



# AYK SUSTAINABLE SALMON INITIATIVE

## Project Synopsis

### AYK REGION-WIDE



AYK REGION-WIDE

(Christian E. Zimmerman)

# PROJECT 708

### PRINCIPAL INVESTIGATOR

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### CONTRIBUTING ORGANIZATION

*Simon Fraser University*

### RESEARCH PERIOD

September 2007 -  
April 2009

### BUDGET

\$61,539.00

## CAN WE IMPROVE SALMON MANAGEMENT?

Salmon stocks in the Arctic-Yukon-Kuskokwim region consistently experienced low returns in the late 1990s, leading to multiple disaster declarations, calls for more research, and changes in harvest strategies. Management of salmon stocks is complicated by imperfect data, harvest rates that differ from those set by managers, and changing environmental conditions. Given these pervasive uncertainties, there is a clear need for methods that provide scientific advice to managers that explicitly takes these uncertainties into account.

## OUR OBJECTIVES

Develop a risk-assessment framework for evaluating alternative management policies, particularly for AYK chum salmon populations.

Use this framework to estimate trade-offs resulting from various harvest policy choices between commercial and subsistence harvests, and spawner abundance.

## HOW WE DID IT

We selected five chum salmon stocks for analysis: the combined Kwiniuk and Tubutulik rivers in the Norton Sound area; Yukon River fall chum salmon; two Yukon River tributaries, the Anvik and Andreafsky rivers, with summer chum salmon runs; and the Kuskokwim River. The model was a closed-loop simulation that included

## RESEARCH FRAMEWORK:

SYNTHESIS &  
PREDICTION –  
PRIORITIES #8 AND #9

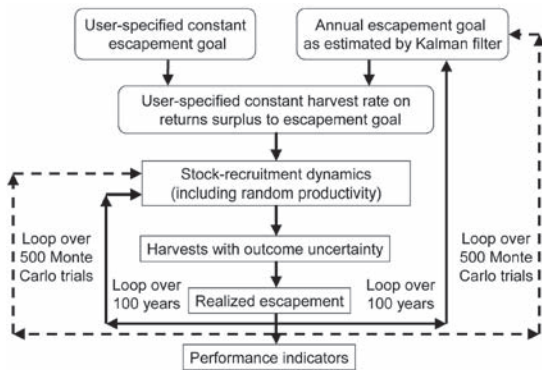
## SNAPSHOT

This project resulted in a model of AYK chum salmon stocks that takes into account inherent uncertainties in data collection, environmental conditions and policy implementation.

The model was used to evaluate the performance of different policy decisions for salmon stocks that experience environmental effects on decadal time scales.



Map of the Arctic-Yukon-Kuskokwim region showing locations of chum salmon stocks used in this study. Map data from [www.rivers.gov/maps](http://www.rivers.gov/maps). (Collie, URI)



Simulation framework and flowchart for the salmon life-cycle model. The arrows in the middle and to the left define the time-invariant harvest policy. The arrows in the middle and to the right define the time-varying harvest policy. (Collie, URI)

**AYK SSI Mission:** To collaboratively develop and implement a comprehensive research plan to understand the causes of the declines and recoveries of AYK salmon.

**ARCTIC-YUKON-KUSKOKWIM SUSTAINABLE SALMON INITIATIVE**

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salmon population dynamics and their environmental influences. We also included error in the implementation of harvesting decisions along with uncertainties such as observation errors.

**WHAT WE DISCOVERED**

Our results indicated that environmental changes taking place over decades have a greater effect on these stocks than year-to-year changes in recruits-per-spawner and that chum salmon productivity is primarily determined by ocean survival. With a harvest policy similar to the existing one applied to a simulated chum salmon stock, in about half the years the escapement target would not be met and the commercially fishery would be closed. Time-varying harvest policies, in which parameters are updated annually as new data come in, did not appear to improve outcomes. We also found that accurately planned policy is easily undermined by outcome uncertainties, such as the actual harvest differing from the goal. This points to a need for increased enforcement of regulations and improved in-season abundance estimates.

**PRODUCTS AND OUTREACH**

Our model is available for use by fishery managers. We also submitted our results for publication in a peer-reviewed journal.

**WHAT'S NEXT?**

Our generic model can be used by managers to analyze Yukon River chum salmon management policy; however, due to greater uncertainties with the Kuskokwim River, we caution against its use for those stocks. Follow-up work could include analyzing the sensitivity of the time-varying harvest policy to different sources and levels of uncertainty.