



*(Christian E. Zimmerman)*

**PROJECT  
606**

**PRINCIPAL  
INVESTIGATOR**

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**CONTRIBUTING  
ORGANIZATIONS**

*Bue Consulting, LLC*

*Montana State  
University*

*University of Alaska  
Fairbanks*

*University of Montana*

**RESEARCH PERIOD**

May 2006 -  
June 2007

**BUDGET**

\$150,378.00

**ALTERNATIVE METHODS FOR SETTING ESCAPEMENT  
GOALS IN THE ARCTIC-YUKON-KUSKOKWIM**

**A FRESH LOOK AT ESCAPEMENT GOALS**

Escapement goals and management strategies for salmon stocks in the Arctic-Yukon-Kuskokwim region have been the subject of considerable controversy. Traditional methods of creating brood tables and using stock-recruitment curves are hampered by limited information. In recent years, new initiatives have been developed that incorporate uncertainty, habitat condition, life history, watershed biocomplexity, and evaluation of objectives other than maximum sustained yield.

**OUR OBJECTIVES**

Evaluate new methods of determining salmon escapement goals for the AYK region.

Summarize all the existing data and identify data quality.

Compare the results obtained from setting escapement goals using traditional stock recruitment relationships, a life history model approach, and a habitat-based approach.

Assess the value of marine-derived nutrient information.

**HOW WE DID IT**

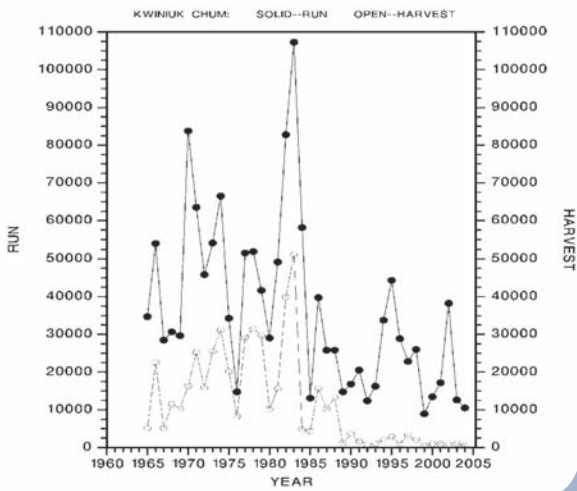
We collected salmon abundance and age, sex, and length data for specific species from eight river systems in the AYK area. Escapement, total run-size, harvest, and age composition data were analyzed for quality and rated using a four-level system. We then re-analyzed the changes in productivity in chum salmon stocks in the

**RESEARCH  
FRAMEWORK:**  
SYNTHESIS &  
PREDICTION –  
PRIORITIES #8 AND #9

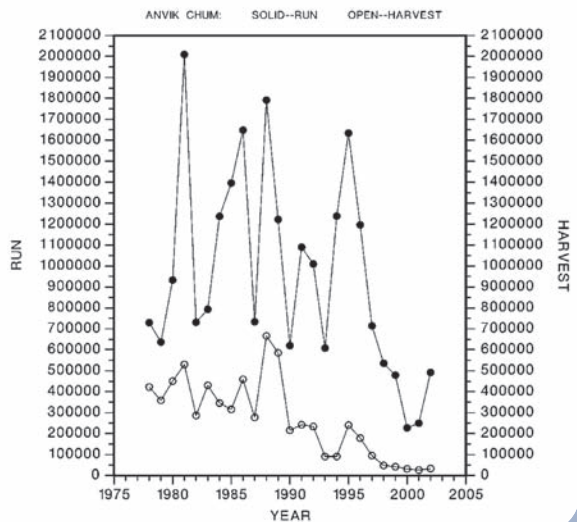
**SNAPSHOT**

This project explored alternatives to traditional ways of determining salmon escapement levels in the AYK region. Available historical data was evaluated, re-analyzed for population trends, and used to derive escapement levels using a life history modeling approach.

Researchers also conducted a preliminary study on estimating juvenile salmon densities using habitat analysis, and explored the effects of marine-derived nutrients.



The historic peak run size and harvest of the Kwiniuk River stock occurred in 1983, still leaving a large spawning escapement; but in 1985 the run was lower than had ever been recorded before in the data set starting with 1965. Harvests were greatly reduced in 1984, and stayed low, but the run sizes never really recovered. (Hilborn, UW)



The runs for Anvik River show broad variation from 1978-1997, and then shifted to a lower range starting in 1998. (Hilborn, UW)

**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**

BERING SEA FISHERMEN'S ASSOCIATION  
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 ANCHORAGE, AK 99501  
 (907) 279-6519

Kwiniuk, Anvik, and Andreafsky rivers using data from 1965–2004. We constructed a generic life history model with three variations and used those and the traditional approach to determine harvest rates, fixed escapements, and resulting yields. We also used satellite imagery to link habitat types to juvenile chum salmon density on the Kwethluk River in order to provide estimates for the Kwiniuk, Anvik, and Andreafsky rivers.

**WHAT WE DISCOVERED**

Our analysis revealed that all three of the Kwiniuk, Anvik, and Andreafsky river stocks exhibited strong downward trends in recruits-per-spawner. Some regional factor appears to be affecting all of these stocks simultaneously. Using the life history model approach resulted in lower escapement goals than using traditional analysis. We determined that it probably would not be effective to analyze these salmon stocks using changes in marine-derived nutrients from salmon carcasses. We were able to achieve rough estimates of juvenile chum salmon densities on the three rivers using the Kwethluk River model; however, this study was preliminary.

**PRODUCTS AND OUTREACH**

Our data are located in an electronic database.

**WHAT'S NEXT?**

Further research is needed to determine the factor(s) controlling salmon abundance on the Kwiniuk, Anvik, and Andreafsky rivers. Additional information on survival rates will help to refine our life history approach to determining escapement goals. Further research on juvenile density on the Kwethluk River will provide us with a more accurate habitat-based model.