



**Short description.**

BioAnalysts, Inc. staff provide technical support for modelling analyses in PATH. We assemble and review the integrity of data sets, synthesize information regarding fish passage, work with modellers and review their analyses and output..

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**Section 2. Key words**

Mark	Programmatic Categories	Mark	Activities	Mark	Project Types
X	Anadromous fish		Construction		Watershed
	Resident fish		O & M		Biodiversity/genetics
	Wildlife		Production		Population dynamics
	Oceans/estuaries		Research		Ecosystems
	Climate	X	Monitoring/eval.	X	Flow/survival
	Other		Resource mgmt		Fish disease
			Planning/admin.		Supplementation
			Enforcement		Wildlife habitat en-
			Acquisitions		hancement/restoration

**Other keywords.**

Fish passage, smolt performance, survival, migratory behavior

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**Section 3. Relationships to other Bonneville projects**

Project #	Project title/description	Nature of relationship

**Section 4. Objectives, tasks and schedules****Objectives and tasks**

Obj 1,2,3	Objective	Task a,b,c	Task
1	Compile and analyze information to assess the level of support for alternative hypotheses in PATH	a	Identify, assemble and analyze data that are suitable for use in this application, particularly information pertaining to biological effects of hydroelectric development and operation on

			anadromous fish.
2	Identify alternative hypotheses and/or model improvements based on weight of evidence	a	Analyze and synthesize information and estimates related to fish passage through the Columbia River hydroelectric complex
		b	Emphasize updating perspectives by using the most recent and robust information at our disposal
3	Improve existing or develop new models for use in regional fisheries management forums.	a	Identify opportunities to incorporate updated and improved information into passage models
4	Develop adaptive management experiments to resolve critical assumptions and hypotheses	a	Participate in the design of research and monitoring strategies/experiments that can either verify or refute critical model assumptions, or resolve competing hypotheses that surfaced during PATH analyses

**Objective schedules and costs**

Objective #	Start Date mm/yyyy	End Date mm/yyyy	Cost %
1	10/1998	9/1999	25.00%
2	10/1998	9/1999	25.00%
3	10/1998	9/1999	25.00%
4	10/1998	9/1999	25.00%
			TOTAL 100.00%

**Schedule constraints.**

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**Completion date.**

Uncertain: regional fisheries managers will determine the need for future PATH activities.

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**Section 5. Budget**

***FY99 budget by line item***

Item	Note	FY99
Personnel		\$59,200
Fringe benefits		

Supplies, materials, non-expendable property		
Operations & maintenance	Includes all overhead @ 57% + FICA +B&O tax	\$43,687
Capital acquisitions or improvements (e.g. land, buildings, major equip.)		
PIT tags	# of tags:	
Travel		\$6,000
Indirect costs		
Subcontracts		
Other		
<b>TOTAL</b>		<b>\$108,887</b>

***Outyear costs***

<b>Outyear costs</b>	<b>FY2000</b>	<b>FY01</b>	<b>FY02</b>	<b>FY03</b>
Total budget	\$110,000	\$110,000	\$110,000	\$110,000
O&M as % of total	40.00%	40.00%	40.00%	40.00%

**Section 6. Abstract**

**Section 7. Project description**

**a. Technical and/or scientific background.**

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In recent years, the Bonneville Power Administration (BPA), the Northwest Power Planning Council (NWPPC), the National Marine Fisheries Service (NMFS), the U.S. Army Corps of Engineers (USACE), and various state and tribal resource agencies have been working together, as the Analytical Coordination Workgroup (ANCOOR), to compare and enhance the three existing modeling systems used to evaluate management options intended to lead to recovery of depleted Columbia River Basin salmon stocks. The 1995 Biological Opinion (page 124, Recommendation 17) states that "The BPA shall participate with NMFS in activities to coordinate the regional passage and life cycle models and to test the hypotheses underlying those models." NMFS notes that "the emphasis should shift to analyses that test the different assumptions underlying the models, rather than refining our understanding of how the models are different." NMFS concurred with the recommendation of the Scientific Review Panel (SRP) to conduct an analysis of alternative hypotheses. To accomplish these requirements of the Biological

Opinion, the region assembled a group of analysts treat these issue. Staff at BioAnalysts, Inc. (most notably Albert Giorgi) were among those identified and selected for participation in PATH (Plan for Analyzing and Testing Hypotheses. BioAnalysts Inc. has been involved since FY 1996. While PATH was designed to respond to the NMFS 1995 Biological Opinion, it also meets specific needs of the NWPPC Fish and Wildlife Program measures 3.2, 4.2A, 5.0A.<sup>1</sup>

Three different modeling systems have evolved to address recovery planning and rebuilding assessment for Columbia River salmon stocks. State and tribal fishery managers, federal fishery managers, federal hydropower operators and NWPPC reached consensus and implemented in 1992 a coordinated, peer reviewed effort to address the analytical needs of the region with respect to Columbia River salmon recovery and rebuilding. Toward accomplishment of this goal, a regional Analytical Coordination Work Group (ANCOOR) was established, including members of the following agencies: the Columbia Basin Fish and Wildlife Foundation (CBFWF), ODFW, the Washington Department of Fish and Wildlife (WDFW), the Idaho Department of Fish & Game (IDFG), the Columbia River Inter-Tribal Fish Commission (CRITFC), the NMFS, the BPA, the USACE and the NWPPC.

Reviews of the models and some of the analytical approaches were prepared by a scientific peer review panel (SRP) of academic experts funded by BPA during FY 1994 and 1995. One report from that effort recommended that model review and comparison should be focused on hypothesis formulation and testing to resolve crucial differences in assumptions and data interpretation. Though initiated by written directives (i.e. the Scientific Review Panel, NMFS and NWPPC), the direction of PATH responds to periodic meetings with senior management and policy personnel in NMFS, BPA, NWPPC, WDF, ODFW, IDFG, US Fish and Wildlife Service (USFWS) and CRITFC.

The region may have a continuing need to consider analytical results in decision making in a number of areas, including: the development of specific recovery plans for listed salmon and steelhead stocks; the Endangered Species Act mandated Section 7 consultation process; and, the development of rebuilding programs under the NWPPC Fish and Wildlife Program (see sec. 2.2-4 Strategy for Salmon Vol. II). The region would benefit significantly in these areas from a coordinated and consistent approach to technical analyses supporting salmon rebuilding and recovery efforts. In recognition of the need, the NWPPC (Ibid., Sec. 7.3 ) has called for "...a process to provide for continuing review, coordination and development of analytical tools to assist decision making, facilitate program evaluation and identify critical uncertainties." The PATH

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<sup>1</sup> Section 3.2 (adaptive management; integration of monitoring, evaluation and research into a unified framework to assist decision makers); Section 4.2A (system-wide analysis of major uncertainties); and Section 5.0A (specific hypotheses).

process is intended to ensure that the region has the benefit of the use of best available scientific methods and information in the analyses supporting recovery/rebuilding efforts.

provide answers in paragraph form)

**b. Proposal objectives.**

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BioAnalysts, Inc. staff contribute most directly to four of nine PATH objectives (as identified by the facilitator ESSA Technologies):

1. Compile and analyze information to assess the level of support for alternative hypotheses identified in PATH.
2. Identify alternative hypotheses and /or model improvements based on weight of evidentiary material acquired within the basin.
3. Improve existing, or develop new models for use in regional fisheries management decision-making processes.
4. Develop adaptive management experiments to resolve critical assumptions and hypotheses that have surfaced to date in PATH analyses.

Work products are to include letter reports and data tables submitted to the broader PATH membership, including modeling teams. These materials analyze and synthesize information pertaining to smolt and adult salmon survival associated with passage past dams and through reservoirs in the Snake and Columbia rivers. These materials include authorship of chapters for inclusion in PATH analysis reports.

**c. Rationale and significance to Regional Programs.**

PATH was established by regional decision-makers to clarify and resolve uncertainties regarding the effectiveness of a variety of management alternatives directed at recovering salmon stocks listed under ESA. BioAnalysts, Inc. staff provide substantial experience to the PATH project. The primary participant Dr. Albert Giorgi has conducted research on salmon passage issues in the Basin since 1982. Prior to 1990 he was a senior research scientist with the National Marine Fisheries Service.

**d. Project history**

Project # 96ap91935; Technical analysis and support to PATH

Thus far, Dr. Giorgi has been the primary BioAnalysts, Inc. staff member involved in the PATH. He has been active in the process since 1996. In 1996 and 1997, as a member of the spring chinook Hydro Group, he has authored or co-authored several documents including: “Hydro decision pathway and review of existing information” (Chapter 6 in

Marmorek et al. 1996); two technical appendices in that same manuscript; two draft manuscripts which are currently under internal review by the Hydro Group, “ Issues regarding hydroelectric passage and Snake River Fall Chinook” and “ Review of dam passage routing and survival, direct transport survival, and squawfish removal effectiveness estimates for yearling chinook salmon in the Snake/Columbia System”. Activities for 1998 include facilitating the passage modeling hydro group and conducting assorted tasks as identified later in this form.

From 2/19/1996 through 10/31/97, \$158,021 was budgeted of which 154,315 was spent as of 12/9/97. The 1998 budget of approximately \$109,000 is pending.

**e. Methods.**

Many of the tasks identified herein began in 1998 and are envisioned to extend into 1999, others will likely be initiated in FY1999 include:

- Task 1: Conduct reconnaissance of fall chinook and steelhead data sets and estimates for potential use in PATH analyses and model development. Identify and compile data sets required for analyses as requested by PATH managers. Assess the strengths and limitations of data sets and estimates, and provide recommendations as to their reliability, quality, and suitability for specific applications. Data sets may include: tagging information (CWT, PIT, freeze brand, radio telemetry or balloon tags), adult abundance estimates (e.g. dam counts, redd/spawner estimates), and estimates of juvenile abundance (e.g. parr in tributaries, smolts at dams).
- Task 2: Act as facilitator and coordinator for the Fall Chinook Hydro/Early Life History Work Group. Responsibilities include coordinating activities of modeling groups, synthesizing output from model analyses, disseminating information to all work group members, scheduling work sessions, and coordinating the assembly of work products into documents for PATH.
- Task 3: Participate in PATH-related technical meetings (work group sessions) and workshops as directed by PATH managers or BPA staff. Forums may cover topic matters involving mainstem fish passage issues and ecological processes affecting salmon stocks within the Snake/Columbia Basin.
- Task 4: Conduct assignments involving data analyses, or writing research documents as instructed by the PATH group. Most activity in this regard has been and will continue to be within the Hydro Group dealing with fall chinook and steelhead. Products will be incorporated into formal publications released by PATH.

- Task 5: Review and critique technical materials produced by other members participating in the PATH process. Materials to be reviewed include; models and their output, hypotheses and assumptions within those models, and analyses that may support or refute certain hypotheses. Products and analyses from the Harvest, Habitat, and Hatchery groups, as well as the Hydro group will be included in this activity.
- Task 6: Assess the relevance of empirical evidence in evaluating management actions being considered as recovery strategies. In particular, identify recent empirical evidence that is not necessarily incorporated within existing models, but is important in evaluating the efficacy of management alternatives being considered as strategies for salmon recovery. Also, participate in the design of adaptive management experiments to resolve key assumptions and competing hypotheses.

**f. Facilities and equipment.**

This is an analytical exercise only requiring existing office space and equipment.

**g. References.**

## **Section 8. Relationships to other projects**

The relationship of PATH to other regional processes, projects and decisions is described in detail in the ESSA Technology proposal. Briefly, PATH was established to provide input to NMFS for the 1999 decision regarding the implementation of smolt passage strategies in the Columbia-Snake Basin.

## **Section 9. Key personnel**

**Personnel:** Dr. Giorgi (Fisheries Scientist) is the primary BioAnalysts, Inc. staff member involved in the PATH. Dr. Albert Giorgi will participate in all tasks specified herein (520 h) Mr. John Stevenson (Fisheries Biologist) will be available to provide technical support in the form of data processing and management (for up to 320 h). Drs. Don Chapman and Tracy Hillman (Fisheries Scientists) will be available on a limited basis (approximately 40 h each) to review and comment on work products and draft documents produced by PATH.

## **ALBERT E. GIORGI, Ph.D.**

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**BioAnalysts, Inc.**

**FISHERIES SCIENTIST**

### **EDUCATION**

Ph.D., 1981, Fisheries, University of Washington  
M.S., 1975, Biology, Humboldt State University  
B.S., 1972, Biology, Humboldt State University

### **EXPERTISE:**

Salmon Migratory Behavior and Survival, Fish Passage Technology, Hydropower Impacts on Anadromous Fish, Endangered Species, Salmon and Trout, PIT Tags, Population Modeling, Radio Telemetry, Salmon Ecology

### **PROFESSIONAL EXPERIENCE:**

**1990 - Present: Fisheries Scientist, BioAnalysts, Inc./Don Chapman Consultants, Inc., Boise ID.**

#### **Chelan County Public Utility District:**

- ▶ PI- Evaluate smolt passage behavior at Rocky Reach and Rock Island Dam 1996-1997.
- ▶ PI- Evaluate biological effects of increasing the reservoir elevation at Rocky Reach Dam. 1990-1991.
- ▶ Coauthor- Status reviews for salmon and steelhead stocks in the Mid-Columbia Basin.

#### **U. S. Army Corps of Engineers:**

- ▶ Technical Analyst/PI- Assess the effects of reservoir drawdown on smolt passage and survival, Snake River.
- ▶ Technical Analyst- Review and evaluate surface flow bypass alternatives at Snake and Columbia River dams.
- ▶ Technical analyst/PI- Review and synthesize biological information regarding smolt passage at dams on the lower Columbia River.
- ▶ Technical analyst- Evaluate surface collection options and

forebay occlusion devices at Bonneville Dam Second Powerhouse.

**Bonneville Power Administration:**

- ▶ PI- Evaluate the biological effectiveness of flow augmentation in the Snake River.
- ▶ Technical analyst- Design protocols for estimating smolt survival through the Snake and Columbia rivers.
- ▶ Technical analyst- evaluate mitigation alternatives for improving survival of ESA salmon stocks migrating through the Columbia River hydroelectric system.
- ▶ Technical analyst- System Operation Review.
- ▶ Technical analyst- Plan for Analyzing and Testing Hypotheses (PATH).

**Douglas County PUD:**

- ▶ Technical analyst- Describe the migratory characteristics of sockeye salmon.

**Montana Power Company:**

- ▶ Technical analyst- Evaluate the feasibility of providing fish passage at Milltown Dam, Missoula, MT.

**Grant County PUD:**

- ▶ PI- Evaluate the biological effects of Wanapum Dam drawdown.

**Pacific Northwest Utility Conference Commission:**

- ▶ Technical Analyst- Identify hydroelectric impacts on Snake River salmon stocks listed under ESA.
- ▶ Technical analyst- Evaluate effectiveness of regional water management strategies for recovery of ESA-listed salmon stocks.
- ▶ Author - Status review of Kootenai River White Sturgeon.

**1982 - 1990: Fisheries Research Biologist/Sub-Task Manager, National Marine Fisheries Service, Northwest Fisheries Center, Coastal Zone and Estuarine Studies Division, Seattle, WA**

- ▶ Smolt behavior and migration, Smolt passage, Fish

- guidance
- ▶ Smolt survival estimation, Smolt physiology
- ▶ Hydropower development; impacts on fisheries resources
- ▶ Radio telemetry, PIT tag applications

**1978 - 1981: Fisheries Research Biologist, National Marine Fisheries Service, Northwest and Alaska Fisheries Center, Resource Ecology and Fisheries Management Division, Seattle, WA.**

- ▶ Lingcod life history, Marine species stock identification
- ▶ Resource assessment demersal marine fish

**1972-1974: Research Assistant, Humboldt State University, Sea Grant Program, Arcata, CA.**

- ▶ Reproductive biology of red abalone

**PROFESSIONAL AFFILIATIONS**

American Fisheries Society  
Pacific Fishery Biologists

**FACULTY APPOINTMENT:**

1989 - Present, Affiliated Faculty, University of Washington, Seattle, WA.

**PUBLICATIONS and REPORTS:**

Dr. Giorgi has published more than 45 technical reports and authored or edited more than 12 articles in peer-reviewed publications.

## **Section 10. Information/technology transfer**

Information is transferred through several means. Letter reports and Chapter contributions to PATH are distributed via internet and are increasingly being posted on an informational WEB page. Chapter contributions are submitted to ESSA and they incorporate them into the more inclusive PATH reports. We follow guidelines established by ESSA Technologies for the distribution of work products.