

**Bonneville Power Administration
Fish and Wildlife Program FY99 Proposal**

Section 1. General administrative information

**Development /Refinement Of Natural Production
Objectives & Strategies**

Bonneville project number, if an ongoing project 9706200

Business name of agency, institution or organization requesting funding
Yakama Indian Nation Fisheries Resources Management

Business acronym (if appropriate) YIN

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Subcontractors.

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NPPC Program Measure Number(s) which this project addresses.

7.4K.1

NMFS Biological Opinion Number(s) which this project addresses.

Biological Opinion for 1995-1998, Hatchery Operations in the Columbia River Basin,
(NMFS 1995a)

Biological Assessment of 1997-2001 Hatchery Operations of the Proposed Cle Elum
Hatchery, December 1995 (BPA 1995)

NMFS concurrence letter dated 04/01/96

Other planning document references.

Wy Kan Ush Me Wa Kish Wit, Volume II
Yakima Sub-basin Plan
Appendix B, Columbia River Fish Management Plan,
Consent Decree from US v Oregon

Subbasin.

Yakima

Short description.

Uses a diagnosis of factors affecting natural production and species interactions to develop/refine enhancement objectives and strategies for salmon and steelhead stocks in the Yakima and Klickitat Subbasins.

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	*	Monitoring/eval.	*	Flow/survival
	Other	*	Resource mgmt	*	Fish disease
		X	Planning/admin.	X	Supplementation
			Enforcement		Wildlife habitat enhancement/restoration
			Acquisitions		

Other keywords.

life history, modeling, predation, hatchery-wild interactions, ecological interactions

Section 3. Relationships to other Bonneville projects

Project #	Project title/description	Nature of relationship
8812001	Yakima/Klickitat Fisheries Project Management	Core Management/Admin. support for all YIN's YKFP Tasks.
8811500	Yakima Hatchery Construction	Final design/construction of needed acclimation facilities/wells for YFP.
9701300	Yakima Cle Elum Hatchery O&M	O&M costs for Cle Elum Suppl. and Research Facilities. Core facility
9506300	Yakima/klickitat M&E Program	Covers all essential M&E needs for species targeted by the YKFP.
8811500	Fisheries Technician Field Activities	Provides essential technical support

		to fulfill diverse needs of the YKFP (e.g., M&E support, spawner surveys, juvenile facility operations, marking, etc.)
8812005	Fish Passage Video Monitoring	Monitors, at Prosser and Roza Dams, the number of adult salmonids returning to the Yakima Subbasin. A key element of YFP M&E.
9603301	Yakima River Fall Chinook Suppl -- O&M	Essential for YKFP's all-stock initiative: experimentation needed for design of future fall chinook supplementation program.
9603302	Yakima River Coho Restoration -- O&M	Essential for YKFP's all-stock initiative: experimentation needed to test feasibility of coho restoration in the Yakima.
9506404	Policy/Technical Involvement/Planning -- YKFP	Supports the required co-manager process for the YKFP.
9506406	Monitoring of Supplementation Response Variables for the YKFP	Essential for adequate M&E planning and technical participation as co-manager of the YKFP.
9506402	Upper Yakima Species Interaction Studies	Vital M&E function relative to impacts of YKFP on existing fish community in Yakima Subbasin, and relative to impacts of existing fish community on YKFP.
9105700	Yakima Phase 2 Screen Fabrication	Essential for preventing entrainment of adult and juvenile salmonids in irrigation diversions.
9200900	Yakima Phase 2 Screen O&M	Essential for maintaining effectiveness of screens that prevent entrainment and loss of adult and juvenile salmonids in irrigation diversions.
9107500	Yakima Phase 2 Screen Construction	Essential for preventing entrainment of adult and juvenile salmonids in irrigation diversions.
9503300	O&M of Yakima Fish Protection, Mitigation and Enhancement Facilities	Essential for maintaining effectiveness of Yakima Subbasin fish protection structures.
9704900	Teaway Instream Flow Restoration	Tributary enhancement critical to success of YKFP.
9603501	Satus Watershed Restoration	Habitat enhancement project for critical tributary of Yakima River; a prerequisite for effective

		supplementation.
9506800	Klickitat Habitat Preliminary Design Project YIN	Provides habitat/utilization data critical to the design of a future Klickitat supplementation project.
5512600	Upper Klickitat Meadows Riparian Restoration YIN	Contributes to the improvement of prime habitat vital to the success of a future Klickitat supplementation project.
5512700	Klickitat Basin Culvert Rehabilitation YIN	Provides for passage within tributaries; essential to the success of a future Klickitat supplementation project.
5512800	Lower Klickitat Habitat Enhancement Project YIN	Improves reproductive success of lower Klickitat species; essential to the success of a future Klickitat supplementation project.
0	Yakima River Basin Water Enhancement Project (YRBWEP): Congressional Act.	Irrigation water conserved by YRBWEP may be allocated in part to benefit fish stocks analyzed by this planning/modeling project.

Section 4. Objectives, tasks and schedules

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Develop initial natural production objectives and associated enhancement strategies for species/stocks heretofore untargeted by the YKFP	a	Summarize existing goals based on societal values and such biological analyses as exist
		b	Build baseline "survival landscapes". A survival landscape is a matrix in which rows represent place (rivermile) and columns time (and life stage). Each reach X month cell in the matrix is assigned a survival rate based on key environmental attributes.
		c	Groups of local biologists rate cells on the basis of a summary report of seasonal habitat attributes

			by reach and a knowledge of optimal attributes for the species/lifestage. Ratings include expected survival, % key habitat & food availability.
		d	The survival landscape is plotted in 3 dimensions (X=reach, Y=month, Z=survival) to highlight favorable and unfavorable trajectories (life history types) through the landscape).
		e	Based on typical lifestage durations and travel speeds, the most likely trajectories through the landscape are determined. Cumulative productivity and carrying capacity along each representative trajectory is then computed.
		f	Plots of cumulative productivity (smolts/spawner) vs carrying capacity highlight viable & nonviable trajectories, and "reach usage indices" (mean time a reach is "used" by all trajectories weighted by trajectory productivity) identify important reaches.
		g	Based on productivity, reach usage & spawning habitat quality, "population segments" (major spawning areas) are identified. Weighted productivity and capacity is then estimated for the expected trajectories for each population segment.
		h	The preceding analysis is then "calibrated" by adjusting sex ratio, age distribution & fecundity when known distributions of spawners and/or rearing juveniles differ from predictions based on estimated population segment productivity and carrying capacity.
		i	The initial goals are now

			reformulated in terms of "performance parameters" -- segment-specific productivities, carrying capacities and life history diversity (# of viable trajectories).
		j	A "diagnosis" is now made: viz., one or more sets of segment-specific changes in performance parameters necessary to achieve initial goals. These changes in parameters represent general enhancement strategies required to achieve initial goals
2	Develop specific, alternative enhancement actions after reviewing initial objectives and strategies at policy and technical levels.	a	Determine if political or economic considerations compel consideration of non-diagnosis-based strategies, or if initial goals are unrealistic. Reformulate any new objectives/strategies in terms of performance parameters.
		b	Develop a number of alternative sets of specific actions that would be expected to realise performance goals associated with all strategies.
		c	Specific actions include all effective combinations of supplementation, habitat enhancement and changes in land and water use. Supplemented reaches are analyzed as distinct habitat segments with artificially enhanced productivity.
3	Determine optimal enhancement strategy and action via a trade-off analysis	a	Compare the effects of alternative actions on initial/revised goals both for target and nontarget species.
		b	Compare alternative actions in terms of feasibility and cost.
		c	Choose action with best combination of efficacy, feasibility and cost.

Objective schedules and costs

Objective #	Start Date mm/yyyy	End Date mm/yyyy	Cost %
1	1/1999	12/1999	.68
2	1/1999	12/1999	.22
3	1/1999	12/1999	.1
			TOTAL 100.00%

Schedule constraints.

It will basically take one man-year per species to complete the modeling. Because the plan is to devote two biologists on a half-time basis to do this task, a policy-level decision to model more than one species at a time would delay completion a year.

Completion date.

This project is expected to occur at increasingly infrequent intervals indefinitely.

Section 5. Budget

FY99 budget by line item

Item	Note	FY99
Personnel		\$39,295
Fringe benefits		\$7,277
Supplies, materials, non-expendable property		\$5,951
Operations & maintenance		
Capital acquisitions or improvements (e.g. land, buildings, major equip.)		
PIT tags	# of tags:	
Travel		\$1,728
Indirect costs		\$12,749
Subcontracts		
Other		
TOTAL		\$67,000

Outyear costs

Outyear costs	FY2000	FY01	FY02	FY03
Total budget	\$67,000	\$67,000	\$67,000	\$67,000
O&M as % of total	0.00%	0.00%	0.00%	0.00%

Section 6. Abstract

The overall project goal is to develop the most rational possible initial enhancement strategy for species/stocks not yet targeted by the YKFP. This rationality derives from a rigorous integration of known seasonal habitat characteristics in environmentally distinct portions of the basin, known lifestage-specific habitat requirements for a given species, and known lifestage-specific movement patterns. The integration takes the form of a reach by season survival landscape, which represents all possible survival probabilities for fish during the egg-to-smolt portion of their life cycle. Well-established principles of population dynamics are used to estimate productivity and carrying capacity for each distinct egg-to-smolt trajectory through the landscape, and for any combination of trajectories (Mobrand and Lestelle, 1997). This kind of “landscape ecology” has recently been strongly recommended by Regional biologists (NRC, 1996; ISG, 1996). This analysis requires the use of a computer program, the Ecosystem Diagnosis and Treatment (EDT) model (Lestelle et al., 1996) and, because of the time required to estimate season- and lifestage-specific survival probabilities from known habitat attributes for every reach in the basin, requires about one man-year per species.

Section 7. Project description

a. Technical and/or scientific background.

The conceptual framework underlying this project landscape ecology which, in turn, is based on the fact that anadromous salmonids are continually moving, seeking different kinds of habitat at different lifestages and during different seasons. Thus, one should conceive a yearclass of fish not as a stationary group of individuals distributed more or less homogeneously throughout the basin from egg to smolt, but as a multitude paths through time and space traced out by individuals spawned in different locations and finding seasonally suitable habitat in different places. The basin thus may be conceived as a space-time matrix in which the cells provide more or less adequate habitat for different lifestages at different times. Fish in the basin with different life histories are conceived as following different trajectories through the matrix. The number viable life histories decreases in proportion to the patchiness of habitat suitable for diverse lifestages and the inherent migratory ability of the species.

Starting from this landscape perspective, the analytical approach (Ecosystem Diagnosis and Treatment, or “EDT”) used in this project then assumes that lifestage-specific productivity (density-independent survival) is determined by habitat *quality* (the congruence between habitat attributes needed and habitat attributes available), and that lifestage-specific capacity (density-dependent survival) is determined primarily by habitat *quantity*. Therefore, in EDT analysis, a knowledge of seasonal habitat attributes throughout a basin, combined with a knowledge of species- and lifestage-specific habitat requirements, allows a biologist to assign a lifestage-specific productivity and capacity to every cell in matrix, thus forming a “survival landscape”. Given a survival landscape, it is possible to combine the properties of a disaggregated production function (Moussali

and Hilborn, 1986) with a knowledge of reach size to estimate a “cumulative productivity” along a complete life history trajectory, as well as a “cumulative carrying capacity”. The EDT computer model then uses these and other principles of population dynamics to estimate productivity and carrying capacity for the entire basin or any portion of it. A comparison of current and historical productivities and carrying capacities, and the environmental reasons for the differences between them, form the basis of the “diagnosis” of a depressed stock/basin system. On the basis of this diagnosis, one proposes specific alternative actions that each have the effect of increasing productivities and carrying capacities that have been diminished since historical times. These actions may take the form of direct habitat manipulations, intended to improve those attributes that currently limit production; or of the use of supplementation, which can to a degree increase productivity in spite of degraded habitat; or both.

The principles of EDT, if not yet the latest, computerized model, have been applied in the design of YKFP enhancement projects for a number of years. An earlier version of the EDT technique was applied to upper Yakima spring chinook, and led to the development of the current production objectives and enhancement strategies (Watson, 1993). Similar concepts were applied to coho (Watson, 1993a) and fall chinook (Hubble, 1997) and were used in the 1997 revision of the Project Status Reports for coho (Watson et al, 1998, *in preparation*) and fall chinook (Watson et al, 1998, *in preparation*).

b. Proposal objectives.

OBJECTIVES	HYPOTHESES	PRODUCT(S)
1) Develop initial natural production objectives and associated enhancement strategies for species/stocks not targeted by the YKFP prior to the development of objectives..	a)Biologists familiar with the Yakima River can accurately estimate season- and lifestage-specific survival rates for all environmentally distinct reaches in the Yakima given existing knowledge of habitat quality and quantity, and a description of optimal lifestage-specific habitat attributes. b)Lifestage-specific rules entered into the EDT model will accurately reflect the actual distribution of life histories emanating from all spawning areas. c)Supplemented reaches can be accurately incorporated into the	a)A series of objectives in terms of adult returns, spawning escapement, harvest opportunity and acceptable impacts to nontarget species. b) An initial strategy for enhancing a previously untargeted stock under the YKFP. c) A series of measurable performance characteristics that will indicate the success or failure of the enhancement strategy. The results of this objective and the other two objectives will be published under BPA cover.

	EDT model as “artificial stream reaches” with superior productivity.	
Develop specific, alternative enhancement actions after reviewing initial objectives and strategies at policy and technical levels.	The full suite of valid enhancement option must include societal considerations and may not necessarily be limited to diagnosis-based actions.	A complete set of enhancement strategies and actions for final analysis. The results of this objective and the other two objectives will be published under BPA cover.
Determine optimal enhancement strategy and action via a trade-off analysis	<p>a)The actual effects of enhancement actions can accurately be predicted before implementation.</p> <p>b)Cost and feasibility of specific enhancement actions can be accurately estimated.</p>	A final, justifiable set of enhancement strategies and enhancement actions. The results of this objective and the other two objectives will be published under BPA cover

c. Rationale and significance to Regional Programs.

This project proposes to take the existing concept of YKFP supplementation a step farther, and develop an enhancement program that is an optimal blend of *habitat enhancement* as well as supplementation. More specifically, “strategic” habitat actions will be proposed that enhance the effectiveness of supplementation in all areas targeted. The principles developed in the YKFP exercise should be extremely useful to Regional managers caught in the dilemma of not being able to wait for habitat work alone to take effect, and not wanting to put “all their eggs” in the supplementation basket.

d. Project history

The Yakima Klickitat Fisheries Project (“YKFP or Project”) was first approved by the Northwest Power Planning Council (“NPPC or Council”) in 1982. At that time, the Council envisioned the Project as a cluster of production facilities in both the Yakima and Klickitat River Basins designed to enhance the fishery for the Yakama Indian Nation (“YIN”) and other harvesters. The development of the Project’s master plan began in 1985. By that time, however, the Council had modified the purpose of the Project to include research activities testing the assumption that new supplementation methods could increase natural production while protecting the genetic resources common to the river basins. The Council also determined that the principles of adaptive management, which encourages an affirmative pro-active response to research discoveries, were to be utilized by the resource managers selected to manage the YKFP. These managers are the YIN and the Washington Department of Fish and Wildlife (“WDFW”).

As recommended and directed by the Council, the Project's master plan, which included a supplementation research program, was conceived and developed. On October 15, 1987, the Council approved the YKFP's master plan, which included the construction of the production and acclimation facilities in the Upper Yakima River Basin commonly referred to as the Upper Yakima Supplementation Complex ("UYSC or Complex"). Consistent with the NPPC's Columbia River Basin Fish and Wildlife Program ("Program") Measure 7.4K.1, the Project's Preliminary Design Report was completed in 1990. At that time, an Environmental Assessment (EA) was prepared for YKFP construction activities and facility operations throughout the Yakima and Klickitat River Basins.

In 1992, the Project began the process of preparing an Environmental Impact Statement ("EIS"). During the EIS's preparation period, the Council endorsed the managers proposal to "tier" the Project's production and research activities by bringing them on-line in gradual stages. The first phase (tier) targeted the supplementation of depressed populations of upper Yakima river spring chinook. This initial phase also included research designed to determine the feasibility of re-establishing a naturally spawning population and a significant fall fishery of coho salmon in the Yakima Basin. Future phases of the YKFP include the supplementation of fall chinook and steelhead, and a reintroduction of now extirpated stocks. Also envisioned for the Project's future is the introduction of supplementation to the Klickitat Basin, which could include the use of the Klickitat Hatchery, a Mitchell Act facility now operated by WDFW.

By design, the supplementation of summer steelhead and fall chinook populations in the Yakima basin was not detailed in the initial EIS. Research activities focused upon the Klickitat River fisheries also fell outside its scope. However, they remain essential components of the Project. At this time, fall chinook, steelhead and the Klickitat basin are the subjects of on-going research activities designed to determine whether the YKFP will support the introduction of additional anadromous fish stocks into its production and research programs.

The Project's EIS was completed in 1996, and the Record of Decision ("ROD") was signed by BPA's Administrator and Chief Executive Officer, Randall W. Hardy, on March 13, 1996. With the completion of the EIS and the signing of the ROD, construction of the YKFP's Cle Elum Supplementation and Research Facility ("Cle Elum Facility") began in May of 1996. The Cle Elum Facility was completed on August 1, 1997. The UYSC also includes three acclimation facilities to be constructed in the Upper Yakima basin. Thus far, the YIN, as the Project's Lead Agency and the UYSC's operator, has captured 240 adult spring chinook at the Roza adult collection facility. Egg taking and fertilization procedures were performed in September 1997. 450,000 eggs were fertilized and incubated at the facility. Funding for the continued operation and maintenance of the UYSC has been approved by the Council and included in Program Measure 7.4K.1.

Earlier YKFP project numbers included under the Council's Fish and Wildlife plan are as follows:

82-016 - YAKIMA RV. SPRING CHINOOK ENHANCEMENT STUDY - YIN
85-062 - PASSANGE IMPROVEMENT EVALUATION - BPNL
86-045 -YAKIMA HATCHERY PRE-DESIGN - CLE ELUM PROJECT - NMFS
86-101 -FILMING FOR PROJECT RECORD - MOVING PICTURES INC.
87-135 -YAKIMA HATCHERY - MASTER PLAN DEVEL - YIN
87-136 -YAKIMA HATCHERY - WAPATO CANAL PEN REARING - YIN
87-414 -YAKIMA ANADROMOUS FISH A/V - JOHN CAMPBELL
88-120 -YAKIMA NAT. PROD. & ENHANCEMENT PROG. - YIN
88-120-01 -YAKIMA/KLICKITAT FISHERIES PROJECT MGMT. - YIN
88-120-02 -YAKIMA ENGINEER ASSISTANCE - YIN
88-120-03 -YAKIMA SPECIES INTERACTION - YIN
88-120-04 -HATCHERY TRAINING AND EDUCATION - YIN
88-120-05 -FISH PASSAGE VIDEO MONITORING - YIN
88-120-06 -YAKIMA FISHERIES TECHNICIANS - YIN
88-120-07 -YAKIMA SPRING CHINOOK NATURAL PROD. - YIN
88-120-08 -FISHERIES TECHNICIAN FIELD ACTIVITIES - YIN
88-120-09 -STEELHEAD AND FALL CHINOOK PROD. OBJECTIVES - YIN
88-123 -YAKIMA HATCHERY COORDINATION - ROZA IRRIGATION DISTRICT
88-149 -YAKIMA HATCHERY - WATER ANALYSIS - BOR
88-167 -YAKIMA HATCHERY ECONOMIC STUDY - CWU
89-082 -YAKIMA HATCHERY - EXPERIMENTAL DESIGN - WDFW
89-083 -YAKIMA HATCHERY - EXPERIMENTAL DESIGN - WDFW
89-089 -YAKIMA/KLICKITAT RADIO TELEMTRY STUDY - NMFS
89-100 -YAKIMA HATCHERY ENVIRONMENTAL ASSESS. REVIEW - BPNL
89-105 -YAKIMA - SPECIES INTERACTION STUDY - WDFW
90-058 -YAKIMA HATCHERY - PROJ. LEADER FUNCTION - SAMPSEL CONS.
90-062 -CLERICAL SERVICES-YAKIMA PROJECT - PENNYS FROM HEAVEN
90-065 -CHANDLER JUVENILE TRAP CALIBRATION - NMFS
90-069 -YAKIMA HATCHERY - FINAL DESIGN - CH2M HILL
90-045 -YAKIMA ADULT/JUVENILE TRAPPING FINAL DESIGN - BOR
91-048 -EVAL. OF ENV. IMPACTS OF YAKIMA PROD. PROG. - BPNL
91-055 -SUPPLEMENTATION FISH QUALITY (YAKIMA) - NMFS
91-059 -FOOD ABUNDANCE YAKIMA RV TROUT, STLHD, CHINOOK - CWU
92-021 -EXPERIMENTAL DESIGN DEVELOPMENT - CWU
94-037 -YAKIMA BIO SPEC INTERFACE - HATCHERY OP CONSULTING
94-036 -ECONOMIC IMPACT ANALYSIS YAKIMA RV BASIN - CWU
94-040 -QUANTITATIVE PROD. OBJ. FOR YAKIMA FALL CH. & STLHD - MOBRAND
95-055 -UPDATE OF YAKIMA FISH PROJECT ECONOMIC ANALYSIS - CWU
95-062 -YAKIMA/KLICKITAT FISH. PROJECT ADAPT. MGMT. -
95-063 -YAKIMA/KLICKITAT MONT. AND EVAL. PROGRAM -
95-064 -YAKIMA FISHERIES PROJECT SCI. MGMT SERVICES - WDFW
95-064-01 -REFINEMENT OF MARKING METHODS FOR YKFP - WDFW
95-064-02 -UPPER YAKIMA RIVER SPECIES INTERACTION STUDIES - WDFW
95-064-03 -GENETIC MGMT. FRAMEWORK FOR YAKIMA SP. CHINOOK - WDFW
95-064-04 -POLICY/TECHNICAL INVOLVEMENT AND PLANNING - WDFW
95-064-05 -FURTHER DEVEL. OF NIT/LNIT REARING STRATEGY FOR YKFP - WDFW
95-068 -KLICKITAT PASSAGE/HABITAT PRELIMINARY DESIGN - YIN

BONNEVILLE PROJECT SPECIFIC SUPPORT

88-034 -ENGINEERING SUPPORT --YAKIMA HATCHERY (also 92-029, 91-080) - BPA
88-115 -YAKIMA HATCHERY CONSTRUCTION - BPA
89-042 -ENGINEERING SERVICES PREL. DESIGN S&S FACIL -
89-043 -YAKIMA HATCHERY - PRELIMINARY ENGINEERING -
89-093 -BPA CONSTRUCTION SUPPORT FOR YAKIMA HATCHERY - BPA
93-081 -BPA LANDS SUPPORT FOR YAKIMA HATCHERY - BPA
95-037 -SUPPORT FROM FACILITIES DESIGN - BPA
95-038 -SUPPORT FROM CONSTRUCTION SERVICES - BPA
95-040 -SUPPORT FROM REAL ESTATE - BPA
95-061 -SUPPORT FOR ENVIRONMENTAL ANALYSIS -
95-069 -YAKIMA/CLE ELUM LAND PURCHASE -

A summary of Project reports and technical papers can be found in the YKFP's Final EIS (January 1996). All major research results are include in those reports. Hardcopies of these reports are in the possession of BPA's Fish and Wildlife Program.

Because the YKFP is attempting to mitigate for effects on declining natural resources in a complicated, large-scale ecosystem without a full understanding of its complexities, the Project managers believe the principles of adaptive management to be particularly appropriate tools. By incorporating them into the Project's scientific method, the managers expect to achieve Project goals while protecting the basin's fishery resources from unforeseen, adverse Project impacts.

In applying adaptive management, actions by YKFP managers will respond to a set of agreed-upon objectives. These actions are designed as experiments to test hypotheses regarding their outcome: to see whether the predicted result occurs or whether some other result occurs. Carefully designed to obtain valid (i.e., statistically reliable) results, the experiments are conducted, monitored and evaluated to allow statistical evaluation of the results. New experimental insights are used to modify or discard ineffective strategies, to improve underlying theory and, when necessary, to revise objectives to conform with perceived possibilities. Informed Project scientists and managers may modify programs, procedures, and facilities in response to these findings, even if it means drastic changes to a program. Thus risks to the ecosystem are realized and addressed in the Project's annual planning cycle (described in detail below), which will annually examine the capacity and constraints of the stock and stream system, as well as the performance of hatchery fish, testing and revising a theory of supplementation. The rearing and release of each new group of smolts will represent an experimental test of the latest revision of the theory.

e. Methods.

Project scientists and managers realize that effective monitoring is the key to a successful adaptive management program. It enables them project managers to determine whether an action achieved its objective, or whether the objective was properly developed.

Monitoring should also provide insight into the actual result of an action as well as explain the success (or lack) in achieving the predicted result.

The YKFP's PSR lays out an integrated multi-level monitoring program for supplementing upper Yakima spring chinook. This structure ensures that strategies are implemented as intended, that experimental studies produce reliable results, and that risks associated with unresolved uncertainties are contained. It also ensures efficiency, prevents duplication of effort, and tracks progress toward meeting objectives.

Since monitoring activities for these categories overlap, they will be developed into an integrated monitoring plan. The monitoring plan would be revised and expanded as part of the adaptive management process. The Project's upper Yakima spring chinook monitoring plan, which will be used as a template for future production activities, addresses the following five monitoring categories:

1. Quality control will monitor the performance of the facilities and their operators. Standards would be developed for all fish culture and data collection activities as part of the certification process required for the facilities. Monitoring procedures would be included in the operations manuals for all facilities and field activities.
2. Product specification attributes will be monitored at the Cle Elum facility, the acclimation ponds, and the juvenile monitoring facilities to determine whether the fish produced by the project meet goals with respect to: fish health; morphology (size and shape); behavior; and survival.
3. Research monitoring activities will be designed to test the performance of two treatments of artificially reared fish (OCT vs. SNT) and to compare their performance with naturally reared fish. These monitoring activities would be performed at the Roza and Chandler juvenile facilities for outmigrating smolts, at the Prosser and Roza fish ladders and collection facilities for returning adults, and on the spawning grounds for straying rates and reproductive success monitoring. Research monitoring would include measurements of performance in four main areas:
 - o post-release survival (survival from time of release until the fish return to spawn);
 - o reproductive success (number of offspring produced per spawner);
 - o long-term fitness (genetic diversity and long-term stock productivity); and
 - o ecological interactions (population abundance and distribution, growth rates, carrying capacity, survival rates, transfer of disease, and gene flow).
4. Risk containment consists of a monitoring plan developed to evaluate four categories of interest identified in the risk analysis to monitor risk containment: 1) experimental; 2) genetic; 3) harvest; and, 4) natural production/ecological interactions. These four areas relate back to the objectives and strategies. The risk analysis defines risk in terms of the probability of failure to meet the objectives of the project for these four categories.

5. Monitoring of stock status includes measurements of run size and escapement to determine whether harvest objectives can be met without affecting natural production. It would provide information essential to track the long-term performance and fitness of the fish populations.

Implementation of the monitoring plan, annual review of the findings, and subsequent adjustment, as necessary, of the supplementation program objectives, strategies, assumptions, uncertainties, and risk analysis would complete the feedback loop that is essential to the success of the adaptive management process, and ultimately, the entire project.

f. Facilities and equipment.

No facilities or equipment other than a meeting place (for biologists to meet when rating habitat by reach) and a 200 megahertz or faster computer with at least 64 Megs of RAM and several gigabytes of hard drive are needed. The project already has a meeting place and the necessary computer.

g. References.

(Bonneville Power Administration). 1990a.

Yakima-Klickitat Production Project Environmental Assessment and Finding of No Significant Impact. DOE/EA-0392, Bonneville Power Administration, Portland, Oregon.

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Genetic Issues Associated with Implementation of Phase I of the YFP and other Aspects of the SDEIS. Memorandum to the Yakima Fisheries Project.
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Section 8. Relationships to other projects

Because this project is intended ultimately to target all species of anadromous salmonid currently or historically present in the Yakima and Klickitat Subbasins, any factor that affects habitat quality, habitat quantity, interspecific interactions or fish survival affects this project. Accordingly, all of the following FWP projects are related to this project.

9105700	Yakima Species 2 Screen Fabrication	Vital to species control within basin for straying into irrigation diversions.
9200900	Yakima Screen Phase II O&M	Vital to maintain screens for above purpose and effectiveness.
9107500	Yakima Phase 2 Screens-Construction	Vital for control within basin

9503300	O&M of Yakima Fish Protection,	for straying into irrigation diversions. Vital to maintain, screens for control of target species within basin from irrigation diversions.
9704900	Teaway Instream Flow Restoration	Essential tributary enhancement vital to success of YKFP.
9603501	Satus Watershed Restoration	Represents a positive factor for improving tributaries within Yakima Basin; vital for supplementation
9506800	Klickitat/Habitat Preliminary Design Project YIN	Klickitat, in its preliminary stages, is a vital part of YKFP for the implementation of supplementation
5512600	Upper Klickitat Meadows Riparian Restoration YIN	Contributes to improving prime habitat which is vital for success of supplementation implementation.
5512700	Klickitat Basin Culvert Rehabilitation YIN	Passage within tributaries is essential for natural restoration of species.
5512800	Lower Klickitat Habitat Enhancement	Essential for improved reproduction of affected species.

Section 9. Key personnel

MELVIN R. SAMPSON
370 N. BROWN ROAD
WAPATO, WASHINGTON 98951
509-848-2854

EXPERIENCE:

- 2/93-PRESENT** **POLICY ADVISOR/PROJECT COORDINATOR**
Yakima/Klickitat Fisheries Project
Yakama Indian Nation
Toppenish, WA 98948
- 1989-1992** **PRESIDENT**
-Melco Petroleum Inc., Wapato, WA 98951
 ***Wholesale fuel distribution**
VICE-PRESIDENT
-Yakima Petroleum Inc., Wapato, WA 98951
 ***Wholesale fuel distribution**
-Eagle Stop and Save, Inc.
 ***Fuel-convenience stores**
-Yakima Solutions Inc., Wapato, WA 98951
-Native Solutions Inc., Wapato, WA 98951
 ***Consulting and Business Management**
- 1985-1989** **CHAIRMAN, YAKAMA TRIBAL COUNCIL**
- 1971-1989** **YAKAMA TRIBAL COUNCIL (ELECTED)**
Committees served:
-Timber, Grazing, Overall Economic Development
-Loan, Extension, Education, and Housing
-Legislative
-Health, Employment, Welfare, Recreation, and Youth
- Activities**
-Budget and Finance
-Executive Board
-Enrollment
-Special Tax Committee
-Radio Active/Hazardous Waste
-Public Relations/Media

-While serving on the Tribal Council for 18 years, I served as Chairman at one point of the listed committees

- 1971** **TRIBAL PLANNER**
- 1969-1970** **ASSISTANT MANAGER**
PERSONNEL MANAGER
-White Swan Industries
-Wholesale Furniture Manufacturing
- 1968-1969** **RESIDENT COUNSELOR**
-Fort Simco Job Corps
-Worked nights, commuted to CWSU during day
- 1967-1968** **MANAGER TRAINEE**
-White Swan Industries
-Wholesale Furniture Manufacturing
- 1965-1967** **Industrial injury, not employed**
- 1961-1965** **STUDENT**
-Lower Columbia College, Longview, WA
-While attending college, worked full time at night in a lumber planner mill in various jobs, including lumber grader.
- 1959-1961** **-U.S. Army, Active Service**
- 1956-1959** **VARIOUS JOBS**
-Fisherman
-Boeing Aircraft Company
-Construction
-Farm Labor

EDUCATION:

- American Indian Management Institute, Albuquerque, NM**
-Completed six-week comprehensive studies on Tribal Executive Development Central Washington State College, Ellensburg, WA
-Major: Sociology Minor: Psychology, Business
- Lower Columbia College, Longview, WA**
-Business Major
- Lower Columbia College, Longview, WA**
-Associate Degree in Electronics, 1963
- White Swan High School, White Swan, WA.**
-Graduate, 1956

ORGANIZATION AFFILIATES:

- Lifetime member, National Congress of American Indians**
- Member, Fraternal Order of Eagles No. 2225, Toppenish, WA**
- Founder, member, past Chairman, Northwest Portland Area Indian Health Board, Portland, OR. (18 years)**
- Member, past Chairman, National Indian Health Board, Denver, CO (16 years)**
- Served as a member, Indian Food & Nutrition Board, Denver, CO (3 years)**
- Served, Yakima Valley College Board of Trustee, Yakima, WA (2 years)**
- Served as member, founder, Heritage College Board of Trustees, Toppenish, WA**
- Served on Advisory Board, Master of Public Health, University of California at Berkeley, CA. (2 years)**
- Served on, Inter-Mountain School Board, Provo, UT (2 years)**
- Member, President, Yakama Indian Rodeo Assoc., (25 years, volunteer)**
- Member, founder, past President, Western States Indian Rodeo Assoc. (20 years)**
- Member, founder, current President, Indian National Finals Rodeo, Inc.,(22 years)**
- Served as member, Special Yakima Rodeo Board, to produce, promote the National High School Rodeo Finals in Yakima, WA. in 1980.**
- Served on "The Advisory Panel on Alternative Means of Financing and Managing Radioactive Waste Facilities", Administrative Appointee, Depart. of Energy, 1984.**

RECOGNITIONS:

- Yakama Indian Nation, Supervisor of the Year, 1995.**
- Board Member of the year, Northwest Portland Area Indian Health Board, 4 times.**
- Board Member of the year, National Indian Health Board, 2 times.**
- Special Recognition of Appreciation as a Founder of Western States Indian Rodeo Association on their Tenth Anniversary.**
- Special Recognition as a Founder of the Indian National Finals Rodeo from the American Revolution Bicentennial, 1776-1976.**
- National Indian Rodeo Man of the Year, 1978, Hoof and Horns Magazine.**
- National Indian Man of the Year, American Indian Heritage Foundation, Washington, D.C., 1988.**

MILITARY EXPERIENCE:

1959-1965 VETERAN, United States Army, Honorable Discharge, SGT E5.

PERSONAL DATA:

Date of Birth: April 20, 1938

Tribe: Yakama, Enrollment # 4059

Marital Status: Married, 5 daughters, 1 son

HOBBIES AND INTERESTS:

-Hunting, Fishing, Horses, Sports, Crafts, & Rodeo

REFERENCES:

-Submitted upon request

DAVID E. FAST

Fisheries Resource Management
P.O. Box 151
Toppenish, Washington 98948
Work: 509-966-5291

Education

University of Washington, Seattle, Washington
Doctor of Philosophy in Fisheries Science, 1987.

University of Puerto Rico, Mayaguez, Puerto Rico
Master of Science in Marine Sciences, 1974.
St. John's University, Collegeville, Minnesota
Bachelor of Science in Zoology, 1969.

Research Experience

1988-Present: Research Manager. Fisheries Resource Management Program, Yakima Indian Nation. Responsible for the design, development, and implementation of a major supplementation and research facility to test the concept of using artificial production to rebuild natural spawning populations of spring chinook salmon in the Yakima Basin. Write detailed project plans, develop short and long-term project goals and objectives, and supervise professional and technical staff.

1985-1988: Project Leader. Spring Chinook Enhancement Study. Responsible for research project designed to determine the best methods of enhancing the spring chinook salmon population in the Yakima Basin. Evaluate survival through various life stages and total production of naturally producing salmon. Determine methods of supplementation with hatchery reared fish while minimizing adverse genetic impacts.

Fast, D.E. 1987. The Behavior of salmonid alevins in response to light, velocity and dissolved oxygen during incubation. Pages 84-92 in Salmonid Migration and Distribution Symposium (E.L. Brannon, ed.), School of Fisheries, University of Washington, and Directorate for Nature Management, Norway, Trondheim, Norway.

Fast, D.E., J.D. Hubble, T.B. Scribner, M.V. Johnston, W.R. Sharp.

1989. Yakima/Klickitat Natural Production and Enhancement Program. 1989 Annual Report to Bonneville Power Administration. Project 88-120. 107 pp.

Fast, D.E. 1989. Supplementation Strategies For The Yakima/Klickitat Production Facility. Pages 143-147 in Northwest Fish Culture Conference Proceedings (R.Z. Smith, ed.).

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Section 10. Information/technology transfer

The technical information resulting from this project (and its components tasks) will be distributed in the following ways:

- Where applicable, task specific, annual reports will be submitted to Bonneville consistent with the contract requirements and Bonneville will distribute copies to all individuals and agencies on its mailing list.
- Excerpted data will be appropriately formatted and submitted to the Northwest Aquatic Information Network (StreamNet) and made available to the public via the Internet.
- As an element of the YKFP, the objectives and findings of this project will also be entered into the YKFP home-page on the Internet. This home-page is currently under construction, and should be operational sometime in 1998. The kind of information posted to the YKFP home-page will differ somewhat from that posted to StreamNet. Specifically, the YKFP Internet site will contain more detailed and site-specific information than that in StreamNet, which has a regional perspective and therefore aggregates data in standardized units of larger geographic scope. There will also be more different kinds of data posted to the YKFP site than can presently be accommodated by StreamNet.
- The results of this study will also be presented and critiqued in a public workshop hosted by the YKFP, the "Project Annual Review". The Yakama Indian Nation can be contacted for abstracts of presentations made at this workshop.
- Information pertinent to monitoring natural production and ecological interactions of species targeted by the YKFP will be incorporated into the appropriate species' Monitoring Plans.