T. PROD'N OBJECTIVES AND STRATEGIES FOR YAKIMA BASIN AD. SALMONIDS 9706200

SHORT DESCRIPTION:

Development and use of computer models incorporating empirical data to design suppementation/habitat enhancement projects to enhance natural production and harvest opportunity of all existing and extirpated species of anadromous salmonids in the Yakima Basin, to predict success of evolving strategies, and to identify potential risks and monitoring needs.

SPONSOR/CONTRACTOR: YIN
Yakama Indian Nation
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SUB-CONTRACTORS:
Mobrand Biometrics

GOALS

GENERAL:
Supports a healthy Columbia basin, Maintains biological diversity, Maintains genetic integrity, Increases run sizes or populations, Provides needed habitat protection, Adaptive management (research or M&E), Program coordination or planning, Basinwide

WATERSHED:
Assessment/action plan development, Coordination, Research, M&E

ANADROMOUS FISH:
Habitat or tributary passage, Production, Research, M&E

RESIDENT FISH:
Research, M&E

WILDLIFE:
Habitat, Research, M&E

NPPC PROGRAM MEASURE:
7.4K.1

RELATION TO MEASURE:
Based on an analysis of major factors constraining current production (Ecosystem Diagnosis and Treatment analysis), this project develops the strategies and objectives for enhancing and re-establishing all species and stocks of anadromous salmonids historically present in the Yakima Basin. It is the initial step in adding additional species and stocks to the YKFP, which currently targets only one stock of spring chinook.

BIOLOGICAL OPINION ID:
N/A

OTHER PLANNING DOCUMENTS:
The need and justification for multi-stock enhancement (or re-establishment) in the Yakima Basin by a combition of habitat enhancement and supplementation is spelled out in Chapter 5B and Parts 9a, 9b, 9c, 9d, 9e and 9f of Wy Kan Ush Me Wa Kush Wit, as are the comprehensive planning processes (e.g., RASP, 1992; Cuenco, 1993) by which such enhancement projects are designed.

TARGET STOCK	LIFE STAGE	MGMT CODE (see below)
Naches Subbasin sockeye	Prespawning adult through smolt	E,S
Upper Yakima sockeye	Prespawning adult through smolt	E,S

Yakima Basin summer chinook	Prespawning adult through smolt	E,S
Yakima Basin coho	Prespawning adult through smolt	E,S
Naches Subbasin summer steelhead	Prespawning adult through smolt	S,W
Upper Yakima summer steelhead	Prespawning adult through smolt	S,W
Toppenish Creek summer steelhead	Prespawning adult through smolt	S,W
Satus Creek summer steelhead	Prespawning adult through smolt	S,W
Yakima mainstem fall chinook	Prespawning adult through smolt	S,W
American River spring chinook	Prespawning adult through smolt	S,W
Naches River spring chinook	Prespawning adult through smolt	S,W
Upper Yakima spring chinook	Prespawning adult through smolt	S,W

AFFECTED STOCK	BENEFIT OR DETRIMENT
Competitors	Neutral
Pathogens	Neutral
Mutualists	Beneficial
Predators	Beneficial
West slope cutthroat	Neutral
Yakima Basin bull trout	Beneficial
Yakima Basin rainbow trout	Neutral

BACKGROUND

STREAM AREA AFFECTED

Stream name:
Yakima River and tributaries

Subbasin:
Yakima

Stream miles affected:
Potentially all accessible in basin (~940 miles for all species except sockeye)

Land ownership:
Federal, state, tribal, private

Hydro project mitigated:
N/A Does not mitigate for a particular Hydroelectric Project.

Habitat types:
N/A Not a wildlife project.

HISTORY:

Similar projects that estimated estimated benefits and established objectives for the YKFP by the use of computer modeling have occurred in the past. A Refined Statement of Goals document was produced in 1990, which used the SPM model -- the model employed in Subbasin Planning -- to estimate benefits of supplementation for all Yakima stocks. These estimates became quantitative objectives for upper Yakima and Naches spring hinook, summer chinook, fall chinook, steelhead and coho. The SPM model was relatively simple, especially in its treatment of production within the subbasin. Objectives for upper Yakima spring chinook were refined in 1993 by the use of a more sophisticated model that was developed by the Regional Assessment of Supplementation Project (RASP). The RASP model was more detailed than the Subbasin Planning model in its treatment of the egg-to-smolt portion of the life history, incorporating productivity rates and capacities for three distinct life stages, allowing for density-dependent interactions between stocks, including various kinds of impacts of resident predators on outmigrating smolts, and allowing for varying degrees of genetic impact and recovery. This exercise resulted in the document Natural Production Objectives for Upper Yakima Spring Chinook (Anon., 1993), which contained supplementation strategies and projected benefits (objectives) which were officially adopted by the YKFP. The current project makes use of the Ecosystem Diagnosis and Treatment (EDT) model. This model integrates large amounts of environmental and life history data to allow productivity to be estimated for individual "clusters" of life history types, and to estimate improvements in productivity
associated with any combination of habitat enhancement and supplementation. The EDT model will be the primary tool used in the development of revised enhancement strategies and objectives for steelhead, fall chinook and coho. Further evolution of

models is anticipated, especially after the spring chinook program comes on line and the need for assessing progress toward estbalished objectives becomes critical.

BIOLOGICAL RESULTS ACHIEVED:
No Response.

PROJECT REPORTS AND PAPERS:
No Response

ADAPTIVE MANAGEMENT IMPLICATIONS:
No Response

PURPOSE AND METHODS

SPECIFIC MEASUREABLE OBJECTIVES:
This project is in fact the exercise by which specific, measurable objectives are initially established and then periodically revised. Specifically, for steelhead, fall chinook, coho and ultimately summer chinook and sockeye, the objective of the project is to analyze existing natural production contraints and to develop enhancement strategies based on this analysis. Other objectives include: estimation and revision of benefits of enhancement strategies in terms of return to subbasin, spawning escapement and harvest opportunity, identification of all assumptions (critical uncertainties) entailed by such estimates, initial framing of risk analyses for each program developed, development of monitoring plans for all programs, and assessment of progress toward estbalished goals after projects are implemented. These analyses are iterative, with periodic revisions to incorporate the latest findings with respect to genetic impacts of hatchery rearing, current productivity and carrying capacity of the basin, ecological interactions with competitors, predators and non-target stocks, target stock demographics, and the impact of environmental events and conditions (e.g., seasonal mean flows and temperatures, floods, habitat alterations, etc.).

CRITICAL UNCERTAINTIES:
This project is exlusively a planning exercise with the goal of designing habitat enhancement/supplementation projects for Yakima Basin anadromous salmonids based on a "diagnosis" of factors limiting productivity and carrying capacity. Accordingly, it entails at least four major critical uncertainties which are also major risks -- if optimistic assumptions turn out to be false. The first fundamental critical uncertainty is that the major factors that determine current productivity and carrying capacity can be identified with information at hand. The risk is that they cannot and that current enhancement plans must therefore be fundamentally flawed. The second fundamental critical uncertainty is that current low levels of production are primarily attributable to remediable, anthropogenic impacts on productivity, and not to an intrinsically limited carrying capacity. Put another way, it is a critical uncertainty that a combination of strategic habitat enhancement and supplementation will increase density-independent survival rates enough to allow targeted populations to utilize large quantities of underseeded habitat and increase in abundance. The risk is that the habitat has been irreversibly degraded and/or physically lost (e.g., by unladdered dams), and that the Yakima Basin is already producing at capacity. A third critical uncertainty/risk is that adverse genetic impacts to supplemented stocks will be modest and/or reversible by one or two generations of natural reproduction, such that increases in productivity and abundance can be sustained. The converse of this issue -- that genetic impacts will NOT be modest or easily reversible -- is also, of course, a major risk. The final issue concerns ecological impacts on valuable non-target stocks. A critical uncertainty is that adverse impacts to non-target species can be kept to levels acceptable to all user groups. The risk is that they cannot. Again, it should be borne in mind that this modeling/planning project is the primary vehicle by which critical uncertainties and risks are initially identified and transformed to testable hypotheses or issues subjected to risk monitoring (if the uncertainty is not empirically resolvable).

BIOLOGICAL NEED:
The ultimate biological need is to implement an enhancement program that halts the decline of anadromous salmonids in the Yakima Basin and ultimately leads to the re-establishment of viable, resilient populations capable of sustaining a meaningful fishery. The immediate and most pressing biological problem is low productivty (returns/spawner), which approximates 1.0 for spring and fall chinook, and is less than 1.0 for steelhead. Although all life stages are affected, rearing conditions for subyearlings (both summer and winter) are a major issue.

HYPOTHESIS TO BE TESTED:

Again, this project FORMULATES testable hypotheses for species not yet covered by the YKFP (fall chinook, steelhead, summer chinook and sockeye), and refines hypotheses for species already targeted (spring chinook and coho). As a planning project, this project does not actually test any hypothesis.

ALTERNATIVE APPROACHES:

Enhancement exclusively by habitat enhancement was considered during the NEPA process but rejected because a major purpose of the project is to test the efficacy of supplementation, and because recovery by habitat enhancement alone would take so long and be so costly that several depressed stocks might be extirpated before the projects became effective.

JUSTIFICATION FOR PLANNING:

This project is exclusively a planning project for enhancement of natural production of anadromous salmonids. Clearly, SOME kind of analysis and planning must precede ANY on-the-ground enhancement action. This planning effort integrates all subbasin-level elements of the ecosystem, AND ATTEMPTS TO PRIORITIZE PROBLEMS AND OPPORTUNITIES. This identification of enhancement actions of maximal effectiveness is the primary reason this project should precede unprioritized on-the-ground enhancement actions. The project will be conducted by the YIN and Mobrand Biometrics and, at a future date, by WDFW as well. The project is coordinated by the Policy Group of the YKFP, which coordinates all projects conducted under the YKFP.

METHODS:

The project employs Ecosystem Diagnosis and Treatment to (EDT; Lestelle, L.C.,L.E.Mobrand,J.A. Lichatowich and T.S. Vogel. 1996. Applied ecosystem analysis - a primer. Report prepared by Mobrand Biometrics, Inc. for Bonneville Power Administration, Division of Environment, Fish and Wildlife, P.O. Box 3621, Portland, OR 97208-3621. Project Number 9404600, Contract #94 AM 33243. May, 1996. DOE/BP-33243-2 August 1996 8C.) Adiagnose factors depressing current productivity and carrying capacity, to highlight needed improvements in habitat quality, population productivity and life history diversity, and to estimate the benefits of specific enhancement measures. The EDT method begins with descriptions of optimal habitat for the production of all ecologically distinct life stages of a target species. It then assesses the suitability of all reaches of the targeted system to support each life stage -- both under current, depressed conditions (the APatient) and under productive, historical conditions (the ATemplate@). It then transforms reach-by-life-stage suitability ratings into a reach-by-life-stage survival landscape. A Adiagnosis@ of the primary factors limiting production in the Patient is formed by comparing productivities and carrying capacities for major life history types (trajectories through the survival landscape) in the Patient with major life history types in the Template. A Atreatment@ is then formulated from the diagnosis, and particularly from the rating s given a suite of critical environmental attributes ascribed to places and times that are primarily responsibile for depressed productivity in the Patient. The treatment can consist wholly of habitat enhancement, supplementation, or a combination of both. Finally, the treatment is Ascaled@ by estimating how large a treatment effect is necessary to achieve objectives in terms of productivity and carrying capacity. In its current state of development, the EDT approach suffers from a number of drawbacks: a very large mass of interrelated environmental and life history data must be coordinated and analyzed; extreme care must be taken in standardizing habitat suitability ratings between raters; gobal population parameters (e.g., stock productivity and carrying capacity) are difficult to estimate or interpret in the context of a multitude of distinct life history types; and it is difficult to determine optimal size for a supplementation project solely on the basis of an EDT analysis.

PLANNED ACTIVITIES

SCHEDULE:

Planning Phase	**Start**	1995 (steelhead and fall chinook); Jan 1, 1997 (coho)Initial plans for steelhead, fall chinook and coho?	**End**	Dec 31, 1997.Data management system for analyzing stock productivitiy.	**Subcontractor**	Mobrand Biometrics

Task For 1997, major tasks include the development of a supplementation/habitat enhancement simulation program and data management system for steelhead, coho and fall chinook, and the completion of an initial enhancement plan for these species. For 1998 and beyond, tasks include revisions to the plans for steelhead, coho, fall chinook and upper Yakima spring chinook, and initial development of enhancement plans for Naches and American River spring chinook, summer chinook and sockeye. NOTE - THIS PROJECT IS ITERATIVE, AND WILL CONTINUE FOR THE DURATION OF THE YKFP. IT WILL USE M&E DATA AS IT IS GATHERED TO REVISE ENHANCEMENT STRATEGIES, SOMETIMES TO ALTER PROJECT OBJECTIVES, AND TO EVALUATE PROGRESS TOWARD ESTBLISHED GOALS. IT IS ONE OF THE MAJOR TOOLS FOR ADAPTIVE MANAGEMENT.

PROJECT COMPLETION DATE:

N/A

CONSTRAINTS OR FACTORS THAT MAY CAUSE SCHEDULE OR BUDGET CHANGES:

Examples include NEPA analysis, permit requirements, consent of other agencies, entities, landowners, or other affected parties, or other factors beyond the control of the project managers. To date, the major factor that has altered the schedule and budget is the technical complexity of alyzing very large masses of interrelated data. This problem has already delayed the completion of initial plans for steelhead and fall chinook two years. The data management problem will, with the asssistance of Mobrand Biometrics, be solved this year. Other scheduling constraints include: consent of other agencies for particular species/habitat enhancement plans, and the need for supplemental NEPA documents before new plans can be officially adopted by the YKFP.

OUTCOMES, MONITORING AND EVALUATION

SUMMARY OF EXPECTED OUTCOMES

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

If funding for permanent, iterative supplementation modeling is provided, it can be expected that a series of increasingly realistic, species- and stock-specific models of supplemented natural production in the Yakima Basin will be developed. As additional species are supplemented under the YKFP, these models will: 1) identify increasingly effective supplementation treatments; 2) result in the establishment of increasingly realistic production and harvest objectives;3) identify program-specific risks and stimulate the development of appropriate risk monitoring and containment activities;4) provide detailed guidance in the development of effective monitoring programs; and5) describe a mosaic oh habitat enhancement measures that will synergistically increase the effectiveness of supplementation programs.

Present utilization and convservation potential of target population or area:

Regarding conservation potential, all extant stocks of anadromous salmonids in the Yakima Basin are depressed, especially summer steelhead. The current utilization potential for extant stocks is low for spring and fall chinook and negligible for summer steelhead.

Assumed historic status of utilization and conservation potential:

It has been estimated that runs of anadromous salmonids in historical times in the Yakima Basin ranged between 300,000 and 800,000 annually. In decreasing order, the most abundant species/stocks were summer chinook and sockeye, spring and fall chinook, coho, and summer steelhead. Historical utilization was also very high. Estimates of historical harvests by native Americans approach 200,000 fish.

Long term expected utilization and conservation potential for target population or habitat:

The only stock to be analyzed since the first relatively crude efforts in 1990 (Refined Statement of Goals, 1990) is upper Yakima spring chinook. For this species/stock, we project the following outcome for the existing supplementation effort IN THE ABSENCE OF ANY NEW HABITAT ENHANCEMENT PROJECTS: mean returns of ~11,600 adults, mean termil harvests of ~6,400, mean Columbia and ocean harvests of ~3,200 and mean natural spawning escapement of ~3,300.

Contribution toward long-term goal:

This project will primarily be responsible determining whether the spring chinook program is Aon course (it may take as long as

30 years before sufficient adult data will have been collected to prove statistically that natural productin has increased and that associated goals have been met)..

Indirect biological or environmental changes:
It is possible that future iterations of the analysis will suggest specific habitat enhancement actions that will be implemented under the YKFP (instead of the Yakima Basin Enhancement Project, a loose confederation of Feberal and State agencies with the goal of enhancing anadromous fish production in the Yakima by any means possible, but especially by habitat enhancement).

Physical products:
N/A -- a planning project.

Environmental attributes affected by the project:
N/A -- a planning project.

Changes assumed or expected for affected environmental attributes:
N/A

Measure of attribute changes:
N/A

Assessment of effects on project outcomes of critical uncertainty:
Describe how you will assess the effects on project outcomes of critical uncertainties identified above.The YKFP (Buasck et. al, 1997, in press) has just completed a thorough Monitoring Plan for the upper Yakima spring chinook suplementation program. This document systematically describes how all critical uncertainties involved in the spring chinook project will be assessed.

Information products:
(monitor inerformed as a means of assessing shifts in D50 and D84 of substrate size classes from data collected from various habitat types. Mean cobble embeddedness would be compared from year to year using multiple analysis of variance (MANOVA) techniques to assess both long and short term trends in deposited sediment. Standard electrofishing or snorkel techniques would be employed to assess relative abundance of fish at the site. Numbers of adult spawners and redds would be counted each year and documented. 3) No hatchery outplantings of hatchery fish are currently proposed, but we would consider this an option depending on other agency involvement (i.e. Idaho Department of Fish and Game, Nez Perce Tribe). This would be an option for chinook salmon only as the steelhead in the Selway River have never been supplemented with hatchery fish. Species affected by this project include chinook salmon, steehead trout, westslope cutthroat trout, and possibly bull trout. Relative densities of all these species will b

Coordination outcomes:
N/A

MONITORING APPROACH

Provisions to monitor population status or habitat quality:
Data from pre-established monitoring stations include fish densities.

Data analysis and evaluation:
See above.

Information feed back to management decisions:
If data show that the project does not achieve its overall goal of sediment reduction in lower O'Hara Creek, alternative actions to achieve this goal will be considered.

Critical uncertainties affecting project's outcomes:
Through monitoring levels of suspended sediment during project implementation. Increases in sediment yield following road obliteration may occur, which should be followed by an overall reduction in sediment yield.

EVALUATION
Request monitoring data and assess numbers of adults returning to the Clearwater River basin.

Incorporating new information regarding uncertainties:
Since the goal of the project is sediment reduction, and since the main risk involves temporary increases in sediment, the project will be alterred to achieve the goal.

Increasing public awareness of F&W activities:
The interpretive walk and brochure along lower O'Hara Creek, updated to provide new information concerning structure improvement and fish information, will help increase public awareness.

RELATIONSHIPS

RELATED BPA PROJECT	RELATIONSHIP
9602000 PIT-tag hatchery fish, multiple states.	Although 9602000 will not be implemented in the YKFP for the next several years, this project will help determine the ways in which tagged fish should be monitored.
9506404 Policy and technical involvement and planning, YKFP.	The Policy Group must approve enhancement plan developed under this project before they can be adopted and implemented.
9506402 Upper Yakima species interaction studies.	There is a two-way interaction between this study and 9506402:modeling identifies potential issues of concern which must be investigated, and 9506402 provides data which is incorporated in the modeling.
9506401 Refinement of marking methods for YKFP.	Although it has not occurred for the one stock now being supplemented, it is possible that future treatments for stocks currently not supplemented will require 95066401 to develop marks capable of differentiating fish in ways not now necessary.
5507700 Monitoring of supplementation response variables for YKFP.	This project identifies the intial list of response variables to be monitored.
8903000 effects of acclimation on the survival of spring chinook salmon.	8903000 will provide essential data on the performance of hatchery-reared smolts which will be used by this project in designing and evaluating current and future projects.
9506800 Initiate the tasks needed to provide basic information from fisheries surveys, population monitoring, habitat inventory & engineering surveys for passage barriers for Preliminary Design Report (Klickitat Basin).	95-68 will result in the collection of environmental and life hsitory data that will this project will make use of at a future date to design enhancement projects in the Klickitat Basin.
9006300 Develop and test M&E plans for YKFP.	This project is the means by which M&E plans are intially developed.
9006900 Final design for upper Yakima spring chinook acclimation sites and wells.	90-69 has no relationship to this project now: deliberations over appropriate siting of aclimation facilities have already occurred.
8811500 Design/construction of upper Yakima spring chinook facilities for YKFP.	88-115 has no relationship to this modeling exercise now: design is complete and construction is preogressing.
9506800 Klickitat passage/habitat preliminary design.	9506800 will result in the collection of environmental and life hsitory data that will this project will make use of at a future date to design enhancement projects in the Klickitat Basin.

8812010 Chandler certification study.	8812010 will result in the ability to make statistically powerful estimates of the production of all stocks of wild spring chinook and all groups of upper Yakima hatchery spring chinook. Essential for YKFP evaluation.
8812009 Development of enhancement strategies for coho; development of stochastic models for progress assessment for spring/fall chinook and steelhead.	8812009 is this project.
8812008 Technical personnel support for field data collection, Task assignments and special projects consistent with YKFP objectives and needs.	8812008 results in collection of new data which is used in simulations and projections.
8812004 Training Assistance for Personnel for YKFP needs.	8812004 produces a skilled tribal manpower pool for the YKFP but has no direct relationship to this modeling project.

RELATED NON-BPA PROJECT	RELATIONSHIP
Yakima Basin Watershed Council, funds from state and private sources	Possibility of cooperative habitat enhancement projects.
Yakima River Basin Water Enhancement Project (YRBWEP), Congressionally funded.	Irrigation water conserved by YRBWEP may be allocated in part to benefit fish stocks analyzed by this planning/modeling project.

OPPORTUNITIES FOR COOPERATION:

The YIN and WDFW have and will continue to collaborate in the creation and refinement of models and the gathering of data needed to run them. The BOR provides essential hydrological data to this effort.

COSTS AND FTE

1997 Planned: $66,500

FUTURE FUNDING NEEDS:

FY	$ NEED	% PLAN	% IMPLEMENT	% O AND M
1998	$10,000	0%	70%	30%
1999	$10,000	0%	50%	50%
2000	$5,000	0%	10%	90%

PAST OBLIGATIONS (incl. 1997 if done):

FY	OTHER FUNDING SOURCE	AMOUNT	IN-KIND VALUE
1998	USFS	$95,000	
1999	USFS	$10,000	
2000	USFS	$5,000	

OTHER NON-FINANCIAL SUPPORTERS:

Future partners may include Trout Unlimited, Idaho Department of Fish and Game, and the Nez Perce Tribe. The Nez Perce Tribe has desigted O'Hara Creek as part of a large-scale spring and summer chinook salmon supplementation program. The Tribe annually stocks O'Hara Creek with spring chinook pre-smolts.

LONGER TERM COSTS: N/A

1997 OVERHEAD PERCENT: .28

HOW DOES PERCENTAGE APPLY TO DIRECT COSTS:

[Overhead % not provided so BPA appended older data.]

CONTRACTOR FTE: 3

SUBCONTRACTOR FTE: 0