STEELHEAD SUPPLEMENTATION STUDIES IN IDAHO RIVERS 9005500

SHORT DESCRIPTION:
Determine if supplementation can be used to rebuild depressed stocks and re-establish extirpated stocks of summer steelhead. Research different methodologies to determine the best method(s) to supplement steelhead stocks to improve natural production. Gather life-history attributes from wild stocks to guide decisions to match donor and recipient stocks.

SPONSOR/CONTRACTOR: IDFG
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SUB-CONTRACTORS:
none

GOALS

GENERAL:
Supports a healthy Columbia basin, Maintains biological diversity, Maintains genetic integrity, Increases run sizes or populations

ANADROMOUS FISH:
Research, M&E

NPPC PROGRAM MEASURE:
4.1A, 4.1C, 4.1D, 4.2A, 5.9A.1, 7.1.C3

RELATION TO MEASURE:
Collects genetic, life-history, and morphological characteristics from wild steelhead populations.

TARGET STOCK	LIFE STAGE	MGMT CODE (see below)
Red River steelhead	Fry,parr,smolts,adults	S, (P)
Upper Salmon River steelhead	Fry,parr,smolts,adults	S, E?, (P)
East Fork Salmon River steelhead	Fry,parr,smolts,adults	S, E?, (P)
Rapid River steelhead	Fry,parr,smolts,adults	N, (P), W
Lower Selway River Steelhead	Fry,parr,smolts	N, (P), W
Upper Lochsa River Steelhead	Fry,parr,smolts	N, (P), W
Lower Lochsa River Steelhead	Fry,parr,smolts,adults	N, (P), W

AFFECTED STOCK	BENEFIT OR DETRIMENT
East Fork Salmon River chinook salmon	Beneficial
Upper Salmon River chinook salmon	Beneficial
Rapid River bull trout	Beneficial
Rapid River summer chinook salmon	Beneficial
Lochsa River bull trout	Beneficial
Lochsa River cutthroat trout	Beneficial

BACKGROUND

Stream name:
Fish Creek, Gedney Creek, Red River, SF Red River, Crooked Fork Creek, Marsh Creek, Frenchman Creek, Beaver Creek, other tributaries of the Clearwater and Salmon drainages

Subbasin:
Lochsa River, Selway River, Salmon River

HISTORY:

The projects objectives, methods, and experimental design was submitted to BPA in December 1992. Field work began in 1993 and the full implementation of the project was planned by the end of 1995. Because of BPA funding reductions, we have not been able to implement the full study as described in the Experimental Design.

BIOLOGICAL RESULTS ACHIEVED:

1993
Intensively snorkeled 8 streams to obtain juvenile steelhead densities.
Recorded stream temperatures at 17 sites in 17 streams.
Install a weir in Fish Creek to collect wild adult steelhead escapement, length, sex ratio, and scales.
Collected 4,748 and PIT-tagged 2,870 wild juvenile steelhead in 6 streams. Obtained the length, weight, condition factor, and migration timing of juvenile steelhead from the streams.
Stocked hatchery adult steelhead in Frenchman and Beaver creeks (Objective 1)
Stocked 50,000 hatchery fingerlings in the South Fork Red River (Objective 2).
Did a stream habitat survey in 5 streams.
318 wild PIT-tagged steelhead smolts were detected at the Snake River dams and McNary Dam during the spring.

1994
Intensively snorkeled 11 streams to obtain juvenile steelhead densities.
Recorded stream temperatures at 34 sites in 29 streams.
Install a weir in Fish Creek to collect wild adult steelhead escapement, length, sex ratio, and scales.
Collected 9,312 and PIT-tagged 6,314 wild juvenile steelhead in 12 streams. Obtained the length, weight, condition factor, and migration timing of juvenile steelhead from the streams.
Stocked hatchery adult steelhead in Frenchman and Beaver creeks (Objective 1)
Stocked 50,000 hatchery fingerlings in the South Fork Red River (Objective 2).
Did a stream habitat survey in 4 streams.
795 wild PIT-tagged steelhead smolts were detected at the Snake River dams and McNary Dam during the spring.

1995
Intensively snorkeled 8 streams to obtain juvenile steelhead densities.
Recorded stream temperatures at 36 sites in 32 streams.
Installed a weir in Fish Creek and collected wild adult steelhead escapement, lengths, sex ratio, and scales.
Recorded air temperature, relative humidity, and air pressure at Fish Creek.
Trapped 4,278 and PIT-tagged 3,523 wild juvenile steelhead in 7 streams. Obtained the length, weight, condition factor, and migration timing of juvenile steelhead from the streams.
Stocked hatchery adult steelhead in Beaver Creek (Objective 1)
Stocked 50,000 hatchery fingerlings in the South Fork Red River (Objective 2).
Did a stream habitat survey in 1 stream.
1,305 wild PIT-tagged steelhead smolts were detected at the Snake River dams and McNary Dam during the spring.

1996
Intensively snorkeled 11 streams to obtain juvenile steelhead densities.
Recorded stream temperatures at 38 sites in 32 streams.
Installed a weir in Fish Creek and collected wild adult steelhead escapement, lengths, sex ratio, and scales.
Recorded air temperature, relative humidity, and air pressure at Fish Creek.
PIT-tagged 7,340 wild juvenile steelhead in 8 streams. Obtained the length, weight, condition factor, and migration timing of juvenile steelhead from the streams.
Stocked hatchery adult steelhead in Beaver Creek and PIT-tagged 100 parr (Objective 1)
Stocked 50,000 hatchery fingerlings in the South Fork Red River and 8,000 hatchery smolts in Red River (Objective 2).
Did a stream habitat survey in 5 streams.
1,317 wild PIT-tagged steelhead smolts were detected at the Snake River dams and McNary Dam during the spring.

PROJECT REPORTS AND PAPERS:

Steelhead supplementation studies in Idaho Rivers. Annual Report 1993.

Steelhead supplementation studies in Idaho Rivers. Annual Report 1994. (Final draft being reviewed by IDFG staff).
Steelhead supplementation studies in Idaho Rivers. Annual Report 1995. (First draft being reviewed by IDFG staff).
Steelhead supplementation studies in Idaho Rivers. Annual Report 1996. (In progress; first draft complete 4/1/97).

ADAPTIVE MANAGEMENT IMPLICATIONS:

The general expectation for supplementation among management and user groups in Idaho is to use artificial propagation to improve natural production of steelhead and build self-sustaining, harvestable populations of steelhead in the Salmon River and Clearwater River drainages without adversely impacting existing wild populations. This research will be used to guide management decisions and policy on the supplementation methods used to attain fishable steelhead populations and to restore steelhead where extirpated. Data from smolt PIT-tag detections will be incorporated in IDFG recommendations for mainstem flow and river management polices.

PURPOSE AND METHODS

SPECIFIC MEASUREABLE OBJECTIVES:

1 . Monitor Beaver and Frenchman creeks to determine juvenile and smolt production from adult outplants.
2. Outplant wild steelhead adults (when escapement increases) and compare the production of juveniles and smolts with a hatchery stock.
3. Assess the survival from egg to smolt and from smolt to adult of wild steelhead that are spawned and reared in a hatchery and compare with the hatchery stock.
4. Determine the number of adults that return from the fingerling stockings in SF Red River and from smolt stockings in Red River. Estimate and compare juvenile production from the adults from the two groups (fingerling or smolt stocking) that spawn naturally.
5. Continue PIT-tagging juvenile steelhead to obtain smolt migration characteristics, survival rates from parr-to-smolt, survival from smolt-to-adult, and growth rates in the streams.
6. Continue snorkeling "key" steelhead production stream to tract abundance on a yearly basis.
7. Collect baseline disease and genetic data from wild steelhead streams in the Clearwater River and Salmon River drainages.

CRITICAL UNCERTAINTIES:

The uncertainties this research addresses include: 1) the relative ability of hatchery and wild steelhead broodstocks to re-establish naturally producing populations where extirpated, 2) the ability of hatchery steelhead released at different life stages to produce adults and the ability of those adults to produce progeny in the wild, 3) assessing the abundance and life history characteristics of steelhead in various streams and habitats in the Salmon River and Clearwater River drainages and 4) the effects (if any) of steelhead supplementation on existing wild populations of steelhead, chinook salmon, and resident species.

BIOLOGICAL NEED:

To determine the best methods to increase production of naturally spawning steelhead and to re-establish steelhead in streams where extirpated by comparing the performance of a wild stock(s) with a hatchery stock(s). Wild steelhead escapement into Idaho has been on a downward trend in recent years. NMFS has proposed listing Idaho steelhead as a threatened species under ESA. Many watersheds where wild steelhead reside are in roadless and wilderness areas--habitat is pristine in these locations. Habitat has been degraded in other areas from agriculture, logging, and mining. The mainstem Snake-Columbia rivers smolt migration habitat has been degraded by the construction of eight dams.

HYPOTHESIS TO BE TESTED:

H1: There is no difference among brood sources to establish natural production (supplementation-restoration) in tributaries of the upper Salmon River.
H2: There is no difference in survival between a wild brood source and an established hatchery brood source from: (1) egg-to-smolt in a hatchery environment; (2) smolt-to-adult of fish reared in a hatchery and released into the natural environment; (3) egg-to-age 1 parr in the natural environment; and (4) age 1 parr to smolt in the natural environment.
H3: There is no difference between fingerling or smolt stockings in establishing natural steelhead production as measured by F, age 1 juvenile abundance in the Red River drainage.
H4: There is no difference among wild steelhead stocks in: (1) smolt age; (2) smolt length; (3) smolt migration pattern; (4) smolt condition factor; (5) juvenile growth rates and; (6) parr migration patterns.

ALTERNATIVE APPROACHES:

Byrne A. 1994. Steelhead supplementation studies in Idaho rivers. Experimental Design. Idaho Department of Fish and Game, Boise. 90pp.

JUSTIFICATION FOR PLANNING:

Supplementation has been identified as a method to increase production in the Columbia Basin yet many uncertainties exist as to whether supplementation can increase natural production. This research was designed to address these uncertainties and to develop guidelines for supplementation of steelhead stocks in Idaho.

METHODS:

Objective 1: Assess the performance of hatchery and wild brood sources to re-establish steelhead in streams where extirpated.

Approach: Ideally, supplementation-restoration utilizing various brood sources would be assessed at the population level by releasing hatchery fish into separate drainages and tracking fish abundance, survival between life stages, and life history attributes (sex ratio, fecundity, size, etc.) over several generations for each population. Because of the large number of streams that would be required, risks associated with supplementation uncertainties, and the desire to expedite feedback, we have partitioned this research hypothesis into four chronological components that will be tested somewhat independently: in-hatchery survival, post-release survival, reproductive success, and long-term fitness.

General

1) Collect hatchery adults at Sawtooth Hatchery and wild adults from the Middle Fork Salmon River or main Salmon River.

In-hatchery performance

2) Determine percent eye-up, survival, growth, health, and condition factor to the smolt stage of each brood source using general hatchery operating procedures. We plan to use 7 -15 pair of fish per brood source. Each brood source will be handled and reared equivalently, but in separate raceways. ANOVA will be used to test for differences among the brood sources for length, weight, and condition factor utilizing a completely random design. No statistical test for percent eye-up and survival is required since a total count of green eggs, eyed eggs, and smolts for each brood source will be made in the hatchery.

Post release survival

3) Release hatchery reared smolts at weir sites to coincide with natural smolt migration. Using PIT tag detections, measure travel time of outplanted smolts from each brood source to Lower Granite Dam. Each year's data can be analyzed with ANOVA using a Completely Random Design. When several years of data are combined, a Repeated Measures (split plot in time) ANCOVA will be used with flow as the covariate. Smolt survival data will be analyzed with log-linear models.

4) Identify the brood source of adults returning to the weir. Determine smolt-to-adult survival, sex ratio, length, weight, age, fecundity, and timing of return of adults. Results of the first release year, except survival, will be analyzed by ANOVA using a Completely Randomized Factorial Design. Since smolts will be released for 3 consecutive years, a Repeated Measures Analysis (split plot in time) will be used for subsequent analysis. Smolt-to-adult survival data will be analyzed using log-linear models.

Reproductive Success

5) Outplant 7 - 10 pair of adults from each brood source into vacant habitat in two streams that are suitable for steelhead production. Enclose the section of stream where adults are stocked with picket weirs. Determine pre-spawning mortality by daily carcass census in the enclosed stream reach and track the number of redds built. Estimate egg retention from carcass necropsies and calculate the number of eggs deposited in redds.

6) Trap juvenile steelhead immigrants and emigrants with 2-way weirs. Measure stream flow, temperatures, conductivity, and other habitat characteristics.

7) Estimate parr production by snorkel surveys and trapping juvenile emigrants.

8) Estimate reproductive success of each brood year from the number of fry emigrants and age 1 parr densities produced from known adult spawning escapement. The null hypothesis is no differences between brood sources (tested with ANOVA using a split-plot in time repeated measures design). Covariates in the analysis could include the number of spawners, conductivity, temperature, and habitat area.

Long-term fitness

9) PIT tag 500 - 800 juvenile steelhead when they reach 70 mm length. Fish will be collected by seining, electrofishing, minnow

traps, and emigrant traps.
10) Trap smolts leaving the streams, determine age, length, weight, time of migration, and yield. Interrogate smolts for PIT tags and tag untagged fish to estimate their travel time and survival to Lower Granite Dam.
11) Estimate long-term fitness as a function of smolt production to Lower Granite Dam and emigration characteristics. Null hypothesis of no differences between brood stocks (tested with ANOVA using a split-plot in time repeated measures design). Covariates in the analysis could include the number of spawners, conductivity, temperature, and habitat area.
12) Use the results obtained from experiments to propose guidelines for donor stock selection in restoration rivers.

Objective 2: Evaluate the ability of returning adults from hatchery smolt and fingerling releases to produce progeny in natural streams.

Our research will focus on life stage of release using an established hatchery stock. We will compare the abundance of age 1 steelhead parr produced by naturally spawning adults that were released as hatchery fingerlings or smolts. Because of limited research opportunities we will use only an established hatchery broodstock(s) to test this hypothesis. Fingerlings (rather than fry) were chosen since the fish can be fin marked and PIT tagged prior to release into the study streams. The primary evaluation point will be age 1 parr abundance produced from the returning adults This objective is being investigated in the upper Red River drainage.

1) Release 50,000 marked fingerlings (5,000 PIT-tagged, 45,000 CWT) into the South Fork Red River for four consecutive years. Stocking began in 1993.
2) Release 5,000 PIT-tagged smolts in Red River, upstream of the South Fork Red River, for four consecutive years. Begin stocking in 1996.
3) Snorkel the SF Red River and Red River yearly to obtain juvenile steelhead densities.
4) Determine smolt production from PIT tag detections at Lower Snake River dams from smolt and fingerling releases.
5) Trap returning adults at the Red River weir. Determine the origin of the fish and allow them to spawn naturally. We may u se radio telemetry to follow fish to spawning areas.
6) Estimate reproductive success to age 1 using densities obtained from snorkel surveys. Null hypothesis of no differences between smolt or fingerling release can be tested with ANOVA using a split-plot in time repeated measures design. Covariates in the analysis could include the number of spawners, conductivity, temperature, and habitat area.

Objective 3: Assess the abundance, habitat, and life history characteristics of existing steelhead populations in the Salmon and Clearwater river drainages.

1) For each study stream record daily mean, maximum, and minimum temperatures; develop stream hydrograph, estimate proportion of each habitat type, measure conductivity, and gather other pertinent stream and geological data. Snorkel study streams to obtain summer juvenile steelhead densities. PIT tag juvenile steelhead and estimate survival during freshwater rearing and to Lower Snake River dams.
2) Estimate adult steelhead escapement into Fish Creek, Clear Creek, Pahsimeroi River, and the upper Salmon River streams with weirs. Record length of adults, sex ratio, age, and date of return. Develop stock-recruit curves relating spawners with juvenile density and smolt yield.
3) Trap emigrating parr and smolts at screw traps operated by this project and the Idaho Supplementation Studies chinook project. Length, weight, age, and date captured are recorded for outmigrating steelhead. PIT tag fish for survival and travel time estimates to Lower Granite Dam. ANOVA will be used to test for differences among rivers for smolt length and weight.
4) Obtain baseline genetic and pathogenic data on steelhead populations. Measure allelic frequency for naturally produced steelhead using electrophoresis. ANOVA will be used to test for stream differences and differences between hatchery and wild steelhead. Values used in the analysis will be the arcsin of the square root of the frequency of the common allele at each locus. In addition, cluster analysis techniques will be applied to Nei's genetic distance to develop a denogram showing the relations among steelhead stocks within Idaho.

PLANNED ACTIVITIES

SCHEDULE:

Planning Phase **Start** 1) 19922) 1993 **End** 19922004 **Subcontractor** nono

Task Study designed and planned. Yearly logistical planning for project.

Implementation Phase **Start** 1993 **End** 2004 **Subcontractor** no

Task Task:

1) Outplant hatchery adult and wild (dependent upon escapement) into streams for Objective 1 experiments. To date we have not stocked any wild fish because of low wild escapements hatchery adults stocked yearly from 1993 - 1996.
2) Begin the evaluation of a wild stock(s) in a hatchery as outlined in Objective 1 methods. We have not started this task because of low wild steelhead escapements.
3) Stock hatchery fingerling steelhead in SF Red River and hatchery smolts in Red River as outlined in Objective 2 methods. Monitor the Red River weir for returning adults and snorkel each stream to estimate juvenile steelhead abundance. Task on schedule as outlined in experimental design.
4) Install a weir in Fish Creek to enumerate wild adult steelhead escapement. Task on schedule.
5) Operate screw trap to estimate juvenile out-migration. Pit-tag juveniles > 70 mm at each trap. Task on schedule
6) Snorkel study streams each summer for juvenile steelhead densities. Collect and PIT-tag juvenile steelhead in selected streams during the summer. Task on schedule.
7) Collect wild steelhead from tributaries of the Clearwater and Salmon rivers for genetic and disease analysis.8) Data analysis and reporting.

O&M Phase **Start** 1993 **End** 2004 **Subcontractor** No

Task Maintenance of projects computers, equipment and vehicles as needed.

PROJECT COMPLETION DATE:

2004

CONSTRAINTS OR FACTORS THAT MAY CAUSE SCHEDULE OR BUDGET CHANGES:

1) Listing of steelhead under ESA.
2) The wild steelhead escapement must be large enough for us to take adults out of wild production areas to use in Objective 1 experiments.

OUTCOMES, MONITORING AND EVALUATION

SUMMARY OF EXPECTED OUTCOMES

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

Objective 1: Wild brood sources will perform better compared with hatchery sources in the natural stream environment. Hatchery fish will perform better in the hatchery environment.
Objective 2: Smolt stockings will produce more adult returns per fish stocked than fingerling stocking, but the adults returning from a fingerling stocking will produce more progeny per female in the natural stream environment.
Objective 3: There will be differences among the wild stocks in smolt age, length, and condition factor. Streams that are warmer will produce smolts that are younger and smaller than colder streams. Genetic analysis will show that there are differences among stocks throughout the state, in general fish that are in geographical proximity will be more similar than fish that are more distant.

Present utilization and convservation potential of target population or area:

No harvest is allowed on naturally produced steelhead adults. Where steelhead have not been blocked from their historic range by dams, there are large areas in roadless and wilderness areas.

Assumed historic status of utilization and conservation potential:

In the late 1950's and early 1960's, 20,000 - 30,000 wild adult steelhead were harvested yearly in Idaho by sport fishers. Idaho steelhead were also heavily exploited in the Columbia River by commercial, sport, and tribal fisheries. Idaho produced 55% of the total number of summer steelhead in the entire Columbia River Basin.

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

To have self sustaining naturally produced populations throughout their range that are productive enough to allow sport harvest of

adults. Maintain pristine habitat where present today and implement cooperative projects with other agencies and landowners to improve habitat in degraded areas.

Indirect biological or environmental changes:
None are expected.

Physical products:
1) 20,047 wild juvenile steelhead PIT-tagged since 1993
2) fish densities obtained from 7 - 11 streams yearly
3) stream habitat surveys completed on 13 streams
4) 200,000 hatchery steelhead fingerlings stocked in SF Red River since 1993. 20,000 were PIT-tagged, 135,000 coded wire tagged, and 45,000 fin clipped.
5) 8,000 hatchery steelhead smolts stocked in Red River—4,000 were PIT-tagged and 4,000 fin clipped.
6) 150 hatchery adult steelhead outplanted in Beaver and Frenchman creeks since 1993.
7) Stream temperatures recorded in 32 streams.
8) Estimated adult escapement in Fish Creek since 1992.

Environmental attributes affected by the project:
This project has no effect on stream flow, stream temperature, land use, or other environmental factors.

Changes assumed or expected for affected environmental attributes:
NA--no attributes are effected

Measure of attribute changes:
NA

Assessment of effects on project outcomes of critical uncertainty:
(See Methods section)

Information products:
The Methods Section describes how the data collected from this project will be analyzed. Annual progress reports describe each years tasks and findings. The five year reports will summarize long-term trends and findings. The final report will assess the utility of supplementation as a recovery tool. IDFG management receives interim progress reports and research briefs on this project.

MONITORING APPROACH

Provisions to monitor population status or habitat quality:
1) yearly snorkel surveys to assess juvenile densities.
2) trapping out-migrants with screw traps
3) counting wild adult steelhead escapement at weirs
4) PIT-tagging juveniles to estimate survival from parr-to-smolt; smolt-to-adult.

Data analysis and evaluation:
[BPA Note: This section extracted from Methods section to save database space]
The first-year data of some experiments, for example smolt travel time and survival to Lower Granite Dam, will be analyzed with a completely randomized factorial design. This design can be used to test for in-hatchery growth, condition factor, and health differences among broodstocks.

Since most of the experiments in this study will be repeated on a yearly basis for three to four years, the data will be analyzed upon completion with ANOVA using a repeated measures design (split plot in time) with two or three treatments.

Log-linear models will be used to analyze adult return data. Log linear models are a good method for analysis of survival data of known numbers of smolt releases since we are dealing with ordinal (count) data. Analysis of the adult return from one smolt release can be done using the standard chi-square test for independence. For example, adults from b broodstocks released at I weirs can be arranged into a b x I table. When all the data has been collected from the y release years, a b x I x y multidimensional contingency table is formed for analysis. Two models, the product multinominal and super multinominal, will be used for the analysis of multidimensional contingency tables. The product multinominal model is used for hypothesis testing. The model is a treated as a product multinominal (rows are treatments and row totals are fixed). This procedure will determine what independent variables are necessary to predict the logic. In the adult return from smolt release example, brood source is the response variable, and location and year are the independent variables. A test of significance would be made for location, year, and the interaction between location and year. A significant effect implies that a factor is necessary to explain the observed adult return rate of the brood sources. The super multinominal model is not concerned with dependent and independent variables or hypotheses testing. Unlike the product multinominal model, row and column margins are not fixed. Only the total number of observations (N), is fixed. This method is a goodness of fit test to pick a model which best explains the data.

Several nonparametric statistics will be used for data analysis. Kolomogorov-Smirnov statistics will be used to test for differences in distribution functions of spawning time, time of emigration, and time of smolt migration. A Cox-Stuart test for trend will be used to test for changes in adult escapement and juvenile densities if changes are made at existing weir sites and the binomial test can be used to test for changes in sex ratios.

Information feed back to management decisions:

IDFG management personnel receive yearly progress reports on this research. Research briefs and technical information is given as data becomes available. This project is designed to answer uncertainties associated with steelhead supplementation and to develop guidelines for steelhead supplementation in Idaho.

Critical uncertainties affecting project's outcomes:

This project was designed to answer specific uncertainties about supplementation. Our methods were outlined in the Methods section.

EVALUATION

1) 20,047 wild juvenile steelhead PIT-tagged since 1993
2) fish densities obtained from 7 - 11 streams yearly
3) stream habitat surveys completed on 13 streams
4) 200,000 hatchery steelhead fingerlings stocked in SF Red River since 1993. 20,000 were PIT-tagged, 135,000 coded wire tagged, and 45,000 fin clipped.
5) 8,000 hatchery steelhead smolts stocked in Red River—4,000 were PIT-tagged and 4,000 fin clipped.
6) 150 hatchery adult steelhead outplanted in Beaver and Frenchman creeks since 1993.
7) Stream temperatures recorded in 32 streams.
8) Since 1995 this project has estimated the wild steelhead escapement in Fish Creek . From 1992-1994 BPA project 90-052 estimated the escapement. We have been intensively monitoring parr and smolt production from Fish Creek from these adult escapements to develop stock-recruit relationships for this population. This type of information is not available for any other wild steelhead stock in Idaho and very few wild stocks elsewhere.

Incorporating new information regarding uncertainties:

The project was designed to answer several key uncertainties that were identified by the Regional Assessment of Supplementation Projects report (see the Experimental Design for a through discussion). If information becomes available that effects these uncertainties, there is enough flexibility in the study design to alter tasks and rearrange priorities.

Increasing public awareness of F&W activities:

The project assess risks and benefits of different supplementation strategies. This will help policy makers reject supplementation methods that are detrimental to steelhead and focus effort on those can benefit the fish.

RELATIONSHIPS

RELATED BPA PROJECT	RELATIONSHIP
9107200 Research and recovery of Snake River sockeye	We share personnel, equipment, and assist each other as both projects work in the Stanley, Idaho area.
9107300 Idaho Natural Production Monitoring and Evaluation	We share equipment, personnel, and data. We often cooperatively snorkel and PIT-tag in study streams that are in the same geographic area
9005200 Performance/Stock productively impacts of hatchery supplementation	This study is testing our hypothesis H2 (see Testable Hypothesis section) in the Clearwater River drainage. This allows us to focus our research on hypothesis H2 in the Salmon River drainage
8909800 Idaho supplementation studies (ISS)	We share equipment, personnel, and data. Steelhead data collected from ISS study streams include parr densities, PIT-tagging steelhead at screw traps, and juvenile migration characteristics

OPPORTUNITIES FOR COOPERATION:
We have used the adult steelhead weir in Fish Creek that was constructed by NBS for BPA project #90-052.This project and BPA projects 89-098, 91-73, and 91-72 share equipment used to snorkel streams, collect and PIT-tag fish, and screw traps. Personnel from these projects often work cooperatively in streams were data is collected for more than one project.

COSTS AND FTE

1997 Planned: $220,000

FUTURE FUNDING NEEDS:

FY	$ NEED	% PLAN	% IMPLEMENT	% O AND M
1998	$230,000	20%	50%	30%
1999	$230,000	20%	50%	30%
2000	$230,000	20%	50%	30%
2001	$230,000	20%	50%	30%
2002	$230,000	20%	50%	30%

PAST OBLIGATIONS (incl. 1997 if done):

FY	OBLIGATED
1991	$284,728
TOTAL:	$284,728

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

LONGER TERM COSTS:
2003-2004 final year of study, $230,000 (97 dollars spent as shown above)
2005: Final data analysis and report of the study findings, no field activities this year: $100,000

1997 OVERHEAD PERCENT: 24.6%

HOW DOES PERCENTAGE APPLY TO DIRECT COSTS:
Personnel and Operating costs only

CONTRACTOR FTE: 1 permanent and 2-3 temporaries

SUBCONTRACTOR FTE: 0