



WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2002WA5B

Title: Development of a Comprehensive Monitoring Protocol to Characterize the Concentration and Associated Health Risks of Salmonid Pathogens Suspended in Water

Project Type: Research

Focus Categories: Methods, Water Quality, Education

Keywords: Salmonid Pathogens, Polymerase Chain Reaction, Nucleic Acid Arrays, Inhibition, Recovery, Fish Hatcheries, Surface Water Quality

Start Date: 03/01/2002

End Date: 02/28/2003

Federal Funds: \$20,000

Non-Federal Matching Funds: \$43,738

Congressional District: Washington Fifth

Principal Investigators:

Douglas Ruben Call
Washington State University

Rollin H. Hotchkiss
Washington State University

Ken Cain
University of Idaho

Frank Jean Loge
Washington State University

Abstract

Salmonid populations in Washington State have been severely impacted during the past half-century. While many factors have contributed to these declines, little is known about the proximate or ultimate role of disease in this process. Little is known about how different water resource management practices and fish management practices impact the incidence, prevalence and outcome of disease within and between salmonid populations. The lack of knowledge about fish disease is largely due to poorly developed, very slow, or piecemeal methods available for detecting pathogens. Even if improved tools were available, currently there is no framework established to understand the health-risks associated with positive or negative detections. Consequently, improved methods for pathogen detection and risk analysis are sorely needed to evaluate the impact of disease on the demography of salmonid populations.

We propose to develop, refine and integrate advanced methods in filtration, nucleic acid detection and risk analysis to formulate a comprehensive pathogen monitoring protocol. Key features of this approach include:

- Use of advanced methods to concentrate dilute samples of pathogens found in the water column and to prepare nucleic acid extracts.

- Coupling of highly sensitive polymerase chain reaction (PCR) methods with oligonucleotide based microarrays to simultaneously detect multiple pathogens.
- Experimental design that incorporates information about PCR sensitivity, sample volume and assay inhibition to estimate overall assay sensitivity on a sample-by-sample basis.
- Incorporating results into a risk-based framework that permit evaluation of both the expected health risks and adequacy of assay sensitivity for every sample that is collected.

Furthermore, we will demonstrate the applicability of this monitoring methodology for select waters in Washington State and we will incorporate the theory and practical details of this work into a new college course that addresses the ecological aspects of fish management in the Pacific Northwest. Portions of this approach have already been developed. The proposed project will unify theory and practice into a powerful tool for monitoring prevalence and incidence of fish pathogens in the waters of Washington State.