IDAHO SALMON SUPPLEMENTATION 8909802

SHORT DESCRIPTION:
Determine the best outplanting strategy for spring-summer chinook salmon to restore or augment natural production, and evaluate the effects of supplementation on the survival and fitness of existing wild/natural populations in the Salmon and Clearwater River basins.

SPONSOR/CONTRACTOR: NPT
Nez Perce Tribe
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SUB-CONTRACTORS:
Idaho Department of Fish and Game, US Fish and Wildlife Service, Shoshone-Bannock Tribes

GOALS

GENERAL:
Supports a healthy Columbia basin, Maintains biological diversity, Maintains genetic integrity, Increases run sizes or populations, Adaptive management (research or M&E)

ANADROMOUS FISH:
Research, M&E

NPPC PROGRAM MEASURE:
7.3B.2; 7.1D.2; 7.1C

RELATION TO MEASURE:
ISS is designed to evaluate supplementation and to develop recommendation for optimal stocking strategies(7.3.B.2). Included in the study design are the monitoring of population status and life history and morphological characteristics of wild and natural populations (7.1.D2;7.1C).

BIOLOGICAL OPINION ID:
Section 10 Permit Number 825

OTHER PLANNING DOCUMENTS:
Snake River Recovery Plan: 4.5.c. Initiate studies to determine the effects of ecological interactions between hatchery and natural fish in the Columbia River Basin Wy Kan Ush Me Wa Kush Wit (Draft 6/15/95): 5B-25,58. "Develop experimental and monitoring programs in association with these projects to study the relationships between natural and supplemented components of the populations." "Establish additional programs for each of the subbasin tributary systems to monitor adult escapement and resulting smolt production, and to evaluate (by measuring the number of adults returning) the ability of managers to meet goals set by the Columbia River Management Plan.".

TARGET STOCK	LIFE STAGE	MGMT CODE (see below)
Johnson Creek/spring-summer chinook salmon	Adult	S,L,W
Secesh River/spring-summer chinook salmon	All	N,L,W
Lake Creek/spring-summer chinook salmon	All	N,L,W
Slate Creek/spring-summer chinook salmon	All	S,L,W
Newsome Creek/spring-summer chinook salmon	All	S
Papoose Creek/spring-summer chinook salmon	All	S
Squaw Creek/spring-summer chinook salmon	All	S
Eldorado Creek/spring-summer chinook salmon	All	N
Lolo-Yoosa Creek/spring-summer chinook salmon	All	S

AFFECTED STOCK	BENEFIT OR DETRIMENT
Summer Steelhead/Clearwater River	Beneficial

Summer Steelhead/Salmon River	Beneficial

BACKGROUND

Stream name:
Lolo, Yoosa, Eldorado, Newsome, Squaw, Papoose, Slate, Lake Creeks and Secesh River

Subbasin:
Clearwater River and Salmon River

Stream miles affected:
~105

Land ownership:
public and private

HISTORY:

The Nez Perce Tribe (NPT) is a cooperator in the implementation of Project 89-098 with Idaho Fish and Game, U.S. Fish and Wildlife Service, and the Shoshone-Bannock Tribe. In May 1992 the NPT was awarded a contract to participate in the Idaho Supplementation Studies (ISS) which is defined by the experimental design "Salmon Supplementation Studies in Idaho Rivers" (Bowles and Leitzinger 1991). The NPT is responsible for data collection on ten study streams incorporated in the ISS study design. Four streams (Johnson Creek, Lake Creek, Secesh River, and Slate Creek) are in the Salmon River drainage and six streams (Eldorado Creek, Lolo Creek, Newsome Creek, Papoose Creek, Squaw Creek, and Yoosa Creek) are in the Clearwater River drainage.

Since the start of the ISS, decreasing returns of adult chinook salmon to historical lows have negatively affected our ability to measure population characteristics with a high degree of statistical power and have prohibited some scheduled treatments due to limited hatchery production. As a result, ISS is being restructured to best utilize the secondary level of evaluation, a "paired case history" approach to evaluate specific supplementation programs. A 5-year report is currently being developed (spring 1997 completion) that will formally review and evaluate the implementation and modification of the ISS design.

BIOLOGICAL RESULTS ACHIEVED:

Since 1992, the chinook salmon populations in ten study streams have been evaluated by the NPT at three life stages (summer parr, outmigrating smolts, and returning adults). Summer parr abundance transects have been snorkeled annually, resulting in density trend data and parr population estimates partitioned by habitat type and strata. Assessment of outmigration for both wild/natural and supplemented fish from various life stages (parr, presmolt, and smolt) have been accomplished for all study streams, when population size permitted, using Passive Integrated Transponder (PIT) tags. PIT tagging and subsequent interrogations at four Snake and Columbia River dams have produced estimates of migration timing and minimum survival for different supplementation strategies and river systems. Outmigration (rotary screw) traps have been operated in Lolo Creek since October, 1992. These traps have determined life history characteristics and estimated numbers of outmigrating chinook salmon for brood years 1990 -1994. Adult returns have been monitored in all study streams with redd count/carcass surveys and/or weirs, producing trend data on standardized transects, age class structure, and origin and sex ratios.

PROJECT REPORTS AND PAPERS:

Bowles, E. and E. Leitzinger. 1991. Salmon Supplementation Studies in Idaho Rivers. Experimental Design to the U.S. Department of Energy, Bonneville Power Administration. Project No. 89-098, Contact No. DE-BI79-89BP01466.Arnsberg, B. 1993. Salmon Supplementation in Idaho Rivers, 1992 Annual Report, BPA. Nez Perce Tribe, Department of Fisheries Resources Management.Hesse, J. and B. Arnsberg. 1994. Salmon Supplementation in Idaho Rivers, 1993 Annual Report. Nez Perce Tribe, Department of Fisheries Resources Management. Hesse, J., B. Arnsberg, and P. Cleary. 1995. Salmon Supplementation in Idaho Rivers, 1994 Annual Report. Nez Perce Tribe, Department of Fisheries Resources Management.Nemeth, D., et al. In progress. Idaho Supplementation Studies, Cumulative Report 1991-1996.

ADAPTIVE MANAGEMENT IMPLICATIONS:

Short Term - Data collected under ISS will help guide the use of captive brood as a management tool. Efforts with this extreme form of supplementation will benefit from ISS data in quantifying current population levels and life history descriptions for many of the chinook salmon producing streams in the Salmon and Clearwater drainages. Implementation of captive brood programs including: stream prioritization, collection techniques, and monitoring and evaluation techniques will use ISS data.While not directly produced for ISS use, data collected on ISS PIT tagged chinook salmon (wild/natural and hatchery origin) at Snake and Columbia River passage facilities will aid in mainstem smolt monitoring of timing and passage requirements and may contribute to the management/modification of mainstem dam operations.Long Term - The ISS study results and recommendations will help guide state, tribal, and federal hatchery programs. Population characteristics including historical resiliency to low return years, life history, and genetic descriptions from base line sampling will play a vital role in determining which supplementation

strategy produces the best adult to adult production without adverse genetic impacts to natural populations.

PURPOSE AND METHODS

SPECIFIC MEASUREABLE OBJECTIVES:

Objective 1: Monitor and evaluate the effects of supplementation on parr, presmolt, and smolt numbers and adult/spawning escapements of naturally produced salmon.Objective 2: Monitor and evaluate changes in natural productivity and genetic composition of target and adjacent populations following supplementation.Objective 3: Determine which supplementation strategies (broodstock and release stage) provide the quickest and highest response in natural production without adverse effects on productivity.Objective 4: Recommend specific implementable recommendations for the management of hatchery production to prevent extinction and increase returns of chinook salmon in the Salmon and Clearwater River drainages.

CRITICAL UNCERTAINTIES:

The associated risks and critical uncertainties of the ISS were evaluated under the 1991 draft RASP criteria. Genetic - ISS treatment streams already have on-going hatchery programs. Consequently, ISS hatchery protocols should pose a minimal ecological risk, if any, to the chinook salmon populations in these streams. Risks are primarily associated with not conducting ISS, and failing to identify and implement the best hatchery-based recovery measures resulting in the continued decline or extinction of population and adversely impacting wild/natural populations through the use of inappropriate supplementation due to a lack of information.Physical - The use of outmigration traps and adult weirs impose a limited risk to individual animals in terms of direct mortality and migration alteration. The use and acceptability of each research activity is evaluated and monitored under the NMFS section 10 permit process.

BIOLOGICAL NEED:

Existing knowledge on the long term effectiveness of supplementation, based on experimentation and experience, indicates that supplementation using traditional hatchery practices is rarely successful and can impose significant risk to the genetic integrity and long-term survivability of natural stocks (Miller et. al. 1990; Steward and Bjornn 1990). The risk of failure is particularly high for upriver stocks experiencing extreme survival bottlenecks from mainstem passage constraints (Miller et. al. 1990). Conversely, the need for supplementation as an interim recovery tool may be most pertinent for these same upriver stocks, which are rapidly declining to the point where recovery may be impossible.The biological need is to develop strategies that maximize the benefits of supplementation and minimize the risk to target and neighboring natural populations. These strategies must be evaluated prior to large scale management implementation.

HYPOTHESIS TO BE TESTED:

H01a: Supplementation augmentation of existing chinook salmon populations in Idaho does not affect natural production.
Corollary: Rejecting H01a indicates that supplementation can enhance or deter natural production.
Ho2a: Supplementation-augmentation of existing chinook population in Idaho does not reduce productivity of target of adjacent population below acceptable levels (e.g. replacement).
Corollary: Rejecting H02a indicates that supplementation can adversely affect survival and performance of existing natural populations.
Ho3a: Utilization of existing hatchery broodstocks in Idaho is not an effective strategy to supplement existing population of chinook salmon within local or adjacent sub-basins.
Corollary: Rejection of H03b indicates that development of new supplementation broodstocks from the target populations can be more successful for supplementation than utilization of existing hatchery broodstocks.
Ho3c: The effects of supplementation on natural production and productivity does not differ among life stages (parr, presmolt, smolt) of hatchery fish released.
Corollary: Rejecting H03c indicates which supplementation release strategies (life stage) are most effective (or least deleterious) in rebuilding natural populations.

ALTERNATIVE APPROACHES:

N/A There are no suitable alternatives.

JUSTIFICATION FOR PLANNING:

N/A

METHODS:

1) The ISS experiment design is split into three main approaches. The first level of evaluation are large scale population production and productivity studies designed to provide Snake River basin wide inferences. The second level utilizes study streams as individual "case histories" to evaluate specific supplementation programs. The third level represents small-scale studies designed to evaluate specific hypotheses. Levels one and two focus on measuring population responses to supplementation and hence are long-term in nature. The third level determines specific impacts of supplementation such as competition, dispersal, and behavior. These studies are relatively short-term and will be conducted in laboratory streams or "controlled " field environments.

There are two categories of case histories, supplementation of existing natural populations (Salmon River basin) and supplementation of extinct populations (Clearwater River basin). Supplementation effects will be evaluated by comparing weir returns, redd counts, juvenile production, juvenile survival, fecundity, age structure, and genetic structure and variability in supplemented and unsupplemented streams of similar ecological parameters (productivity, geology, habitat quality, etc).

Primary data collection includes:

Mid-summer parr - Parr abundance is estimated in all treatment and control streams. Number of parr is estimated with standardized snorkeling techniques utilizing stratified systematic sampling (Scheaffer et. al 1979) designed to provide a coefficient of variation of approximately 15%. Parr densities are expanded by strata to estimate total parr abundance within the experimental unit (treatment or control reach).

Fall and spring emigrants (presmolt and smolt) - Juvenile emigration numbers and timing are estimated with outmigrant (screw traps) traps. Traps are operated to sample the fall and spring emigration period unless icing or water velocity is prohibitive. Capture efficiency is estimated by recapture of marked emigrants transported above traps. Capture efficiencies are monitored as a function of stream flow and water temperature .

Smolt Production - Minimum survival estimates of smolts reaching Lower Granite Pool is estimated for all treatment and control streams. Approximately 300-500 juveniles are PIT tagged prior to or during emigration from the study streams and hatcheries. Hatchery fish (500 - 1000) are PIT tagged prior to release into treatment streams. Naturally produced parr and emigrants will be PIT tagged following collection by seining, minnow traps, or emigration traps.

Adult escapement - Escapement to study streams is determined for all treatment and control streams. Adult weirs will be located on approximately 73% of our study streams. Multiple redd counts are used in streams with and without adult weirs. Entire potential spawning area is surveyed. Potential egg deposition will be estimated from fecundity schedules derived from appropriate hatchery racks. These schedules will be applied directly to natural fish in study streams with weirs and applied as a function of the measured female:redd ratio for streams without weirs.

2) Supplementation effects will be evaluated using repeated measures profile analysis (split plot through time) to test the response of populations to treatments over time as compared to untreated streams. To help partition variability, some hypotheses utilize a block design. Depending upon the specific hypothesis, blocks may include status of existing population, brood source, life stage out-planted including size and timing, and stream productivity.

3) This study is concerned with chinook salmon and the number of fish supplemented is proportional to the amount of production in any given year.

PLANNED ACTIVITIES

SCHEDULE:

Planning Phase	**Start** 1992	**End** 2007	**Subcontractor**
Task Project design and adaptive management			
Implementation Phase	**Start** 1991	**End** 2007	**Subcontractor**
Task Broodstock development and supplementation treatments			
O&M Phase	**Start** 1992	**End** 2015	**Subcontractor**
Task Population monitoring and evaluation Adult escapement Parr production Juvenile outmigration Genetics			

PROJECT COMPLETION DATE:

2015

CONSTRAINTS OR FACTORS THAT MAY CAUSE SCHEDULE OR BUDGET CHANGES:
Continued decline of spring/summer chinook salmon returning to Idaho, especially the naturally produced component, could impede indefinitely the development of supplementation.

OUTCOMES, MONITORING AND EVALUATION

SUMMARY OF EXPECTED OUTCOMES

Expected performance of target population or quality change in land area affected:
This research will demonstrate the best method for supplementing existing naturally-reproducing populations of chinook salmon and the best method for re-establishing naturally producing populations in streams where chinook have become extirpated. Because study streams have different ecological characteristics, supplementation effects, and recommendations will likely be different for different streams.

Present utilization and convservation potential of target population or area:
Utilization/exploitation of spring/summer chinook salmon populations in all study stream have been too low since the start of the project to support significant sport or tribal fisheries. Return projections for brood year 1997 indicate the potential for a limited tribal and sport harvest in the South Fork Salmon River.

Assumed historic status of utilization and conservation potential:
Historically, Idaho produced a significant portion of the spring/summer chinook salmon returning to the Columbia River.

Long term expected utilization and conservation potential for target population or habitat:
The minimum goal is to maintain a chinook fishery at levels to sustain Tribal utilization. The long term desired utilization goal is to restore chinook populations in Idaho to a sport-fishable level.

Contribution toward long-term goal:
This research will provide insights into the best hatchery methodology to maintain Idaho's chinook salmon to the extent possible with current mainstem migration and mortality problems. If solutions to Columbia and Snake River survival problems are implemented, the ISS should provide information to guide the rehabilitation of Idaho's chinook salmon populations.

Indirect biological or environmental changes:
ISS will provide insight into possible hatchery strategies for other anadromous fish.

Physical products:
The first outplants of juvenile Chinook salmon for supplementation occurred during the summer of 1992. The first fall releases were in the fall of 1992, and the first smolt releases were in the spring of 1993. All these fish were differentially marked from general hatchery production fish. A total of 482,072 hatchery chinook salmon have been marked with fin clips (5,396 with PIT tags) and outplanted in ISS streams monitored by the NPT. A total of 10,724 wild/natural juvenile chinook salmon have been PIT tagged in ISS study streams monitored by the NPT.

Environmental attributes affected by the project:
N/A ISS does not affect habitat parameters.

Changes assumed or expected for affected environmental attributes:
N/A ISS does not affect habitat parameters.

Measure of attribute changes:
N/A ISS does not affect habitat parameter.

Assessment of effects on project outcomes of critical uncertainty:

We will montor population abundance and analysis genetic makeup over time for treatment and control streams. Constant monitoring of trapping will allow for continued development of fish friendly techniques. All data will be reviewed annually to allow for adaptive management.

Information products:
ISS provides monitoring information (adult returns, juvenile production, survival rates) for the critical chinook production areas in Idaho. Information gained from this project will determine the most beneficial method for future chinook supplementation.

Coordination outcomes:
Through coordination with Idaho Department of Fish and Game, Shoshone-Bannock Tribes, and US Fish and Wildlife Service, adult return information, juvenile production, and juvenile survival rate information will be available for 34 streams. In addition, information regarding hatchery chinook salmon behavior has been

MONITORING APPROACH
The ISS study design primarily focuses on monitoring and evaluation of specfic supplementation efforts. The methods described above will serve as our monitoring approach. The region should evaulate this project based on the contribution of population status data in the short term and based on supplementation stratigy reccomendations in the long term.

Provisions to monitor population status or habitat quality:
The ISS Experimental Design was set up to monitor changes in chinook salmon populations through emigrant trapping, snorkeling, redd counts, carcass surveys, and adult trapping.

Data analysis and evaluation:
The Experimental Design outlines statistical procedures to be used. If substantive changes are made to the Experimental Design in the future, new statistical methods will be prescribed.In brief, supplementation effects will be evaluated using repeated measures profile analysis (split plot through time) to test the response of populations to treatments over time as compared to untreated streams. To help partition variability, some hypotheses utilize a block design. Depending upon the specific hypothesis, blocks may include status of existing population, brood source, life stage out-planted, and stream productivity.

Information feed back to management decisions:
Bi-annual coordination meetings are held with researchers and management personne from all cooperative agencies. Managers from the NPT have played an active role in project development and implementaion. In house breifings between researchers and manangement occur at least every two months.

Critical uncertainties affecting project's outcomes:
Improved mainstem survival would alleviate the uncertainty of enough naturally produced chinook salmon adults to develop supplementation broodstocks.

EVALUATION
We are in the process of completing the five year summary report encompassing information from all project cooperators. The success of ISS could be assessed by a number of factors including, but not limited to the following: Adult to adult returns and number of smolts produced per redd.

Incorporating new information regarding uncertainties:
ISS cooperators meet regularly to exchange and compare results and discuss adaptations to the project as necessary.

Increasing public awareness of F&W activities:
The goal of the research project is to provide management with the best possible information to improve the status of chinook salmon populations in Idaho. As with all research, any oppertunities to inform the public on research activities and resource status will be utilized.

RELATIONSHIPS

RELATIONSHIPS

RELATED BPA PROJECT	RELATIONSHIP
8335000	NPTH M&E, collection and monitoring of adult return, parr density, and outmigration data from Lolo and Newsome Creeks that is used by ISS-NPT.
9005500 Steelhead Supplementation Studies in Idaho Rivers	IDFG-Steelhead supplementation studies in Idaho rivers, companion study to ISS looking at steelhead supplementation in Idaho Rivers. Data is exchanged between projects.
9107300 Idaho Natural Production Monitoring and Evaluation 83-7(esa)	IDFG- Intensive Smolt Monitoring, collects data in the upper Salmon River and Crooked River which is used by ISS.
5520600 Listed Stock Gamete Preservation	NPT-Listed Stock Adult Escapement Monitoring, supplies data (actual returns and straying) to ISS project
9604300	NPT-Johnson Creek Artificial Propagation Enhancement, will utilize Johnson Creek as a treatment stream for ISS and will monitor adult returns and juvenile outmigration.
8909801 Salm Supplementation Studies in Idaho Rivers -	US. Fish and Wildlife Service, cooperative agency on ISS study.
8909803 Salmon Supp. Studies in Id Rivers - Sho-bann Tribes	Shoshone-Bannock Tribes, cooperative agency on ISS study.
8909800 Idaho Supplementation Studies (iss)	Idaho Department of Fish and Game, cooperative agency on ISS study.

RELATED NON-BPA PROJECT	RELATIONSHIP
Lower Snake River Compensation Plan Co-op Agreement/1448000196504	Responsible for redd/carcass surveys in portions of Johnson Creek and the South Fork Salmon River

OPPORTUNITIES FOR COOPERATION:

ISS is a cooperative effort between Idaho Department of Fish and Game, the Nez Perce Tribe, the Shoshone-Bannock Tribes, and the U.S. Fish & Wildlife Service. Each cooperating agency has responsibility for investigation of different streams within Idaho. All cooperators meet together to plan project activities and discuss adaptive changes necessary to maintain project relevancy and effectiveness Equipment is shared as available. Nez Perce Tribal Hatchery will aid in facilitating the development of localized broodstocks. PTAGIS enables and assists in the use, interrogation, and data base management of Passive Integrated Transponder tags. U.S. Forest Service special use permits will be necessary with trapping (outmigration and weir) activities in the Secesh River system on land managed by the USFS.

COSTS AND FTE

1997 Planned: $270,000

FUTURE FUNDING NEEDS:

FY	$ NEED	% PLAN	% IMPLEMENT	% O AND M
1998	$275,000			100%
1999	$270,000			100%
2000	$270,000			100%
2001	$270,000			100%
2002	$270,000			100%

PAST OBLIGATIONS (incl. 1997 if done):

FY	OBLIGATED
1992	$107,050
1993	$165,275
1994	$140,134
1995	$143,989
1996	$145,805
1997	$273,702
TOTAL:	$975,955

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

LONGER TERM COSTS: $270,000
Continued implementation

1997 OVERHEAD PERCENT: 30%

HOW DOES PERCENTAGE APPLY TO DIRECT COSTS:
[Overhead % not provided so BPA appended older data.] Total direct

CONTRACTOR FTE: 5

SUBCONTRACTOR FTE: 0