of chinook from the Nechako and Stuart rivers. The dominant age class in 1994/95 was five-year-old chinook with one complete year of fresh water residency.

APPROVED PROJECT 1995/96

In 1995/96 the carcass recovery project will continue to collect biological data on size, sex, age, life history, egg retention and fecundity of chinook.

INCUBATION ENVIRONMENT

The incubation environment refers to the habitat area and conditions within the river where salmon spawn. This environment is utilized during the winter months, from October to March, when the eggs and alevins are within the gravel. Fry emergence is an indicator of the quality of the ingravel environment and can also indicate when winter physical conditions have affected this environment. Studies are being conducted in each of these areas.

Gravel Quality and Dissolved Oxygen Monitoring

RATIONALE

The substrate of the Nechako River provides habitat for spawning, incubating, rearing, and food production for chinook salmon. The oxygen concentration in the interstitial gravel is directly related to emergent success of juvenile chinook salmon. One method to determine the quality of the incubation environment is through the measurement of intergravel dissolved oxygen.

To ensure an adequate database of the intergravel environment, monitoring projects are designed to collect continuous data on the intergravel environment. In addition, to compile a database on the gravel quality of the Nechako River, a comprehensive analysis of the substrate will be performed prior to the implementation of long-term flows.

PROJECT SUMMARY 1994/95

In 1994/95, the complete dissolved oxygen monitoring station was modified and operated on the Nechako River. Since July 1994, the equipment has been operational, serviced and calibrated every three months. An assessment of the reliability and utility of the dissolved oxygen monitoring equipment is ongoing.

APPROVED PROJECT 1995/96

The equipment will remain in the river in 1995/96 to further test the data collection system.

Fry Emergence

RATIONALE

The quality and quantity of fry emerging from the gravel is a key indicator of the condition of the incubation environment. A monitoring project designed to assess emergent success serves as an early warning indicator of any changes in the incubation environment.

PROJECT SUMMARY 1994/95

In 1994/95, four inclined plane traps were installed at a major spawning area near Bert Irvine's (km 19) from March 7 to May 20, 1994. The number of spawners and the index of the estimated number of fry have decreased in the last four years. Data indicates the correlation between the number of spawners during previous years and the total number of fry abundance is very strong. This strong correlation validates the use of the index as an indicator of fry emergence. In 1994/95 a large number of trapped fry indicated good emergence success, indexed at 43.5% fry emergence.

APPROVED PROJECT 1995/96

The 1995/96 project will repeat the program conducted in the previous four years. Four incline plane traps will be installed at Bert Irvine's and mark/recapture experiments will be conducted to determine trap efficiency. T he results of the fry emergence project continue to be important for interpreting results of other monitoring projects. Low spawner numbers in 1994 will provide a further opportunity to test the sensitivity of the trapping project to determine changes in numbers of emerging chinook.

Winter Physical Conditions

RATIONALE

The understanding of winter physical conditions and their effect on chinook incubation and overwintering in the Nechako River is important to gain a better understanding of the life history of the Nechako River stock.

Baseline data collected during the short-term flow regime will contribute to the existing database and will provide the basis for design and application of remedial measures.

PROJECT SUMMARY 1994/95

In 1994/95, data was collected on air and water temperatures and ice conditions on the Nechako River and added to the database.

APPROVED PROJECT 1995/96

In 1995/96, data will continue to be collected and analyzed. A report documenting the results of the project will be completed.

JUVENILE OUTMIGRATION

RATIONALE

The number and conditioning of juvenile chinook migrating down the Nechako River is an early indicator of the productivity of the river's spawning, incubation and rearing areas, and thus a warning of any change in chinook survival.

Monitoring the timing and abundance of migrating juveniles on an annual basis will indicate any changes and will also provide life history and juvenile population information four to five years prior to the return of adult spawners. As outlined in the Strategic Framework, indications of changes in numbers of juvenile chinook leaving the system will determine subsequent monitoring and remedial action.

PROJECT SUMMARY 1994/95

In 1994/95, three rotary screw traps were again fished at Diamond Island and run in conjunction with index sampling. The peak catches of chinook fry at Diamond Island occurred during the third week in April. Reductions in egg deposition and associated fry recruitment was reflected by the lower catches in the traps. This parallels other program results this year, such as 1994 adult spawner enumeration, 1995 fry emergence and winter sampling.

APPROVED PROJECT 1995/96

In 1995/96 the three rotary traps will again be deployed at Diamond Island and run in conjunction with index sampling. The traps will be fished from April 1 to the start of the summer water temperature cooling period, July 20, the period of greatest chinook outmigration. Index sampling will be conducted in April May June and in November. The low numbers of chinook recruits in 1995, as a result of low spawner numbers in 1994, will provide a test for the sensitivity of the trapping methodology.

TEMPERATURE MONITORING/PHYSICAL DATA COLLECTION

RATIONALE

The timing of emergence, growth rates and life history dynamics of chinook salmon are closely related to the temperature of their environment. Reliable collection of river temperature information forms part of the ongoing database of observed physical conditions in the Nechako River. The data is important in the designing of other monitoring projects and assessing the timing of juvenile chinook life history events.

PROJECT SUMMARY 1994/95

In 1994/95 the collection of physical data including air and water temperature, and discharge was continued as in previous years.

The data was applied to the fry emergence, juvenile outmigration, chinook enumeration and winter physical conditions projects.

APPROVED PROJECT 1995/96

In 1995/96, collection of baseline data will be continued to provide physical data to the other program components.

EVALUATION FRAMEWORK/TREND ANALYSIS

RATIONALE

The projects conducted by the NFCP consist of numerous physical and biological components. The need was identified for the Technical Committee to systematically analyze cause and effect relationships to best manage the overall program. In addition, the ability to detect statistically significant changes in the fish population and habitat availability will be evaluated.

To adequately follow the decision path of the NFCP Early Warning Monitoring Program, an initial synthesis and trend analysis of the data is planned. This analysis, undertaken within the context of the Conservation Goal outlined in the Settlement Agreement, will help accelerate action after the change to the long-term flow regime. It will also help define the duration and effort required by monitoring and remedial measures projects to ensure that the chinook Conservation Goal will be met.

PROJECT SUMMARY 1994/95

In 1994/95 work continued on a framework to evaluate the projects of the NFCP. This document will form the basis for the adaptive management approach to be followed by the Technical Committee, allowing for points of action to be identified.

APPROVED PROJECT 1995/96

In 1995/96, it is proposed that a workshop be held to refine the evaluation framework. In preparation for this workshop, a working document summarizing NFCP data collected over the past seven years will be prepared.

JUVENILE CHINOOK OVERWINTERING BEHAVIOUR

RATIONALE

Overwintering behavioural patterns of juvenile chinook in northern river systems requires research. Determination of winter habitat utilization will allow for an estimation of the abundance of juvenile chinook overwintering in the Nechako River. Knowledge of winter habitat requirements will also aid in deciding whether, and to what extent, remedial measures may be required. Knowledge of the relative contribution of overwintering chinook to the total recruitment is beneficial to management efforts of Nechako River chinook stock.

PROJECT SUMMARY 1994/95

In 1994/95 the primary publication of investigations in previous years and all contractor reports will be finalized.

PREDATION AND COMPETITION

RATIONALE

An understanding of the impact of predator and competitor populations upon juvenile chinook populations is necessary to determine if effort is required to control these populations. The relationships between juvenile chinook life history and predator abundance, distribution and impact, must be investigated.

SUMMARY PROJECT 1994/95

In 1994/95, the report on fish and bird predation and chinook availability was finalized and published.

TEMPERATURE EFFECTS

RATIONALE

Cooler water released from the Kenney Dam Release Facility into the Nechako River during the period of sockeye migration may affect invertebrate production, which is the food supply of chinook.

An understanding of the effects of temperature on invertebrate production and fish growth has been identified as an area requiring further research.

PROJECT SUMMARY 1994/95

In 1994/95 the 1993/94 data was analyzed and tests conducted on Nechako River chinook to determine growth rates under various temperatures at the facilities at Fisheries and Oceans Pacific Biological Station. At Fisheries and Oceans West Vancouver Laboratory design modifications for trough tests adjacent to the Nechako River were developed for the 1995/96 program year.

APPROVED PROJECT 1995/96

The study examining the effect of temperature change on invertebrates used as food by juvenile chinook will be continued. Work in 1994/95 has provided information on how to achieve temperature control in experiments. Troughs will be set up beside the Nechako river to conduct experiments in July and August 1995.

Summaries of the 1994/95 budget and the proposed 1995/96 budget are provided in figures 3 & 4. Increases of expenditures in monitoring reflect the development of additional programs.

Figure 3
COMPARISON OF YEAR 7 & YEAR 8 MANPOWER BUDGETS *

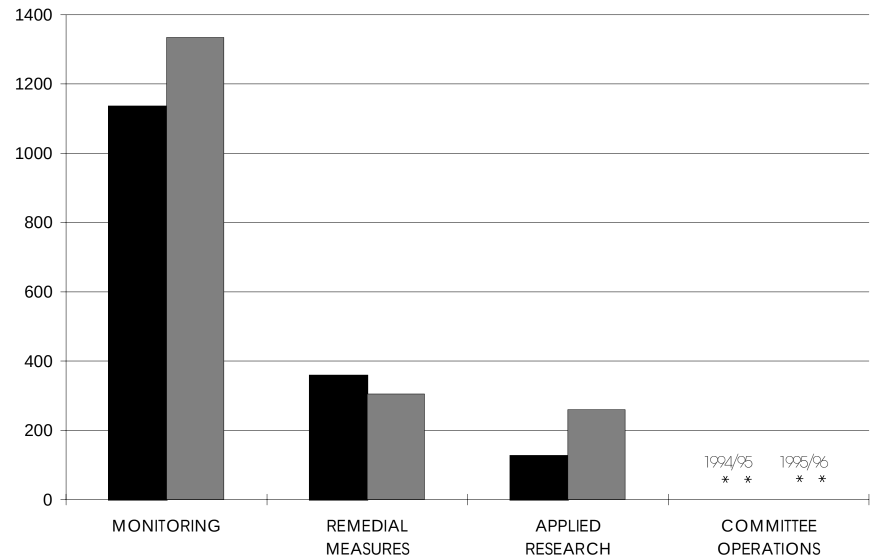
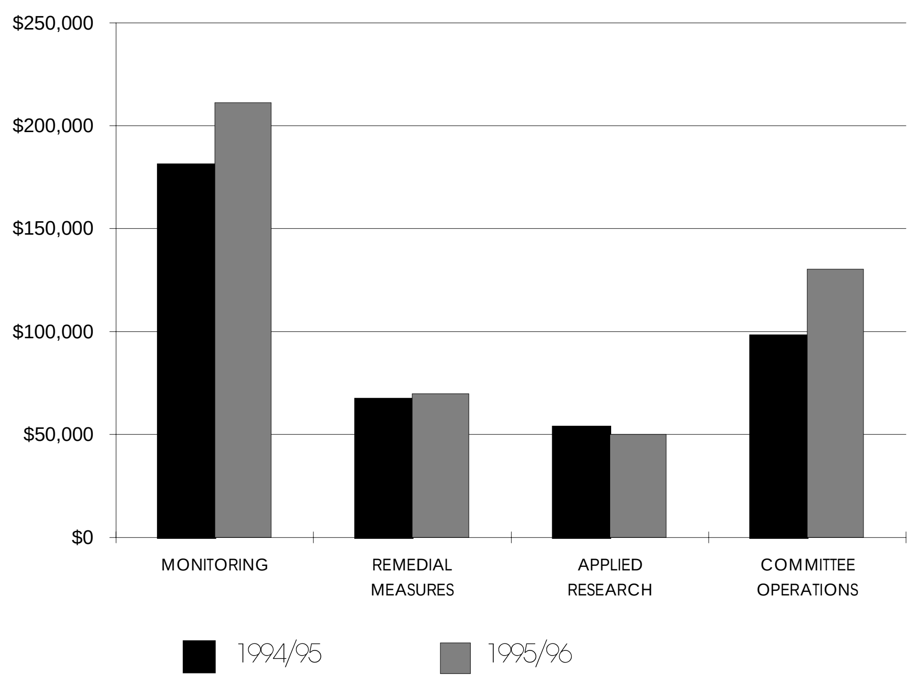


FIGURE 4
COMPARISON OF YEAR 7 & YEAR 8 DISBURSEMENT BUDGETS *

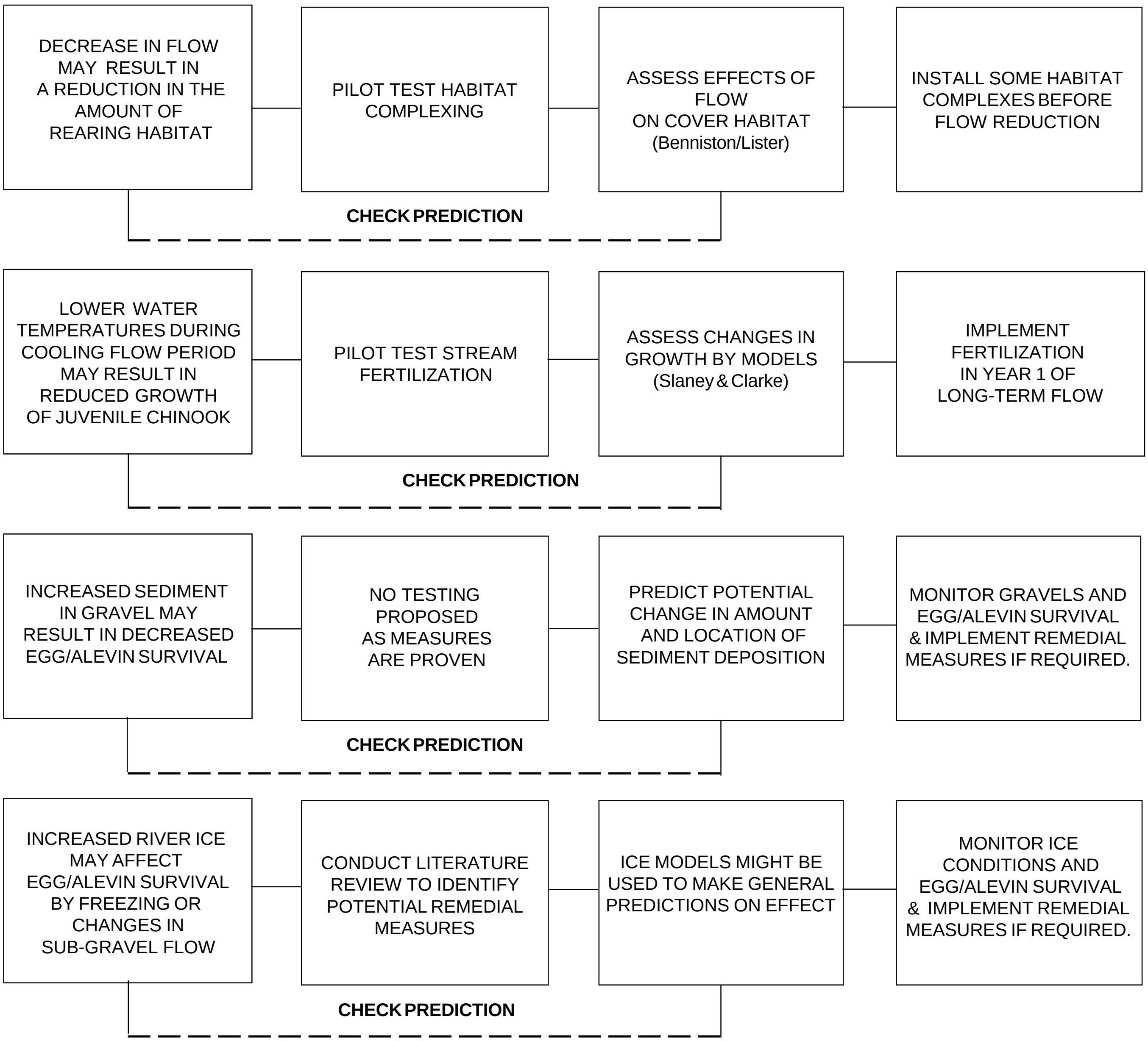


* Cost of manpower budgets are over and above the cost of disbursement budgets.

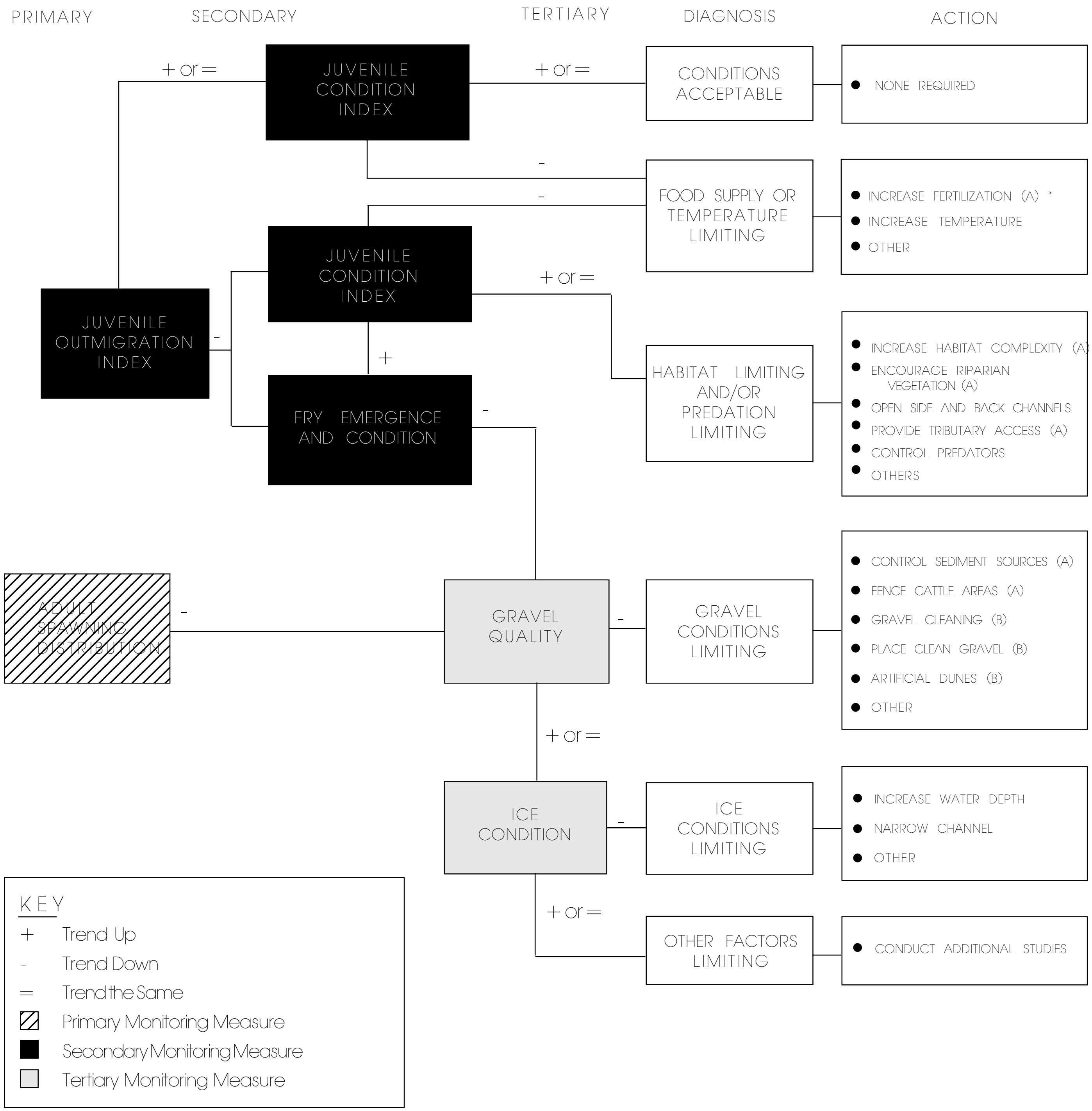
* * As required for each party.

APPENDICES

DECISION CHART FOR
REMEDIAL MEASURES PROGRAM

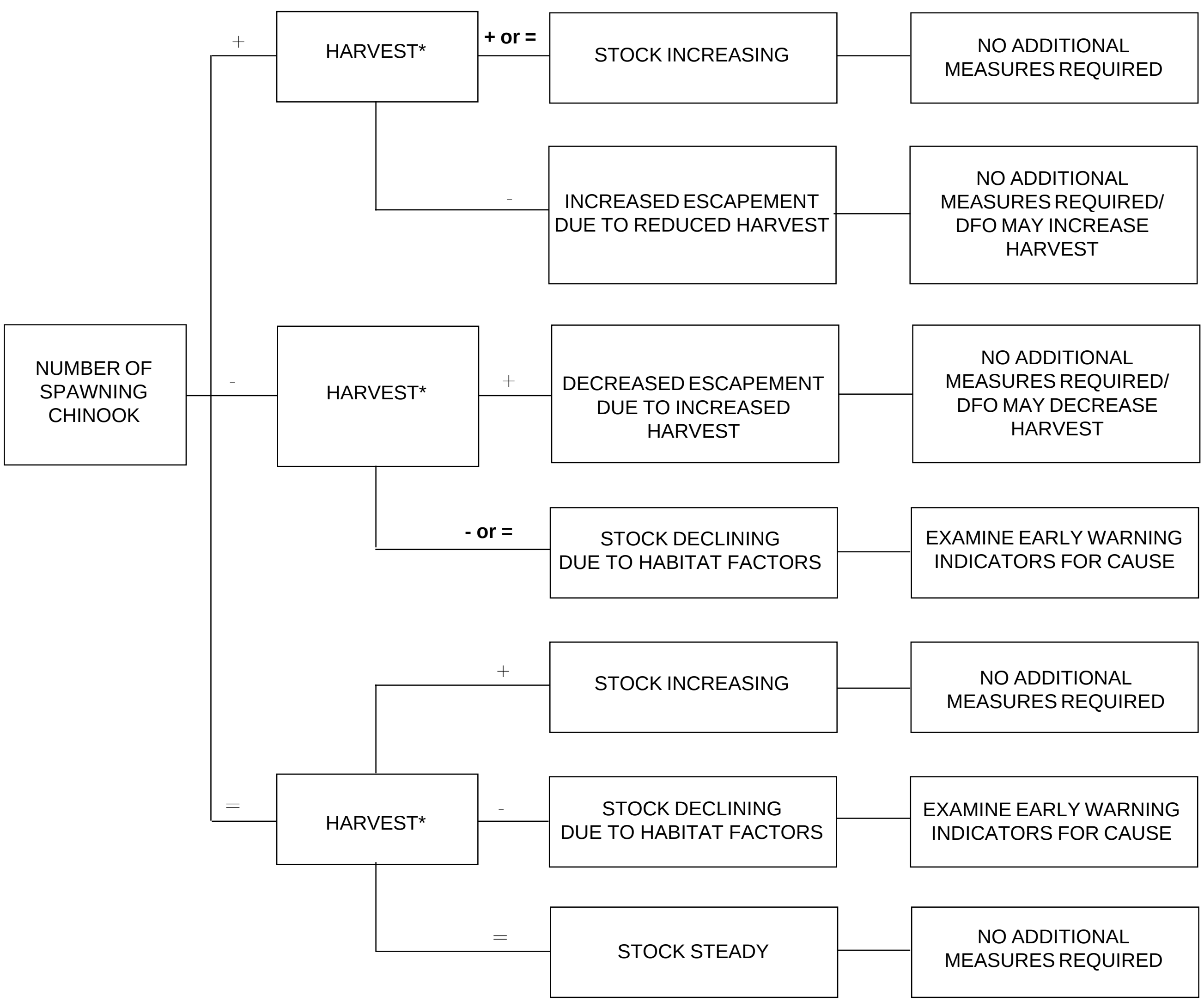


N.F.C.P. EARLY WARNING MONITORING PROGRAM



* Stage of Remedial Measures

ASSESSMENT OF CONSERVATION GOAL



* Harvest analysis includes: comparison of trends in index stream, coastwide trends in chinook stocks and ocean survival.

LISTS OF REPORTS

REPORT NO.	TITLE	AUTHOR
RM94-1	Nechako River 1994 Summer Water Temperature Management Program	Triton Environmental Consultants Ltd.
RM94-2	Instream Modifications and Habitat Complexing	Triton Environmental Consultants Ltd.
RM94-3	Biological Assessment of Habitat Complexing	Triton Environmental Consultants Ltd.
RM94-4	Nechako River Flow Control	Triton Environmental Consultants Ltd.
M94-1	Nechako and Stuart Rivers Chinook Spawner Enumeration	DFO
M94-2	Nechako and Stuart Rivers Chinook Carcass Recovery	DFO
M94-3	Juvenile Outmigration	Triton Environmental Consultants Ltd.
M94-4	Winter Physical Conditions	DFO
M94-5	Nechako River Physical Data Summary	DFO
M94-6	Nechako River Fry Emergence	Triton Environmental Consultants Ltd.
M94-7	Dissolved Oxygen Monitoring	DFO
M94-8	Evaluation Framework and Trend Analysis	DFO Triton Environmental Consultants Ltd.
AR94	Juvenile Chinook Overwintering Study Predation and Competition Temperature Effects	DFO

MEMBERS OF STEERING & TECHNICAL COMMITTEES

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Pacific Region
Department of Fisheries & Oceans

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Alcan Smelters and Chemicals

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B.C. Environment

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Habitat Management Division
Department of Fisheries & Oceans

PROVINCIAL CROWN
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Head, Rivers Fisheries Unit
Fisheries Branch
Ministry of Environment, Lands & Parks

DECISION RECORDS
FROM THE TECHNICAL COMMITTEE

NECHAKO FISHERIES CONSERVATION PROGRAM

A Joint Program of the Government of Canada, Alcan and the Province of British Columbia

NECHAKO RIVER STEERING COMMITTEE MEETING (94-1)

DATE:	Thursday, March 17, 1994
PLACE:	Alcan Smelters and Chemicals Ltd. 400 - 1285 West Pender Street Vancouver, B.C.
ATTENDEES:	P.S. Chamut (Federal Crown) W.J. Rich (Alcan Aluminum Ltd.) J.H.C. Walker (Provincial Crown)

Decision Record

1. The Steering Committee approves the 1994/95 program and budget as presented by the Technical Committee.

P.S. Chamut, Director General, Pacific Region
Department of Fisheries and Oceans

W.J. Rich, Vice President for British Columbia
Alcan Aluminum Ltd.

J.H.C. Walker, Assistant Deputy Minister
B.C. Ministry of Environment

P.O. Box 1630, Station "A", Vancouver, B.C. V6C 2P7

NECHAKO FISHERIES CONSERVATION PROGRAM

A Joint Program of the Government of Canada, Alcan and the Province of British Columbia

Nechako Fisheries Conservation Program Technical Committee

DATE: August 18, 1994

INVITEES: D. Hay (Independent Member)
A. Martin (Provincial Crown)
A.C. Mitchell (Alcan Aluminium Ltd.)

G. Faulkner (Federal Crown)
W.O. Rublee (Alcan Aluminium Ltd.)
P.A.Slaney (Provincial Crown)

Decision Record

1. After reviewing the flow modelling results, it is the view of the Technical Committee that the proposed 8 hour closure of Skins Lake Spillway on August 30 will not impact the project and can proceed.

D. Hay

Gail Faulkner
Federal Crown

Provincial Crown

Alcan Aluminium Ltd.

P.O. Box 1630, Station "A", Vancouver, B.C. V6C 2P7

NECHAKO FISHERIES CONSERVATION PROGRAM

A Joint Program of the Government of Canada, Alcan and the Province of British Columbia

Nechako Fisheries Conservation Program Technical Committee

DATE: Thursday, September 1, 1994

ATTENDEES:
D. Hay (Independent Member)
A. Martin (Provincial Crown)
A.C. Mitchell (Alcan Aluminum Ltd.)

G. Faulkner (Federal Crown)
W.O. Rublee (Alcan Aluminum Ltd.)
P.A. Slaney (Provincial Crown)

DECISION RECORD

2. Alcan will be instructed to maintain the Skins Lake Spillway release at 14.2 m^3/sec until September 1, 1994, then increase to 31.5 m^3/sec on September 2, 1994 and continue this discharge until March 31, 1995 to fully utilize the 1994/95 Annual Water Allocation.

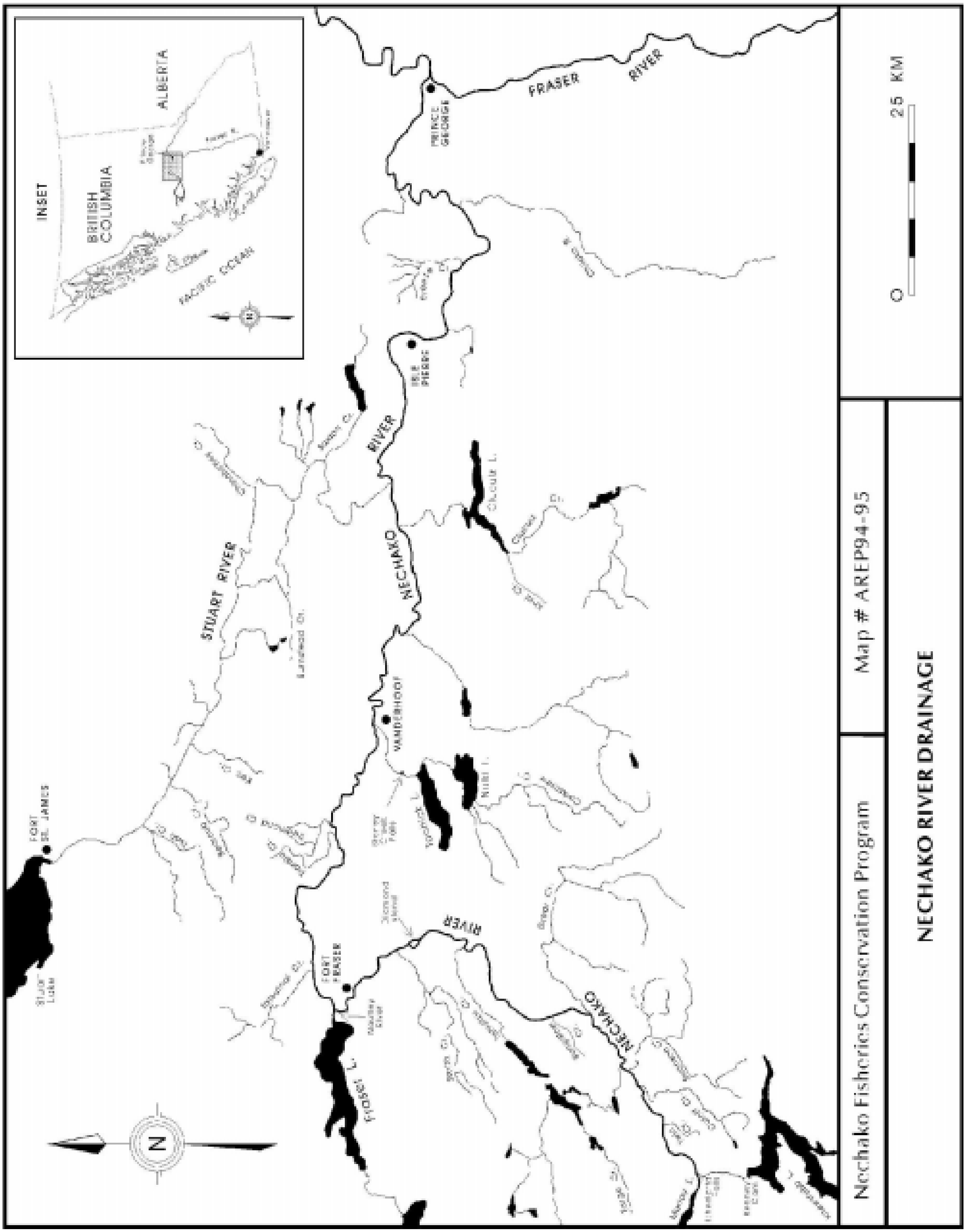
D. Hay

Federal Crown

Provincial Crown

Alcan Aluminium Ltd.

P.O. Box 1630, Station "A", Vancouver, B.C. V6C 2P7


INSET
BRITISH COLUMBIA
ALBERTA
PACIFIC OCEAN
FRASER RIVER
PRINCE GEORGE
ISLE PIERRE
NECHAKO RIVER
STUART RIVER
VANDERHOOF
FORT ST. JAMES
Stuart Lake
FORT FRASER
Fraser L.
Nulki L.
Cluculz L.
Tachick L.
25 KM
0
N
Nechako Fisheries Conservation Program
Map # AREP94-95
NECHAKO RIVER DRAINAGE