Fence expansion evaluation

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# 1 Introduction and Project Scope

The Babine river has a salinine enumeration facility encounters all five Pacific salmon species in addition to steelhead. The primary goal of the facility is to enumerate sockeye, chinook and pink salmon whose runs span from mid-July and are generally over by mid-October. The Coho run frequently continues outside the historical monitoriing period (i.e after October 15th of each year) and consequently suffers from truncated and incomplete counts. Previous to the work here, total run counts were estimated using data from years thought to have complete counts to estimate the “missing proportion”. This approach is limited as it does not make use of anxillary information that may be useful to account for within-year run timing variability.

Here, I employ a Bayesian hierarchical model that uses \*\*\*\* information to estimate total run for Coho at the Babine fishway from 1950 through 2021. I use an approach similar to Walsworth and Schindler ([2015](#ref-cite-walsworth2015))

# 2 Data Description

The data used here spans from 1946 through 2021

The earliest day in data used in this projects begins in 07-19 and complete counts are assumed to be 1950, 1952, 1953, 1957, 1976, 1977, 1979, 1985, 1989, 1991, 1994, 1995, 1996, 1997, 1998, 1999, 2021.

See Figure ??.

# 3 Methods

Also see Equation (3.1).

$$

# 4 References

R Core Team. 2021. *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. <https://www.R-project.org/>.

Stan Development Team. 2021. “RStan: The R Interface to Stan.” <https://mc-stan.org/>.

Walsworth, Timothy E, and Daniel E Schindler. 2015. “Coho Salmon Escapement and Trends in Migration Timing to a Data-Poor River: Estimates from a Bayesian Hierarchical Model.” *Canadian Journal of Fisheries and Aquatic Sciences* 72 (12): 1807–16.

# Appendix A: STAN

Stan is a Bayesian modelling and programming language that can be called from R ([R Core Team 2021](#ref-cite-R)) via the rstan package ([Stan Development Team 2021](#ref-cite-stan)). Here, I will give a brief example of how stan works in R by demonstrating how to run a bayesisn generalized linear model with normal error structure (equivalent to a least-squares regression). <https://mc-stan.org/docs/2_18/stan-users-guide/hierarchical-logistic-regression.html> <https://mc-stan.org/cmdstanr/articles/r-markdown.html>

# Appendix B: Comparison with Reference

# Appendix C: Generalized Additive Modelling (GAM) Approch

An alternative approach would be generalized additive model <https://peerj.com/articles/6876/> <https://en.wikipedia.org/wiki/Generalized_additive_model>