

NECHAKO FISHERIES CONSERVATION PROGRAM

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

NECHAKO FISHERIES CONSERVATION PROGRAM TECHNICAL COMMITTEE

DATE: July 11, 2016

Decision Record (2016/17-1)

This Decision Record sets out the approaches that the NFCP has adopted for measuring Chinook escapements in the Nechako River. The methodology for estimating Chinook escapement has evolved over time and has included the following approaches:

1. pre-NFCP counts including peak aerial, redd and stream-side visual counts;
2. Area-Under-the-Curve (5 helicopter flights);
3. Maximum Likelihood Analysis (5 helicopter flights); and
4. Maximum Likelihood Analysis (2 helicopter flights).

Recently DFO standardized the historical NFCP adult Chinook enumeration data from 1988 onwards. The NFCP accepts the DFO standardization and has decided to report and rely upon the standardized 1988 - 2015 data set for monitoring Nechako Chinook escapement trends.



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The NFCP has a mandate to monitor long-term changes in the Nechako River chinook salmon population in relation to a “Conservation Goal” of between 1,700 to 4,000 Chinook spawners. Historical enumeration methods, prior to the start-up of NFCP monitoring in 1988 are described in Jaremovic and Rowland (1988) and NFCP (2005) and have included peak aerial, redd and stream-side visual counts.

The Area-Under-the-Curve (AUC) method adopted by the NFCP for Chinook spawner estimation uses both periodic helicopter counts of spawner numbers during the fall spawning period and estimates of the time female spawners spend on the redd (residence time) in the calculation of the spawner population size. The method either uses a trapezoidal approach (i.e. “connect the dots”) or a maximum likelihood approach (MLA) to fit a normal curve to the data. Further description of escapement estimation methodology is provided in NFCP (2015).

From 1988 to 2005 the NFCP used the trapezoidal method as the basis for the annual population estimate. In 2006, the NFCP adopted the MLA based on analyses conducted by DFO, which are reported in NFCP (2007). Results indicated that the use of the MLA provides adequate precision at relatively low flight frequencies. The 5-year plan also provides the rationale for using the long-term female residence estimate of 10.6 days for scaling the helicopter flight observations.

Four different approaches have been utilized to estimate Nechako Chinook escapement:

pre-NFCP counts	1951 - 1987
Area-Under-the-Curve (5 helicopter flights)	1988 - 2006
Maximum Likelihood Analysis (5 helicopter flights)	2007 - 2014
Maximum Likelihood Analysis (2 helicopter flights)	2015

Recently DFO adjusted and standardized the analytical approach for estimating the Nechako Chinook escapement and this has generated some minor discrepancies with the pre-2016 estimates (Figure 1). The procedure uses escapement data from the 1980's and 1990's to develop and apply a relationship to standardize all estimates to 'AUC-equivalents'. The relationship describes the ratio of peak aerial counts to AUC estimates and the number of days by which the true peak of spawning was missed. With insufficient assessment data available in 2015 to derive an AUC estimate of escapement, DFO revised the relationship using contemporary data (1999-2014) and used it to develop the 2015 escapement estimate. For consistency, the method was then applied to the historical NFCP data set.

Table 1 contains the time series of spawner population estimates that the program will rely upon during future evaluations.

References

- Jaremovic, L. and D. Rowland. 1988. Review of Chinook salmon escapements in the Nechako River, British Columbia. Can. MS Rept. Fish. Aquat. Sci. 1963. 135p.
- Nechako Fisheries Conservation Program. 2005. Technical Data Review 1988 - 2002. 319p. Vanderhoof, B.C.
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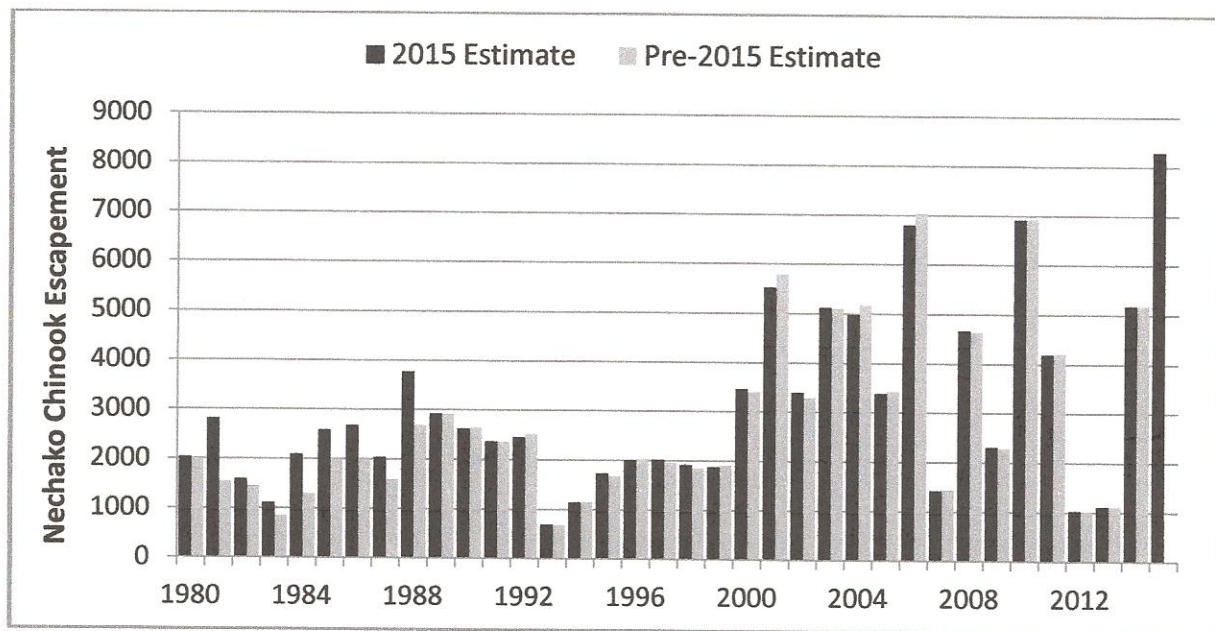


Figure 1. Nechako Chinook spawner estimates using standardized DFO methodology adopted in 2016 (black bars) compared with estimates previously adopted by the NFCP (grey bars).

Table 1. Nechako River Chinook Escapement.

<i>Return Year</i>	<i>Escapement Estimate</i>
1980	2038
1981	2814
1982	1590
1983	1114
1984	2099
1985	2591
1986	2685
1987	2042
1988	3765
1989	2928
1990	2628
1991	2371
1992	2451
1993	685
1994	1138
1995	1736
1996	2005
1997	2021
1998	1919
1999	1876
2000	3459
2001	5526
2002	3397
2003	5121
2004	4978
2005	3393
2006	6803
2007	1428
2008	4670
2009	2310
2010	6915
2011	4200
2012	1021
2013	1117
2014	5183
2015	8291