

# TECHNICAL ASSISTANCE WITH THE LIFE CYCLE MODEL

9303701

## SHORT DESCRIPTION:

Evaluate biological impacts on ESA-listed salmonids due to changes in hydro operations, climate, and land use through empirically-based, peer-reviewed life cycle modeling.

## SPONSOR/CONTRACTOR: PER Ltd.

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## SUB-CONTRACTORS:

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## GOALS

### GENERAL:

Adaptive management (research or M&E)

### ANADROMOUS FISH:

Research, M&E

### NPPC PROGRAM MEASURE:

3.2F.2

### RELATION TO MEASURE:

Work under the project consists of data collection, analysis, and publication relating to population viability of Snake and mid-Columbia anadromous salmon stocks already listed under ESA or that are candidates for listing. Analyses under this project were designed to respond to several of the major objectives of the 1994 program, specifically Section 3.2 ; Section 4.3 ; Section 5.0A; and Section 7.1E.

### BIOLOGICAL OPINION ID:

NMFS BO RPA 13; RPA A17 ;Program Support

### TARGET STOCK

Steelhead

Fall Chinook

Spring-Summer Chinook

### LIFE STAGE

All

All

All

### MGMT CODE (see below)

(N,P)

(N,L)

(N,P, L)

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## BACKGROUND

**Project is an office site only**

### HISTORY:

ESA listing of Snake River stocks required model development and analysis to estimate adult returns under various hydrosystem operations and habitat conditions. In cooperation with PATH participants, we have identified hypotheses to be tested with existing data, and the need for design of monitoring programs for recovery planning. These hypotheses are being tested and life cycle models modified as needed.

### BIOLOGICAL RESULTS ACHIEVED:

Research/modeling project - no specific biological results. However, hypotheses that have been tested should assist regional decision makers in a more effective application of limited resources to ESA mitigation activities, including hydrosystem, hatchery, and habitat projects. Peer review of project work over the past year (by outside reviewers and PATH participants) has been very positive.

## **PROJECT REPORTS AND PAPERS:**

1995-96 analyses included in ESA records.

1996-97 reports include:

Marmorek, D.R. (ed.), J.J. Anderson, L. Bashan, D. Bouillon, T. Cooney, R. Deriso, P. Dygert, L. Garrett, A. Giorgi, O. P. Langness, D. Lee, C. McConnaha, I. Parnell, C. M. Paulsen, C. Peters, C. E. Petrosky, C. Pinney, H. A. Schaller, C. Toole, E. Weber, P. Wilson, and R. W. Zabel. 1996. Plan for Analyzing and Testing Hypotheses (PATH): Final report on retrospective analyses for fiscal year 1996. Compiled and edited by ESSA Technologies Ltd., Vancouver, B.C. 620 pp.

Chapters funded under this project include:

2. Level 1 Hypotheses (principal investigator)
4. Level 2 Hypotheses (principal investigator)
10. Trends in Upstream Spawning and Rearing Habitat (provided extensive comments and are conducting additional analysis)
11. PATH Hatchery Impacts (provided extensive comments and assistance on methods and data)

## **ADAPTIVE MANAGEMENT IMPLICATIONS:**

Results are expected to assist NMFS in deciding on alternative actions in recovery planning and in design of monitoring activities to assess the effects of management actions. Analyses conducted under this project have examined both the differences in stock indicators across space and time (upriver-downriver stocks over the past 30+ years), and have integrated stock responses to climatic indicators and hydrosystem development and operation. They show that different stock groupings (mid-Columbia, Snake spring, Snake summer, and lower-river spring chinook) have substantially different trends in abundance and survival. They also indicate that different stock groups are affected differently by both terrestrial and ocean climate, and by hydro development and operation.

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## **PURPOSE AND METHODS**

### **SPECIFIC MEASUREABLE OBJECTIVES:**

Collect data and perform analyses to help distinguish among hypotheses regarding past effects of hydro operations and habitat conditions. Develop methods to monitor effects of future hydro, habitat, hatchery, and harvest management actions, and to distinguish those effects from naturally occurring variations in climate and other non-management factors.

### **CRITICAL UNCERTAINTIES:**

Uncertainties: The reopening of the NPPC F&W Program in FY97-98 could require significant time investment by project's principal investigator. Litigation among the agencies could reduce ongoing cooperation.

Risks: As a research project, it does not have any risks to other stocks.

### **BIOLOGICAL NEED:**

More accurate projections of the effects of Recovery Plan actions are needed by NMFS. The project results are intended to help provide these. In particular, future work under the project should provide more accurate methods to assess the past impact of land use, hydrosystem operations, and hatchery operations on ESA-listed or ESA-proposed stocks of anadromous fish. These methods in turn will be used in both assessing future effects of management actions and in helping to design adaptive management research and monitoring activities to see if management actions are working as planned.

### **HYPOTHESIS TO BE TESTED:**

Two specific null hypotheses are that all Columbia Basin stocks have the same pattern of abundance, recruitment, and survival, and that stocks in all habitat types have had similar patterns in survival. See October 1995 PATH report for details.

### **ALTERNATIVE APPROACHES:**

Research Project - not applicable

### **JUSTIFICATION FOR PLANNING:**

Although this is a research project, it should help provide tools for assessing the likely improvements in survival that might be expected from a variety of on-the ground projects. In particular, as land use and other habitat data are incorporated into the statistically-based life cycle models developed under the project, the models could be used to assess the range of improvements

that could be expected from habitat improvement and hatchery/supplementation programs. In addition, work under the project can be used to increase the learning and biological benefits associated with such programs.

**METHODS:**

1. Comparisons of escapement and recruitment in stocks in good/bad spawning and rearing habitat.
2. Comparisons of upstream and downstream stocks.
3. Comparisons of stocks with different ocean migration patterns.
4. Comparisons of stock performance under different climatic conditions.
5. Assessment of future possible management actions in light of results from 1-4, above.
6. Assessment of monitoring activity design in light of observed (past) variability in escapement and recruitment.
7. No field research anticipated as part of this project.

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**PLANNED ACTIVITIES**

**SCHEDULE:**

**PROJECT COMPLETION DATE:**

2000

**CONSTRAINTS OR FACTORS THAT MAY CAUSE SCHEDULE OR BUDGET CHANGES:**

ESA-related litigation may cause substantial delays if regional analysts are required to contribute their expertise.

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**OUTCOMES, MONITORING AND EVALUATION**

**SUMMARY OF EXPECTED OUTCOMES**

**Expected performance of target population or quality change in land area affected:**

(Following fields not applicable for Research projects)

**Information products:**

Improved information and analytical methods for decisions regarding hydrosystem operations, habitat enhancement, and hatchery operations as these may affect ESA-listed salmonids.

Database of environmental stressors for each of 15-20 spring chinook stocks, 3-4 fall chinook stocks, and an as yet unknown number of steelhead stocks.

Publications in peer-reviewed journals.

**Coordination outcomes:**

Model updating, calibration and analyses for inclusion in NMFS/BPA consultation for '95-'98 operations.

**MONITORING APPROACH**

Research Project - not applicable

**Provisions to monitor population status or habitat quality:**

Research Project - not applicable

**Data analysis and evaluation:**

Via peer review by PATH participants and other regional analysts, and via publications in peer-reviewed journals.

**Information feed back to management decisions:**

Information from this project will be incorporated by ESSA (project 9600600) into reports to the ISAB, Implementation Team, and other regional decision-making organizations

**Critical uncertainties affecting project's outcomes:**

ESA-related litigation may delay the project, as noted in earlier sections.

**EVALUATION**

As a research project, assessment of overall performance will depend in large part on peer review. In addition, the project should produce additional information concerning the relationship between past anadromous fish performance and a wide variety of stressors (4 H's + climate and other environmental effects). To the extent that the research can clarify these relationships, it will have been successful.

**Incorporating new information regarding uncertainties:**

Frequent meetings and workshops with PATH participants and other regional researchers, as well as external peer review, are used to update the project's priorities and direction.

**Increasing public awareness of F&W activities:**

Not applicable.

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**RELATIONSHIPS**

**RELATED BPA PROJECT**

9203200 Life-cycle Model Development and Application, and Analysis of Fish-habitat Relationships

9600600

9600800 Path (plan for Analyzing and Testing Hypotheses) - Participation By State and Tribal Agencies

8910800 CRiSP Modelling

9601700 Technical Support for Path - Chapman Consulting, Inc.(now Bioanalysts, Inc.)

**RELATIONSHIP**

data exchange and review

Coordination,, facilitation, data exchange, analysis, and review

data collection, exchange, analysis, and review

data exchange, analysis, and review

data exchange, analysis, and review

**OPPORTUNITIES FOR COOPERATION:**

The project involves cooperation among scientists from NMFS, BPA, NPPC, ODFW, IDFG, WDFW, CRITFC, USFS, CBFWA, and the USACE, as well as the University of Washington and other private contractors.

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**COSTS AND FTE**

1997 Planned: \$60,000

**FUTURE FUNDING NEEDS:**

**PAST OBLIGATIONS (incl. 1997 if done):**

<u>FY</u>	<u>\$ NEED</u>	<u>% PLAN</u>	<u>% IMPLEMENT</u>	<u>% O AND M</u>
1998	\$150,000	100%	0%	0%
1999	\$175,000	100%	0%	0%
2000	\$200,000	100%	0%	0%
2001	\$0	100%	0%	0%
2002	\$0	100%	0%	0%

<u>FY</u>	<u>OBLIGATED</u>
1994	\$43,500
1995	\$76,500
1996	\$215,105
1997	\$174,820
TOTAL:	\$509,925

Note: Data are past obligations, or amounts committed by year, not amounts billed. Does not include data for related projects.

**OTHER NON-FINANCIAL SUPPORTERS:**

N/A

**LONGER TERM COSTS:** N/A

**1997 OVERHEAD PERCENT:** 0

**HOW DOES PERCENTAGE APPLY TO DIRECT COSTS:**

N/A

**SUBCONTRACTOR FTE:** .5

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