SALM SUPPLEMENTATION STUDIES IN IDAHO RIVERS - 8909801

SHORT DESCRIPTION:
Evaluate out planting strategies for hatchery spring chinook salmon to restore or augment natural production, and assess the effects of hatchery supplementation on the survival and genetic fitness of existing natural populations in the Clearwater River basin.

SPONSOR/CONTRACTOR: USFWS
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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

RELATION TO MEASURE:
Implements supplementation and develops recomendations for optimal stocking strategies to increasenatural population.

TARGET STOCK	LIFE STAGE	MGMT CODE (see below)
Pete King Creek spring chinook salmon	All	S
Clear Creek spring chinook salmon	All	S

AFFECTED STOCK	BENEFIT OR DETRIMENT
Summer Steelhead	Beneficial

BACKGROUND

Stream name:
Clear Creek and Pete King Creek

Stream miles affected:
57.6 m. Total (both)

LAND AREA INFORMATION

Subbasin:
Clearwater River subbasin

Land ownership:
Both streams have both private and public

Acres affected:
39.55 total

HISTORY:
The U.S. Fish and Wildlife Service (FWS) is a cooperator in the implementation of Project 89-098 with Idaho Fish and Game (lead agency), the Nez Perce Tribe, and the Shoshone-Bannock Tribe. In May 1992 FWS 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 FWS is responsible for data collection on Clear Creek and Pete King Creek (both in the Clearwater drainage), two streams incorporated in the ISS study design. FWS assisted in adult surveys and redd counts as early as 1991.

Since the start of the ISS, returns of adult chinook salmon have decreased to historical lows. This has negatively affected our ability to measure population characteristics with a high degree of statistical power and has 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 the two study streams have been sampled at three life stages (summer parr, out migrating 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 out migration for both wild/natural and supplemented fish from various life stages (parr, presmolt, and smolt) have been accomplished for 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. An out migration (rotary screw) trap has been operated in Clear Creek since October, 1993 (when flows permitted). This trap has helped determine life history characteristics and estimate numbers of out migrating chinook salmon for brood years 1990 -1995. Adult returns have been monitored in both study streams with redd count/carcass surveys. In the case of Clear Creek, a hatchery weir also gives us data on age class structure and origin.

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 may 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 "core" 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 (if any) 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 production 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 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 protocol should pose 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 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.

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 the 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:

Ho1a: Supplementation-augmentation of existing chinook populations in Idaho does not affect natural production. Corollary: Rejecting Ho1a indicates that supplementation can enhance or deter natural production.
Ho1b: Supplementation-restoration utilizing existing hatchery stocks does not establish self sustaining natural populations of chinook salmon in Idaho.

Ho2a: Supplementation-augmentation of existing chinook population in Idaho does not reduce productivity of target or adjacent population below acceptable levels (e.g. replacement).
Corollary:rejecting Ho2a indicates that supplementation can adversely affect survival and performance of existing natural populations.
Ho2b: Supplementation does not lead to self-sustaining populations at some enhanced level (e.g. 50% increase in abundance maintained over time).

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.
Ho3b: Development of new, local broodstocks with known natural component for supplementation does not provide an advantage over utilization of existing hatchery broodstocks for supplementation within the local or adjacent subbasin.

Ho3c: The effects of supplementation on natural production and productivity does not differ among life stages (parr, presmolt, smolt) of hatchery fish released.

ALTERNATIVE APPROACHES:

N\A: There are no suitable alternatives.

JUSTIFICATION FOR PLANNING:

N\A: ISS does not focus on pre-implementation efforts.

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 for the project as a whole, 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 until 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. A similar number of hatchery fish are PIT tagged prior to release into treatment streams. Naturally produced parr and emigrants will be PIT tagged following collection by seining, minnow traps, electrofishing, or emigration traps.
Adult escapement - Escapement to Clear Creek is determined by an adult weir located very near the mouth at our Kooskia NFH trap. Multiple redd counts are used in Clear Creek and Pete King Creek. Potential spawning area is censused. Potential egg deposition will be estimated from fecundity of Kooskia NFH females.

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, 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. Fish size at release and time of release will be consistent to eliminate those variables.

PLANNED ACTIVITIES

SCHEDULE:

Planning Phase **Start** 1992 **End** 2007 **Subcontractor**

Task Data entry/summary/analysis and reporting: All YearOutmigration trap operation: All Year PIT tagging: August through JuneSummer Parr Snorkeling Estimates: July and AugustRedd/Carcass Surveys: August and OctoberAdult Weir Operation: May through September

Implementation Phase **Start** 1992 **End** 2007 **Subcontractor**

Task On-going each year -as the seasons rotate, activities described above rotate. (Treatments)

O&M Phase **Start** 1992 **End** 2007 **Subcontractor**

Task On-going for all of the above described activities-

PROJECT COMPLETION DATE:
2007

CONSTRAINTS OR FACTORS THAT MAY CAUSE SCHEDULE OR BUDGET CHANGES:
The continued decline of spring chinook salmon returning to Idaho, especially the naturally produced component, could definitely impede 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:
The spring chinook salmon populations are at levels too low to support a sport fishery.

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

Long term expected utilization and conservation potential for target population or habitat:
The long term desired goal is to restore chinook populations in Idaho to former levels, which could also support a sport fishery.

Contribution toward long-term goal:
Supplementation of Salmon and Steelhead

Physical products:
Over 1000 outplants of PIT tagged spring chinook have been made in one of the ISS streams monitored by the USFWS.

Environmental attributes affected by the project:
N\A

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:
We will monitor population changes and analyze genetic makeup of the chinook in Clear Creek; also, will provide consistent monitoring of safe trapping techniques.

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

Coordination outcomes:
Through coordination with Idaho Department of Fish and Game, Nez Perce Tribe, and Shoshone- Bannock Tribe, adult return information, juvenile production, and juvenile survival rate information isa available for several streams in Idaho.

MONITORING APPROACH

1) The ISS study design primarily focuses on monitoring and evaluation of specific suppplementation efforts. The methods described above will serve as our monitoring approach.

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:

Management is a part of ISS. In addition, at least three meetings a year are held with researchers and management personnel.

Critical uncertainties affecting project's outcomes:

Improved mainstem survival would alleviate the uncertainty of enough naturally produced chinook salmon adults to develop supplementation broodstock.

EVALUATION

We are in the process of completing the five year summary report encompassing informaiton from all project coordinators. The success of ISS could be assessed by a number of factors includling, 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:

N\A - 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 opportunities to inform the public on research activities and resource status will be utilized.

RELATIONSHIPS

RELATED BPA PROJECT	RELATIONSHIP
8335000	NPTH M+E- collection and monitoring of adult return, parr density, and outmigration data . Data is exchanged between projects.
9107300 Idaho Natural Production Monitoring and Evaluation 83-7(esa)	IDFG- Intensive Smolt Monitoring- collects data which is used by ISS.
9005500 Steelhead Supplementation Studies in Idaho Rivers	IDFG- Steelhead supplementation studies in Idaho rivers- companion study to ISS looking at steelhead supplementation . Data is exchanged between projects.

#1- Idaho Dept of Fish and Game, cooperative agency on ISS Study.#2- Nez Perce Tribe, cooperator on ISS study.#3- Shoshone-Bannock Tribe, cooperator on ISS study.All ISS cooperators collect data and assist with the fulfillment of the experimental design (

OPPORTUNITIES FOR COOPERATION:

ISS is a cooperative effort between the U.S. Fish and Wildlife Service, Idaho Dept.of Fish and Game, the Nez Perce Tribe, and the Shoshone-Bannock Tribe. 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. Kooskia NFH aids in facilitating the development of localized broodstocks. PTAGIS enables and assists in the use, interrogation, and data base manegement of Passive Integrated Transponder tags. Also, the U.S. Forest Service and local landowners continue to allow access to these streams.

COSTS AND FTE

1997 Planned: $124,092

FUTURE FUNDING NEEDS:

FY	$ NEED	% PLAN	% IMPLEMENT	% O AND M
1998	$125,000	20%	40%	40%
1999	$150,000	20%	40%	40%
2000	$150,000	20%	35%	45%
2001	$150,000	15%	35%	50%
2002	$150,000	15%	30%	55%

PAST OBLIGATIONS (incl. 1997 if done):

FY	OBLIGATED
1992	$104,986
1993	$76,970
1994	$73,461
1995	$94,856
1996	$91,098
1997	$124,092
TOTAL:	$565,463

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

OTHER NON-FINANCIAL SUPPORTERS:

None

1997 OVERHEAD PERCENT: 32%

HOW DOES PERCENTAGE APPLY TO DIRECT COSTS:

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

CONTRACTOR FTE: 5

SUBCONTRACTOR FTE: 1