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: April 25, 2006

Decision Record (2006/2007-4)

1. The Technical Committee has information indicating that there is an open lead in the ice around Murray and Cheslatta Lakes. Therefore, Alcan will be instructed to increase Skin Lake Spillway release flows starting on April 26, 2006 to the desired spring release of an average release of 49 m^3/sec.

for J. Hwang

D. Levy

D. Bouillon

For D. Cadden

P.O.Box 2551, Vanderhoof, B.C. V0J 3A0

NECHAKO FISHERIES CONSERVATION PROGRAM

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

STEERING COMMITTEE MEETING (2006/07-1)

DATE: May 11, 2006

Members:

Steering Committee

Don Timlick (Alcan Primary Metal Group)
Nancy Wilkin (Provincial Crown)
Dave Innel (Federal Crown)

Decision Record

1. The Steering Committee approves the 2006/07 program and budget as set out in the attached table.

Dave Innell
Director, Habitat Enhancement Branch
Fisheries and Oceans Canada

N. Wilkin
Assistant Deputy Minister
Ministry of Environment

D. Timlick
~~Director, Energy Products~~ Economic Development Officer
Alcan Primary Metal Group.

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Table 1. Nechako Fisheries Conservation Program Proposed 2006/2007 Program

REMEDIAL MEASURES			DAYS	EXPENSES	
RM06-2	Summer Temperature Management		109.5	$15,910	ALCAN
RM06-3	Instream Habitat Complexing		12.0	$4,821	ALCAN
RM06-8	Flow Control		22.5	$3,410	ALCAN
RM06-8A	Flow Discrepancy Project		9	$10,000	ALCAN
		SUBTOTAL	153	$34,141	
MONITORING					
M06-1	Enumeration		22	$40,400	DFO/ALCAN
M06-2	Carcass Recovery		53	$8,600	DFO/ALCAN
M06-10	Outstanding NFCP Report Publication		46	$9,200	DFO
		SUB TOTAL	121	$58,200	
APPLIED RESEARCH					
	No applied research projects recommended for 2006/2007				
		SUB TOTAL	0	0	
		TOTAL	274	$92,341	
COMMITTEE OPERATIONS*			**	$96,392	

Includes Independent Member, Annual Meeting and Report, Technical
*Report
Production, and Committee Meetings
**As required by each party
Production, and Committee Meetings

NECHAKO FISHERIES CONSERVATION PROGRAM
TECHNICAL COMMITTEE

DATE: August 30, 2006

Decision Record (2006/07-2)

2. The Technical Committee has been made aware of the following:

   - Releases from the Skins Lake Spillway (SLS) made as part of the Summer Temperature Management Project (STMP) were decreased to 14.2 m^3/s late on August 18, 2005 to decrease flow in the Nechako River below Cheslatta Falls from the STMP base flow to the fall chinook spawning flows. The predicted recession of the flow in the Nechako River at Cheslatta Falls required the SLS release to be increased to 32.3 m^3/s on September 1 to ensure that the flow in the Nechako River below Cheslatta Falls did not drop below 32.3 m^3/s.
   - As noted on the attached calculation sheet, the average flow of 32.3 m^3/s is to be released from the Skins Lake Spillway from September 1 to March 31 to ensure the Annual Water Allocation is achieved.

Given the above, the Technical Committee has decided that Alcan be directed to maintain the Skins Lake Spillway release as follows:

- the average Skins Lake Spillway release over this period August 31, 2006 to March 31, 2007 is to be at or above 32.3 m^3/s;
- the minimum release from the reservoir is not less than 31.0 m^3/s;
- releases from the Spillway to be managed in a manner to achieve release from the Nechako Reservoir of the annual water allocation without having to spike releases in the latter part of the water year; and,

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- the running average of the release is to be calculated and reported monthly to the Technical Committee.

J. Hwang

D. Levy

D. Bouillon

T. Zimmerman

Date: August 30, 2006
Project: 3695; NFCP Annual Water Allocation - Estimated Winter Base Release

Annual Average Flow Rate = 36.8 m^3/s (as per the 1987 Settlement Agreement)

TIME PERIOD (JD)	TIME (Days)	FLOW (m^3/s)	Volume (m^3/s*Days)
Apr01 (91) to Apr26 (116)	26	32.00	832.0
Apr27 (117) to Aug17 (229)	113	49.0	5,537.0
Aug18 (230) to August 30 (242)	13	14.16	184.1
August 31 (243) to Mar31 (90)	213	X	213X
	365		6,553.1 + 213X

Annual Volume = 36.8*(365) = 13,432 m^3/s*Days = 6,553.1 + 213X
X = 32.30 m^3/s (1,141 cfs)

The Skins Lake Spillway release required to ensure release of the Annual Water Allocation by March 31, 2007 is 32.30 m^3/s (1,141 cfs)

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: November 15, 2006

Decision Record (2006/07-3)

3. The Technical Committee has been made aware of the following:

- Analyses of the sensitivity of the annual spawner counts to the number of overflights of the Nechako River have indicated that acceptable levels of precision will be maintained if 5 or more over-flights are incorporated in the annual enumeration project (see attached background document).
- Analyses of the sensitivity of the annual spawner counts to use of the long term average female residence time in calculating the AUC estimate indicate that acceptable levels of precision will be maintained when the average residence time is used rather than annual estimates as has been the past practice (see the attached background document)

Given the above, the Technical Committee has decided that:

- A minimum of five over-flights be incorporated into the annual enumeration project; and,
- The mean residence time for the period 1989 to 2004 be used in the calculation of the annual Area Under the Curve estimate of the Nechako spawner escapement.

P.O.Box 2551, Vanderhoof, B.C. V0J 3A0

J. Hwang

Bouffler

D. Levy

Y. Zimmerman

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Background

Sensitivity of Annual Chinook Spawner Count to Number of Flights and Residence Time Assumptions

Nechako River Chinook have been monitored annually in relation to the Conservation Goal. Spawner enumeration has been carried out using Area-Under-the-Curve methodology since 1988; prior to then, spawner counts were obtained by DFO Fishery Officers using less rigorous methods. Results are shown in Figure 1.

To further evaluate fisheries habitat quality, NFCP has developed a set of relationships between spawner abundance and fry emergence as well as juvenile outmigration. A future reduction in incubation and juvenile habitat quality may be detectable as outliers or departures from the measured statistical relationships. Where the observations depart significantly from the established relationships, this may indicate habitat degradation.

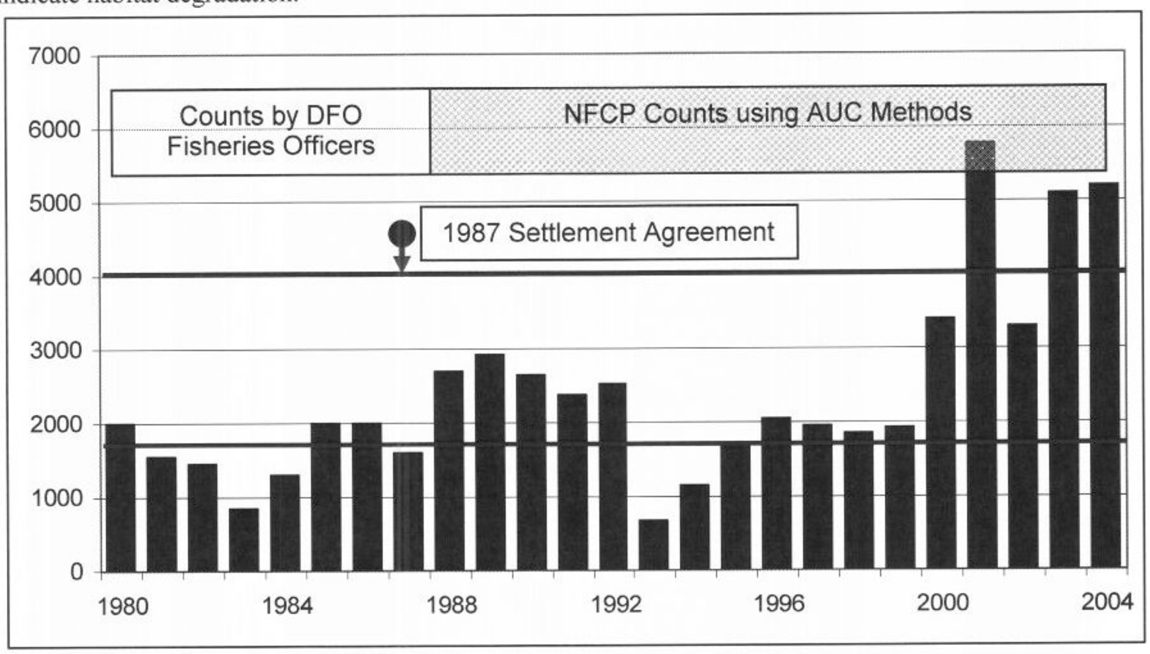

Figure 1. Number of adult Chinook in the Nechako River since 1980. Horizontal lines indicate target population level of 1700 – 4000 spawners. Annual spawner counts have remained above 3000 adults since the year 2000.

Evaluation

Reductions in Overflight Frequency

There is no absolute ground truth of the number of spawning Chinook in the Nechako, such as a fence count. The accuracy of applicable survey methods, including the area-under-the-curve method, is only partially understood. In contrast, the precision of the estimates could be measured by means of repeated measurements (i.e. replicate helicopter surveys within single days), but these are largely impractical. In general, higher sampling frequencies result in more precise measurements. These relationships are illustrated in Figure 2.

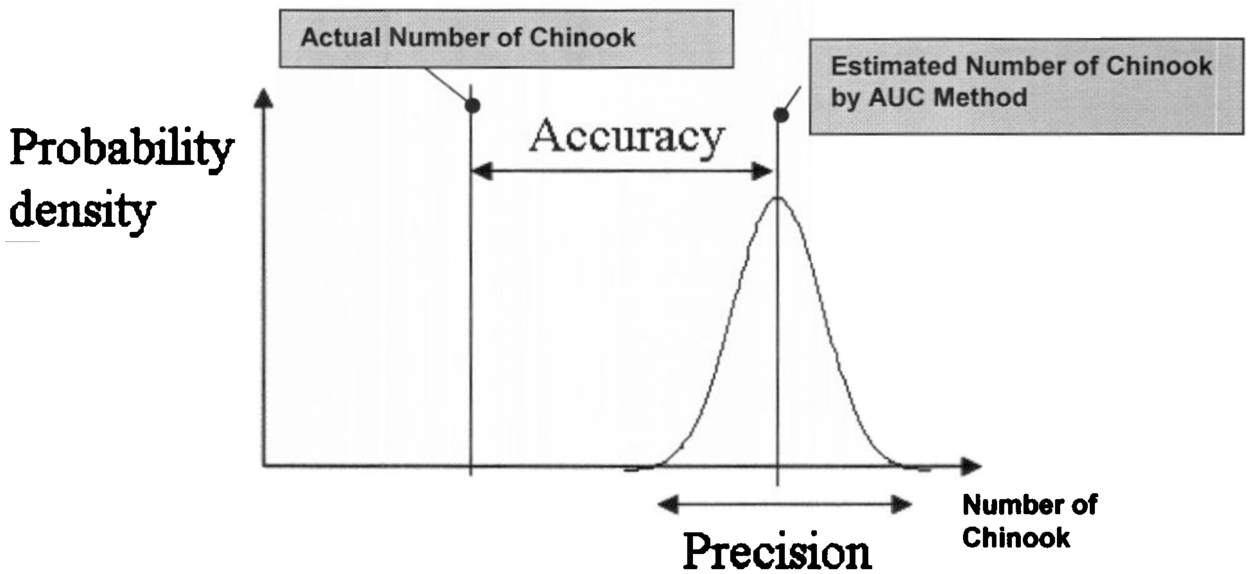

Figure 2. Graphic to illustrate the concepts of accuracy and precision, as they pertain to Chinook abundance estimation in the Nechako River.

DFO have analyzed the loss in spawner abundance measurement precision associated with reductions in the overflight frequency. The primary estimation method is area-under-the-curve which relies on sequential helicopter over-flights and estimates of mean female spawner residency time. The method integrates abundance over time and either uses a trapezoidal approach (i.e. "connect the dots") or a maximum likelihood approach (MLA) to fit a normal curve to the data. Figure 3 shows the 1989 aerial overflight observations relative to the fitted normal curve; subsequent years are shown in Figure 4. The MLA has better statistical properties than the trapezoidal approach, thus providing a better estimate of the true Chinook population size. NFCP presently use the MLA as the basis for the annual population estimate.

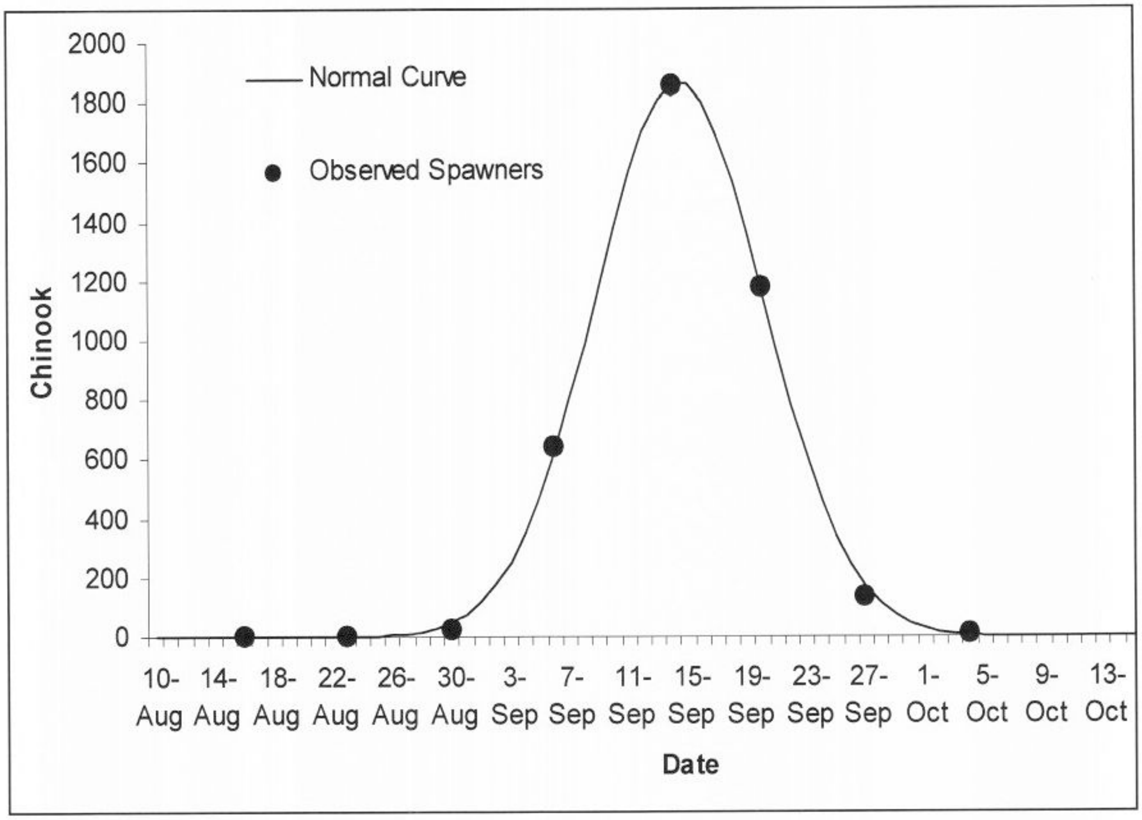

Figure 3. 1989 Maximum Likelihood Analysis graph for adult Chinook in the Nechako River.

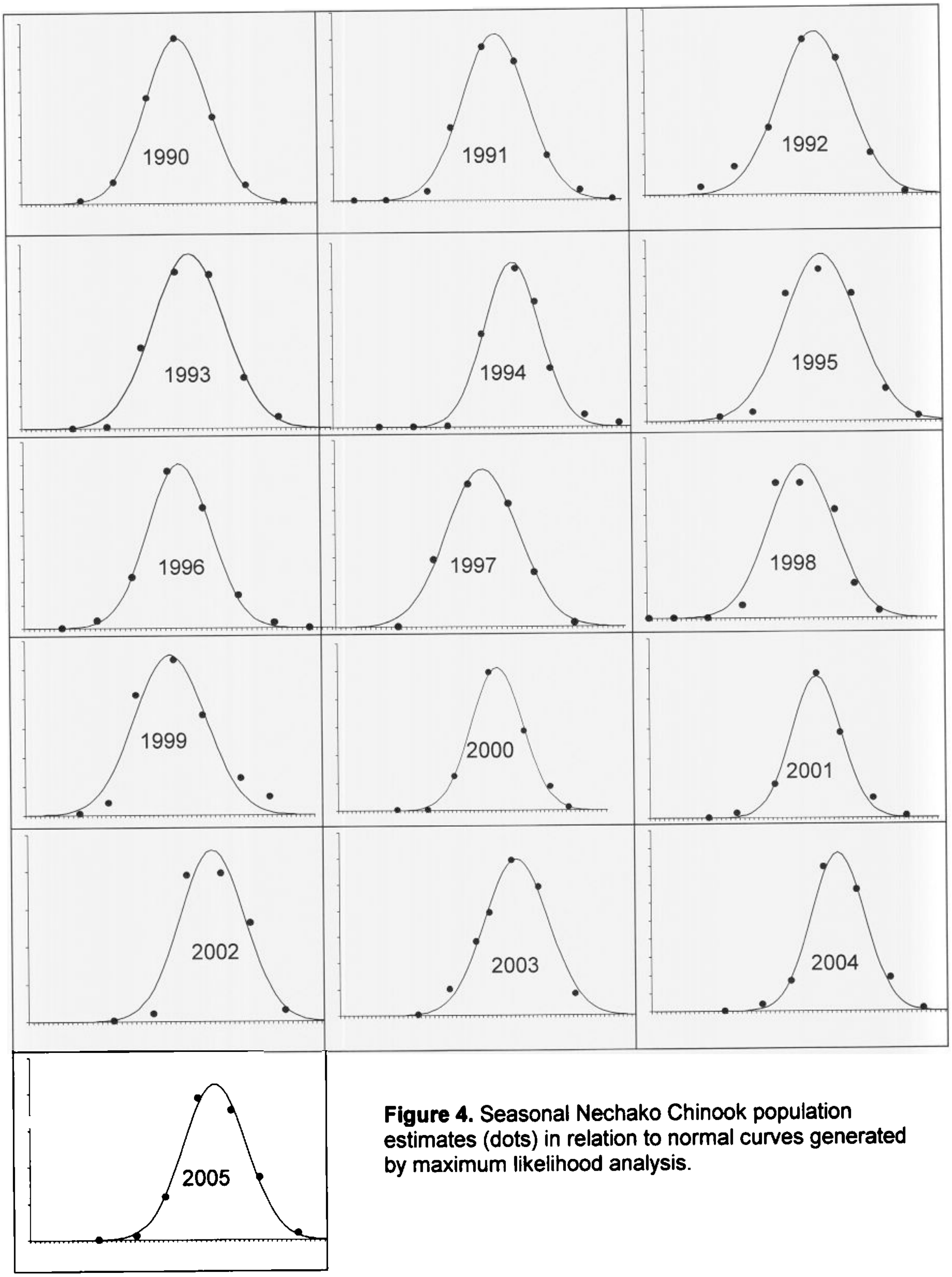

Figure 4. Seasonal Nechako Chinook population estimates (dots) in relation to normal curves generated by maximum likelihood analysis.

Analysis of previously collected Nechako data indicated that the use of five weekly flights (occurring throughout the first 4 weeks in September and first week of October) achieved the best balance between survey frequency, accuracy of resultant escapement estimates, and ability to produce reliable inferences for stock status. By comparing the results with the entire data series (6-9 overflights/year) the analysis showed that this reduced flight frequency had a mean percent error of 1.3% (95% CI is ±0.6%). Results are shown in Table 1.

Table 1. DFO sensitivity analysis of Nechako flight frequency for estimating Chinook population. ML = maximum likelihood, AUC = area-under-the-curve.

Option	Description	Mean Absolute Percent Error	95% CI
1: ML AUC – 5	5 of the original weekly flights thru the first 4 weeks of Sept. and first week of Oct.	1.3%	±0.6%
2: ML AUC – 5	5 of the original weekly flights thru the last week in Aug. and the first 4 weeks of Sept.	2.8%	±2.5%
3: ML AUC – 4	4 of the original weekly flights thru the first 4 weeks of Sept.	3.9%	±3.5%
4: ML AUC – 4	1 flight from the last week in Aug. and the first 3 flights in Sept.	17.4%	±12.9 %
5:Trapezoidal – AUC	All original flights	3.3%	±2.8%
6: Peak count	Original flight with highest count and 1.56 expansion factor (assumes 65% of population is observed)	14.2%	±4.8%
7: Peak count	Original flight with highest count and 1.68 expansion factor (assumes 61% of population is observed)	12.2%	±6.5%

These observations are consistent with a threshold mechanism between flight frequency and measurement precision of Chinook escapements. Additional flights above the threshold will not greatly improve precision. In contrast, a reduced number of flights below the threshold will lead to rapid degradation of the precision of escapement estimates (N. Trouton, DFO, in prep.).

Table 2 provides further information about the effects of methodology and flight frequency on measurement precision. Utilizing all of the available flight data, there is a 2.1 % difference in estimates between ML and Trapezoidal methods, 1.5 % difference between ML with 5 flights and ML with all flights, and 3.4 % difference between ML with 5 flights and Trapezoidal with all flights.

Table 2. Difference between Trapezoidal vs. AUC Methods for Estimating the Nechako Chinook Population.

	Trap All	ML All			ML 5 (Aug 31 to Oct 4)				
Year	Estimate	Estimate	# of fish different vs Trap All	% difference vs Trap All	Estimate	# of fish different vs ML All	% difference vs ML All	# of fish different vs Trap All	% difference vs Trap All
1989	2915	2928	13	0.4%	2935	7	0.2%	20	0.7%
1990	2645	2628	-17	-0.6%	2639	11	0.4%	-6	-0.2%
1991	2363	2371	8	0.3%	2427	56	2.4%	64	2.7%
1992	2525	2451	-74	-2.9%	2393	-58	-2.4%	-132	-5.2%
1993	673	685	12	1.8%	697	12	1.8%	24	3.6%
1994	1150	1138	-12	-1.0%	1103	-35	-3.1%	-47	-4.1%
1995	1686	1741	55	3.3%	1746	5	0.3%	60	3.6%
1996	2040	2005	-35	-1.7%	1998	-7	-0.3%	-42	-2.1%
1997	1954	2021	67	3.4%	2050	29	1.4%	96	4.9%
1998	1851	1919	68	3.7%	1993	74	3.9%	142	7.7%
1999	1915	1876	-39	-2.0%	1870	-6	-0.3%	-45	-2.3%
2000	3405	3459	54	1.6%	3467	8	0.2%	62	1.8%
2001	5785	5532	-253	-4.4%	5515	-17	-0.3%	-270	-4.7%
2002	3296	3397	101	3.1%	3403	6	0.2%	107	3.2%
2003	5108	5121	13	0.3%	5236	115	2.2%	128	2.5%
2004	5189	4978	-211	-4.1%	4718	-260	-5.2%	-471	-9.1%
2005	3427	3418	-9	-0.3%	3424	6	0.2%	-3	-0.1%
Absolute % Difference									
Maximum				4.4%			5.2%		9.1%
Mean				2.1%			1.5%		3.4%
Absolute Difference									
Maximum			253			260		471	
Mean			61			42		101	

Use of a Single Site for Residency Estimates

Parameters affecting the accuracy and precision of the Chinook spawner population estimate were evaluated by Triton (1997)[1]. There was no significant impact on population estimates when mean residency times were pooled for sampling sites (upper river vs. lower river) and spawning times (early spawners vs. late spawners). This implies that a single monitoring site located in the upper river will suffice for measurements of residency time. Figure 5 shows the impact of pooling the upper and lower river estimates of residency times on the spawner population estimate. During the simulation, the difference in the two calculation methods only varied between 0.4% and 7.7% with no consistent direction in difference. In a similar analysis, there were no differences in estimates using residence time values for early vs. late spawners.

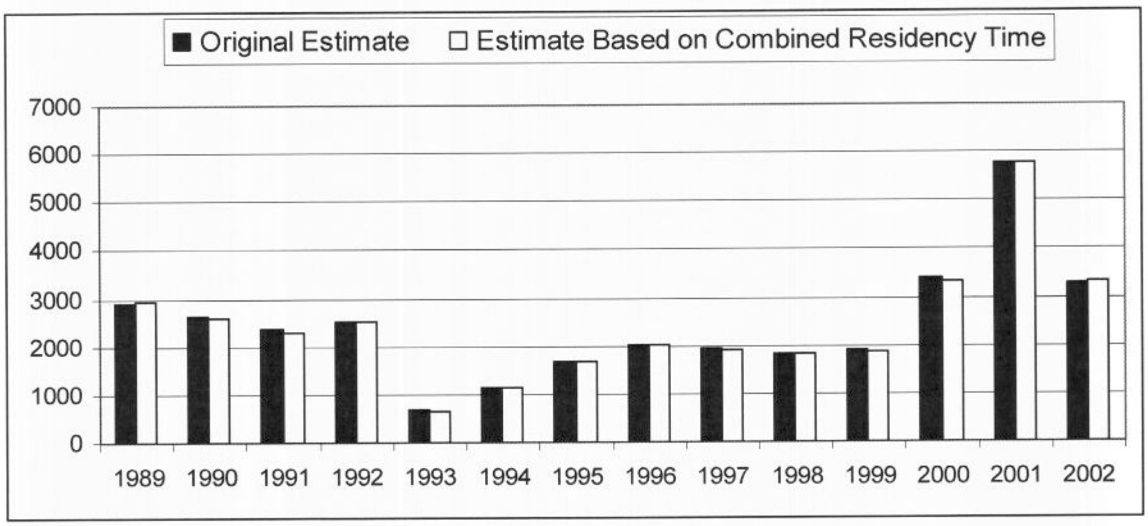

Figure 5. Source: NFCP TDR (2005) Figure 5.1-13.

[1] NFCP 10 Year Review: Background Report (1997)

Use of Mean Residency Time for Population Estimate

Mean female residency time on redds (Figure 6) has varied between 8.9 days in 1994 to 11.7 days in 1992. AUC estimates are sensitive to estimates of female residency time, necessitating the use of accurate estimates. In the Nechako, there is a good historical data set and the statistical properties of the residency time estimates are well understood.

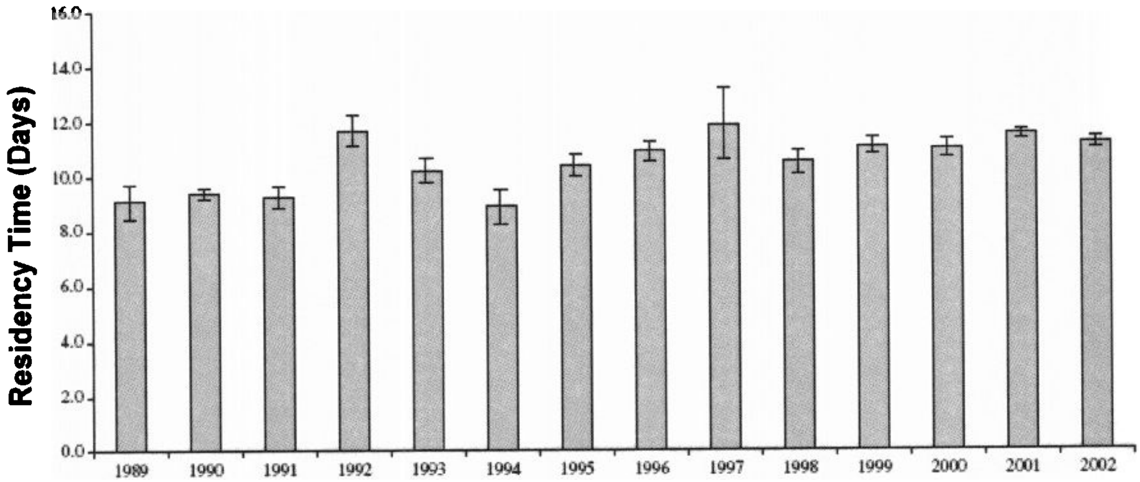

Figure 6. NFCP estimates of mean female residency time on redds. Source: NFCP TDR (2005) Figure 5.1-10.

Variations in the residency time affect the population estimate in a predictable fashion (Figure 7). Use of the minimum residency time inflates the estimate while use of the maximum residency time underestimates the population.

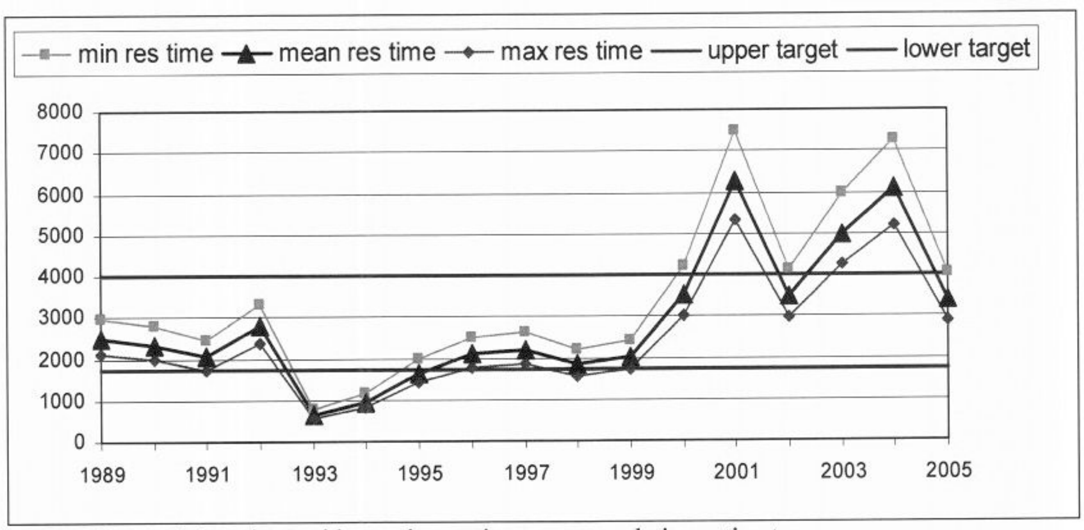

Figure 7. Effects of changing residency time estimate on population estimates.

Across the different years, the average residency time is 10.6 days. Population estimates based on the mean residency time are less precise than estimates derived using annual observations. However, Figure 8 shows that the use of mean residency time results in only a relatively small loss of measurement precision. The magnitude of difference in the annual population estimate introduced by using the mean residency time varied between 0 to ±18 % during the period 1989 – 2005. Deviations greater than 10 % occurred in 7 out of 17 years. This reduction in measurement precision (from using the mean residency time) over the course of the program would not have altered any conclusions regarding the achievement of the Conservation Goal (Figure 8).

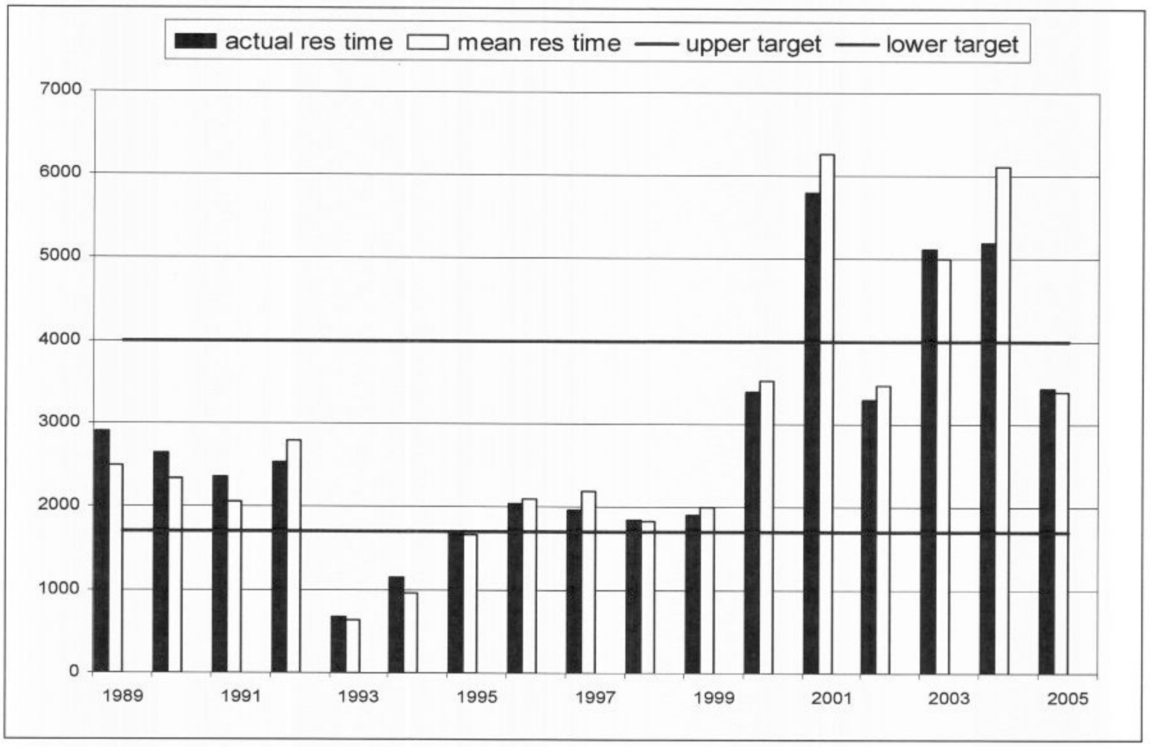

Figure 8. Comparison of historical Chinook abundance estimates using actual measured residency time with estimates based on mean residency time (10.6 days).

NECHAKO FISHERIES CONSERVATION PROGRAM

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

STEERING COMMITTEE MEETING (2006/07-5)

DATE: February 9, 2007

Members:

Steering Committee

Don Timlick (Alcan Primary Metal Group)
Nancy Wilkin (Provincial Crown)
Ken Smith (Federal Crown)

Technical Committee

D. Bouillon (Alcan Primary Metal Group)
T. Zimmerman (Provincial Crown)
J.Hwang (Federal Crown)
D. Levy (Independent Member)

Justus Benckhuysen (Alcan)
C. Mitchell (Alcan Primary Metal Group)
WO.Rublee (Alcan Primary Metal Group)
B. Nutton (Federal Crown)

Decision Record

1. The Steering Committee approves the 2007/07 program and budget as set out in the attached table.

K. Smith
Director, Habitat Enhancement Branch
Fisheries and Oceans Canada

N. Wilkin
Assistant Deputy Minister
Ministry of Water, Land, and Air Protection

D. Timlick
Economic Resource Officer
Alcan Primary Metal Group.

Table 1. Nechako Fisheries Conservation Program Proposed 2007/2008 Program

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