

Northern Boundary and Transboundary Rivers Restoration & Enhancement Fund

Stage I Project Concept Form 2008

(three pages only- additional information will not be considered by the Fund Committee)

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Project Title: Assessing the ability of paleolimnological records to further current understanding of trends in productivity in sockeye populations in relation to harvest, climate, trophic status and productivity of nursery lakes: A workshop of leading and active North American researchers

Project Type:

Improved information for resource management
Habitat restoration
Enhancement

Check one

Estimated Amount Required:

Specify currency

\$ 32,500 CDN
\$
\$

Project Location: Vancouver, BC

Start Date: March 2008

End Date: January 2009

Provide a brief overview of the project; what is being proposed?

Paleolimnological techniques used to reconstruct historic changes in sockeye abundance and productivity of sockeye nursery lakes have been successfully undertaken in Alaska. These studies have shown lake productivity to be regulated by climate and salmon derived nutrients, and that $\delta^{15}N$ can be used as a proxy for spawner density. However the application of these techniques to the variety of freshwater sockeye lakes found throughout coastal BC is yielding less consistent and clear results.

We will host a 2 day invitational workshop in Vancouver, BC in the fall of 2008, which will bring experts, managers, and active researchers together to assess the utility of paleolimnological records in assessing causes of long-term changes in sockeye productivity.

Relevance and Significance: Describe the relevance and significance of the project to the Pacific Salmon Treaty and the goals of the Northern Fund.

Since the advent of formal record keeping, there have been dramatic fluctuations in sockeye salmon populations in BC, Yukon and Alaska. This has led researchers to investigate how these populations respond to anthropogenic harvest pressures as well as more long-term forcing mechanisms such as the Pacific Decadal Oscillation (PDO).

Numerous researchers have used stable isotopes and geochemical information to show that productivity and diversity of freshwater ecosystems, and of salmon themselves, are dependent on the annual delivery of nitrogen and phosphorous via spawning salmon. Because BC sockeye lakes are typically limited in nitrogen and phosphorous, researchers have hypothesized that juvenile sockeye production is also limited. This understanding has been the basis for sockeye lake fertilization programs in BC over the last several decades.

Paleolimnological studies by Finney et al. (2000) support this theory and have successfully documented long term changes in sockeye productivity, showing significant correlations between spawner densities and d15N in lake sediment, zooplankton and smolts. Other studies have not been so clear. Holtham et al. (2004) found little correlation between sockeye escapements and time-series d15N in oligotrophic lakes that have lower sockeye densities, higher flushing rates and higher terrestrial inputs. Schindler et al. (2005a) showed that while significant loss of salmon nutrients occurred in Bristol Bay lakes, sockeye productivity was not adversely affected. Brahney et al. (2006) showed that while d15N is significantly correlated with escapement, BC lakes clearly behave differently than Finney's Alaskan lakes and alternate interpretations of the isotopic and geochemical histories are required. Brock et al. (2007) suggest that although sedimentary d15N and proxy inferred aquatic primary productivity are generally correlated, the degree to which Salmon Derived Nutrient (SDN) flux controls primary productivity in a lake can change over time and with little coherence in trends among nearby lakes.

All of this has lead to skepticism about the utility of paleolimnological studies to provide insights into the cause of changes in sockeye productivity and the importance of spawner densities in assisting depressed sockeye populations to recover.

This proposal identifies the desire to bring leading and active paleolimnological researchers together in a workshop to examine the utility/benefits of this approach to convey long-term changes in sockeye productivity and provide insight into the importance of Salmon Derived Nutrients (SDN) to help these populations recover.

Technical Merit:

The workshop will bring together leading and active researchers from academic and government institutions at Simon Fraser University, University of Fairbanks, University of Washington, Flathead Biological Station, University of Regina, Queens and McGill Universities, Parks Canada, and Fisheries & Ocean's Canada to discuss the role of paleolimnological records to provide further insight into causes of depressed sockeye salmon populations.

Using both published and unpublished data, this group will discuss the current understanding of the complex relationship between climate, harvest, lake trophic status and sockeye production and how this information is documented and interpreted in sedimentary records.

Discussion and sessions have yet to be defined but will generally cover:

- Synthesis of the state of knowledge
- Application of techniques
- Role of salmon nutrients as a main regulating factor
- Importance of whole lake N budgets and mass balance approach
- Interpreting biological, geochemical, and physical indicators
- Unpublished paleo analysis from additional BC lakes

Proceedings will be produced with summaries and conclusions from all sessions, as well as recommendations on how and when paleolimnological records can be used to further our understanding of fluctuating sockeye populations.

Key Personnel:

Workshops hosts: Raincoast Conservation Foundation (RCF) and Fisheries & Oceans Canada (DFO)

Workshop logistics co-ordinator; Misty MacDuffee, Raincoast Conservation Foundation

Workshop scientific director: to be confirmed, but identified session leaders have offered

Workshop session leaders (potential):

Peter Leavitt, PhD, Professor, University of Regina, Dept of Biology,

Daniel Schindler PhD, Professor, U of Washington, School of Aquatic & Fishery Sciences

Marlow Pellatt, PhD, Paleoecologist, Parks Canada

Irene Gregory-Eaves, PhD, Professor, McGill University, Dept of Biology

Erland Maclsaac, Fisheries analyst, School of Resource Management, SFU and DFO

Other participants: additional researchers and fisheries managers from DFO, Queens U, U of Alberta, Flathead Biological Station, SFU, and U of Fairbanks have expressed their support and desire to participate in such a workshop.

Measures of Success:

- the number of leading researchers participating,
- the overall interest and participation in the workshop
- distribution of workshop proceedings
- production of a technical report (DFO?) for fisheries managers and scientific community