

ASSESSING SUMMER AND FALL CHINOOK SALMON RESTORATION-- SNAKE RIVER BASIN

9403400

SHORT DESCRIPTION:

Assess summer and fall chinook salmon spawning habitat, incubation survival, growth rates, emigration timing and survival for evaluating recovery and restoration potential through supplementation in the Clearwater, Middle Fork Clearwater, South Fork Clearwater, Selway, Lochsa, Grande Ronde, Salmon, and Imnaha Rivers.

SPONSOR/CONTRACTOR: NPT-DFRM

Nez Perce Tribe Department of Fisheries Resources Management

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SUB-CONTRACTORS:

Possibly a statistical consulting subcontract, contractor not known at this time.

GOALS

GENERAL:

Supports a healthy Columbia basin, Maintains biological diversity, Maintains genetic integrity, Increases run sizes or populations, Provides needed habitat protection

ANADROMOUS FISH:

Research, M&E

NPPC PROGRAM MEASURE:

7.3B.2; 7.5B.1

RELATION TO MEASURE:

This project will evaluate the restoration potential of summer and fall chinook salmon in mainstem tributaries of the Snake River above Lower Granite Dam. We will evaluate how effective supplementation may be in rebuilding the Snake River fall chinook salmon population in mainstem tributaries by releasing Lyons Ferry Hatchery subyearling fall chinook in study streams and comparing juvenile emigration characteristics and survival to that of naturally produced fall chinook subyearlings.

OTHER PLANNING DOCUMENTS:

Proposed Recovery Plan for Snake River Salmon (March, 1995), 4.7 Biological Objective is to restore listed chinook salmon by reintroducing them into historic habitat; and 4.7.d. Objective is to reintroduce spring/summer chinook salmon in the Lochsa and Selway Rivers once an appropriate stock is identified; and 4.8 Biological Objective is to conduct research to facilitate management that optimizes hatchery production and conserves natural populations. In relation to the Draft Tribal Recovery Plan (June, 1995 p 3-20), the plan states that "fish utilized in supplementation and reintroduction efforts will be selected to best match the natural population of the stream in question" and "the increase in survival and reproduction capacity gained through the use of artificial propagation in supplementation and reintroduction programs is neces

TARGET STOCK

LIFE STAGE

MGMT CODE (see below)

Imnaha River Summer Chinook

All

L,S, W

Salmon River Summer Chinook

All

S, L, W

Grande Ronde Summer Chinook

All

S, E

Clearwater River Summer Chinook

All

S, E

Snake River Fall Chinook

All

S, L, W

AFFECTED STOCK

BENEFIT OR DETRIMENT

None

BACKGROUND

Stream name:

Clearwater River and major tributaries, Grande Ronde, Imnaha and Salmon Rivers

Subbasin:

Snake River

Stream miles affected:

160, 45, 20, and 105, respectively

Land ownership:

public and private

HISTORY:

The Mainstem Clearwater River Study: Assessment for Salmonid Spawning, Incubation and Rearing (Arnsberg et al. 1992) described more than adequate habitat for the recovery and restoration of the ESA listed Snake River fall chinook in the lower Clearwater River and recommended studies of juvenile fall chinook life history characteristics and emigration survival to the mainstem dams. The Mainstem Clearwater River Study included flow and water temperature release recommendations from Dworshak Reservoir to enhance habitat conditions for Snake River fall chinook and all anadromous species and life stages. This study is a follow-up study for information needed on juvenile fall chinook life history characteristics and survival in the lower Clearwater River in relation to flow and water temperature releases from Dworshak Reservoir and to evaluate potential and vacant habitat in the upper Clearwater River and major tributaries, lower Grande Ronde, Imnaha, and Salmon Rivers for assessing summer and fall chinook recovery and restoration potential.

BIOLOGICAL RESULTS ACHIEVED:

Aerial redd surveys revealed fall chinook spawning in all major tributaries to the Snake River and included the mainstem Clearwater, South Fork Clearwater, and Salmon Rivers, and in cooperation with the USFWS and Idaho Power Company, the Grande Ronde and Imnaha Rivers. Fall chinook redds were totaled for each river, locations mapped, and carcasses collected (primarily in the lower Clearwater River) for biological information and in determining hatchery contributions to the natural spawning population. Chinook spawning habitat quantity and quality and water temperature monitoring in the upper Clearwater River and major tributaries were assessed and data are being used to develop a broodstock management plan for restoring chinook stocks in these streams. PIT tag data on wild subyearling fall chinook in the lower Clearwater River indicate that unseasonably high and cold Dworshak Reservoir releases during the summer rearing period may have adverse physiological effects on the fish, resulting in slower growth rates and a higher propensity for yearling emigration to the ocean instead of the more common subyearling type. PIT tag data on Lyons Ferry Hatchery fall chinook subyearlings released in the lower Clearwater River indicate that larger fish released earlier in the year have higher survival rates to the mainstem dams than smaller fish and fish released later in the summer.

PROJECT REPORTS AND PAPERS:

Assessing Summer and Fall Chinook Salmon Restoration in the Upper Clearwater River and Principal Tributaries (1994 Annual Report to BPA). In the process of finishing the 1995-96 Annual Report. Quarterly progress reports have been submitted to BPA.

ADAPTIVE MANAGEMENT IMPLICATIONS:

This research and monitoring study may direct future supplementation strategies (i.e. release location, release timing, release fish size, acclimation versus direct stream release) for Lyons Ferry Hatchery fall chinook supplementation above Lower Granite Dam. This study will provide a broodstock management plan for supplementation to recover stocks of summer and/or fall chinook salmon in the upper Clearwater and major tributaries, Grande Ronde, Imnaha, and Salmon Rivers. Our 1994 Annual Report recommended discharge and water temperature releases from Dworshak Dam that may provide benefits to the ESA listed fall chinook and all anadromous stocks in the lower Clearwater River and reiterated earlier recommendations (Arnsberg et al. 1992). Spawning habitat quality assessments may result in greater habitat protection measures in critical and potential summer and fall chinook spawning reaches.

PURPOSE AND METHODS
SPECIFIC MEASUREABLE OBJECTIVES:

Objective 1. Analyze water temperature data to determine optimal summer and/or fall chinook spawning times for highest egg survival and report summer rearing conditions that may limit restoration in certain stream reaches. This is an ongoing objective to describe environmental variability in streams and how it relates to the recovery and restoration potential of available stocks. Egg incubation studies will describe egg-to-fry survival under different environmental conditions and a growth model will estimate growth and emigration timing from different spawning times of available stocks. Objective 2. Determine the quality and

quantity of summer and fall chinook spawning habitat in the lower Imnaha River and in relationship to the current spawning activity. We will describe the spawning substrate quality and habitat availability for assessing the restoration potential of summer and/or fall chinook. We will monitor current fall chinook adult escapement to spawning areas and describe the hatchery contribution to natural production.

Objective 3. Investigate the movement patterns, growth rates, and survival of wild and hatchery fall chinook salmon in the lower Clearwater and Grande Ronde Rivers, and if enough fish are available, in the lower Imnaha and Salmon Rivers. We will PIT tag wild and hatchery fall chinook subyearlings and document the emigration timing and survival as it relates to size and time of release under different environmental conditions i.e. water temperatures and flows.

CRITICAL UNCERTAINTIES:

Relative chinook salmon smolt performance and emigration survival under different flow and passage conditions at mainstem Snake and Columbia River dams is a suitable indicator for predicting adult returns. Flow and passage conditions at the mainstem dams will be improved substantially for juvenile migrants in the near future so supplementation can be adequately assessed as a tool to recover the Snake River fall chinook.

BIOLOGICAL NEED:

This project addresses uncertainties about spawning, incubation and rearing potential of summer and fall chinook in major production tributaries of the Snake River. The juvenile emigration timing and survival information from production areas through the mainstem dams will be essential for mainstem dam operations to aid in recovery and how supplementation can best help to restore natural populations. In the past, it was assumed the Snake River fall chinook had a pronounced subyearling migration pattern and emigrated before water temperatures reached critical high levels in the lower Snake River reservoirs during the summer months. Although data is limited by the low number of PIT tagged fish, we have found that fall chinook at least in the lower Clearwater River may have a greater propensity to migrate as yearlings under adverse temperature and flow releases from Dworshak Reservoir. Limited fall chinook emigration data from the Clearwater River also suggest subyearling migration occurs mostly during the summer months but also into the fall and winter.

HYPOTHESIS TO BE TESTED:

ated hatchery versus direct stream released fall chinook.

ALTERNATIVE APPROACHES:

N/A, no biological objectives were rejected.

JUSTIFICATION FOR PLANNING:

N/A, project is in research and monitoring phase.

METHODS:

growth rates, and survival from the lower Clearwater River to the mainstem dams. A total of 24,000 PIT tagged hatchery subyearlings at two sizes (75 and 95 mm) will be acclimated for six days and released into the Clearwater River over a six week period (4 replicates of 500 fish of each size). Another 1,250 PIT tagged hatchery subyearlings will be direct stream released on each date as the acclimated fish groups for a total of 7,500 fish. Survival rates will be compared to wild fall chinook subyearlings captured and PIT tagged (up to 4,000) in the lower Clearwater River. Sample sizes were base on sample means and variances obtained for the 1996 survival studies on the Snake and Clearwater Rivers. The Survival Under Proportional Hazards (SURPH) model will be used to estimate survival to the mainstem dams. ANOVA will be used to measure statistical survival differences between hatchery 1) Conduct aerial fall chinook spawning ground surveys by helicopter to determine adult escapement and spawning locations in the Clearwater, Grande Ronde, and Salmon Rivers. Redds will be mapped on each survey and verified from the ground to document spawning escapement and locations. Spawned-out fish will be collected and biological measurements made to determine sex, size, age, percent spawned, and the percent hatchery contributions to natural production.

PLANNED ACTIVITIES

SCHEDULE:

Planning Phase	Start 4/92	End 10/92	Subcontractor
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Task Project planning included identifying mainstem tributaries of the Snake River that summer and fall chinook historically existed or are in decline. A research and monitoring plan was set up to identify underlying causes of decline and what should be accomplished to restore stocks which included monitoring water temperatures during critical life stages, describing spawning habitat quantity and quality, investigating the extent of current spawning activity, describing life history strategies such as emigration timing, and develop an experimental design to see how supplementation can best be used to recover chinook stocks in those streams.

Implementation Phase **Start** 10/94 **End** 12/02 **Subcontractor**

Task Monitor fall chinook adult escapement by aerial redd surveys and collect carcasses for biological information.

Implementation Phase **Start** 7/94 **End** 12/02 **Subcontractor**

Task Investigate the movement patterns, emigration timing, growth rates, and survival of naturally produced and hatchery fall chinook in the lower Clearwater, Grande Ronde, and Salmon Rivers to the mainstem dams.

Implementation Phase **Start** 2/96 **End** 3/97 **Subcontractor** yes

Task Develop a summer and fall chinook broodstock management plan for the upper Clearwater, Grande Ronde, Salmon, and Imnaha Rivers

Implementation Phase **Start** 6/94 **End** 9/98 **Subcontractor**

Task Quantify and Qualify summer and fall chinook spawning habitat in the upper Clearwater, Middle Fork Clearwater, South Fork Clearwater, Lochsa, Selway, Grande Ronde, Salmon, and Imnaha Rivers.

Implementation Phase **Start** 2/94 **End** 12/98 **Subcontractor**

Task Monitor water temperatures in the upper Clearwater River and principal tributaries, lower Grande Ronde, Imnaha, and Salmon Rivers. Describe the summer and fall chinook spawning window for successful incubation and model emergence timing based on available water temperature units.

O&M Phase **Start** 9/99 **End** 12/03 **Subcontractor**

Task Monitor summer and fall chinook adult returns to evaluate the effectiveness of supplementation.

CONSTRAINTS OR FACTORS THAT MAY CAUSE SCHEDULE OR BUDGET CHANGES:

Obtaining a section 10 permit from NMFS to collect information on an ESA listed stock. Enough fall chinook return to Lyons Ferry Hatchery to continue supplementation research for at least five consecutive years.

OUTCOMES, MONITORING AND EVALUATION

SUMMARY OF EXPECTED OUTCOMES

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

Suitable summer and/or fall chinook broodstock will be identified for restoration with associated risks for the Clearwater, Grande Ronde, Imnaha, and Salmon Rivers. The broodstock management plan will allow fishery managers to make decisions for the recovery and restoration of ESA listed stocks (3/97). Water temperature analysis will provide data on egg-to-fry survival and will describe current juvenile rearing conditions in the upper Clearwater, Grande Ronde, Imnaha, and Salmon Rivers (9/98). Spawning habitat availability data will provide fishery managers with adult carrying capacities in all study rivers (9/98). Spawning habitat quality analysis will provide expected egg-to-fry survival levels in the upper Clearwater, Grande Ronde, Imnaha, and Salmon Rivers (9/98). Juvenile outmigration timing, survival, and life history information of wild and hatchery fall chinook juveniles in the Clearwater, Grande Ronde, Imnaha, and Salmon Rivers will give fishery managers and mainstem dam operators the necessary data to make flow and passage decisions that will help in the recovery and restoration of ESA listed fall chinook salmon 9/01).

Present utilization and conservation potential of target population or area:

Summer chinook that emigrate during the first year of life (i.e. ocean type) are extirpated in all study streams. Fall chinook have been counted in the lower Clearwater River with the highest redd count of 69 occurring in the Clearwater subbasin in 1996. Fall chinook have been identified spawning in the upper Clearwater reaches in low numbers. Fall chinook redd counts have been as high as 48 in the Grande Ronde in recent years with 20 redds observed in 1996. A few fall chinook redds have been observed in the lower Salmon and Imnaha Rivers in recent years.

Assumed historic status of utilization and conservation potential:

Historically, summer and fall chinook salmon were abundant in all study streams.

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

To use supplementation to recover chinook stocks in the Snake River Basin and restore them to fishable levels.

Contribution toward long-term goal:

Determine what supplementation strategies work best to recover and restore summer and fall chinook natural spawning populations.

Indirect biological or environmental changes:

More favorable flow and water temperature releases from mainstem dams that enhance survival of chinook salmon stocks.

Physical products:

We are planning to PIT tag 31,500 Lyons Ferry Hatchery fall chinook subyearlings and up to 8,000 wild fall chinook for supplementation research during 1997 and thereafter if fish are available.

Environmental attributes affected by the project:

Since the Snake River fall chinook were listed under ESA, water has been drafted from Dworshak Reservoir in the summer to meet an unnatural and unrealistic flow target at Lower Granite Dam (i.e. 50,000 cfs during the summer). We believe that water withdraws from the upper Snake River Basin are too great and puts an undo burden on water from the Clearwater drainage. We feel that the unnaturally high and cold water releases during fall chinook summer rearing period in the lower Clearwater River may be altering their life history characteristic to migrate as a subyearling and may be jeopardizing their existence. Additional PIT tag data on wild subyearlings in the lower Clearwater will provide more insight on emigration timing and survival in relation to environmental variables.

Changes assumed or expected for affected environmental attributes:

During 1996, our recommendations on Dworshak Reservoir releases were somewhat taken into account by the Technical Management Team. Flow releases were not as drastic as in the past and were increased later in the summer (August instead of July). In the long term, we recommend that water shortages for anadromous fish during the summer come out of conservation measures in the upper Snake River Basin. Habitat protection may result in the long term for heavily damaged and stream reaches identified for restoration.

Measure of attribute changes:

After reporting on spawning habitat quality in study streams, habitat protection and associated sedimentation input will hopefully be reduced in problem areas such as the South Fork Clearwater, Grande Ronde, and Imnaha Rivers.

Assessment of effects on project outcomes of critical uncertainty:

Juvenile wild and hatchery fall chinook survival estimates will be key to identifying the highest survival to the mainstem dams and what flow and temperature releases produce the highest response. Aerial redd surveys and carcass collection will provide the necessary data to evaluate supplementation and how it contributes to recovery of stocks. Continued monitoring of sedimentation in study streams will allow an evaluation on improved spawning conditions.

Information products:

Information will be chinook salmon escapement information and how supplementation of subyearling fall chinook can aid in recovery of the stock. Recommendations will be made on how to improve conditions for fall chinook in the lower Clearwater River. Recommendations will be made on habitat enhancement for summer and/or fall chinook in the upper Clearwater River and tributaries, lower Grande Ronde, Salmon, and Imnaha Rivers.

Coordination outcomes:

We will be coordinating flow recommendations on the lower Clearwater River through the Technical Management Team. We will coordinate with land managers in stream reaches that need habitat protection and enhancement. We will be coordinating with fishery managers on supplementation strategies that provide the best return to natural production areas.

MONITORING APPROACH

Water temperatures and habitat quality measures will be key to enhancing and restoring chinook salmon stocks in stream reaches where they are threatened or extirpated. Juvenile emigration timing and survival will be important in describing current life history strategies in relation to environmental variables and supplementation research findings will be key to evaluating restoration potential. Ultimately, monitoring adult returns to natural spawning areas will allow managers to assess the potential to recover stocks through supplementation.

Provisions to monitor population status or habitat quality:

We will continue to monitor fall chinook adult returns to the spawning areas through aerial redd surveys and evaluate the contribution of supplementation through carcass collections.

Data analysis and evaluation:

Water temperature data will be evaluated and compared to historical information, how land use practices may have altered streams to their present condition, and if and how habitat enhancement and protection measures can help to restore stocks in certain stream reaches. Fall chinook juvenile emigration timing and survival information will allow managers to make decisions on how to enhance survival through controlled flow and temperature releases at key dams.

Information feed back to management decisions:

Coordination with hatchery managers on supplementation strategies that make the best contribution in improving chinook recovery and restoration. Coordination of juvenile fall chinook emigration timing and survival information will be coordinated through the Technical Management Team.

Critical uncertainties affecting project's outcomes:

Have more natural flow and temperature releases from Dworshak Reservoir during the fall chinook summer rearing period and monitor and evaluate emigration timing and survival to the mainstem dams. Broader scale research needs would be to manipulate flows and temperature releases from Dworshak at different but steady scenarios to identify the highest survival response for fall chinook salmon.

EVALUATION

Identifying what flow and water temperature releases from key dams provides the highest survival of wild and supplemented summer and/or fall chinook salmon populations. Increased summer and/or fall chinook adult returns to the spawning areas where stocks have been supplemented and/or habitat enhanced.

Incorporating new information regarding uncertainties:

If juvenile survival through the mainstem dams increases substantially in the near future, will evaluate survival of different supplementation strategies and wild stock releases to determine what release timing and size of fish works best to recovery stocks.

Increasing public awareness of F&W activities:

By increasing the number of adult returning chinook to major production areas and in the long term by ESA delisting and return to a fishery.

RELATIONSHIPS

RELATED BPA PROJECT

RELATIONSHIP

9102900 Supplementation and Survival of Fall Chinook in Snake River

This project is assessing fall chinook spawning habitat availability and quality, juvenile life history characteristics and emigration survival in the mainstem Snake River and we are doing the same in the major Snake River tributaries where fall chinook exist but in low numbers. Project cooperation includes: describing juvenile life history characteristics of wild and Lyons Ferry Hatchery supplemented fall chinook, emigration survival as it relates to environmental conditions, and conducting fall chinook aerial redd surveys and documenting hatchery fish contributions in all remaining production streams above Lower Granite Dam.

RELATED NON-BPA PROJECT

Monitoring and Evaluation of Yearling Snake River Fall Chinook Outplanted Upstream of Lower Granite Dam/USFWS-LSRCP

RELATIONSHIP

We worked cooperatively with the WDFW and USFWS in 1996 to monitor and evaluate supplementation of Lyons Ferry Hatchery fall chinook yearlings acclimated and released on the Snake River at Pittsburg Landing. The ongoing supplementation program will include a second acclimation facility on the Clearwater River in 1997 and a third facility on the Snake River in 1998. In relation to this project, we are evaluating how effective supplementation is in the recovery of the Snake River fall chinook using the more common emigration life history form or the subyearling component.

Fall Chinook Salmon Survival and Supplementation studies in the Snake River and Lower Snake River Reservoirs/U.S. Corps of Engineers and BPA

The NMFS and USFWS worked cooperatively on this project in 1995 to evaluate the emigration survival of supplemented fall chinook (non-Snake River stock) in the Snake River above Lower Granite Dam. During 1996, we worked cooperatively with these entities to evaluate emigration survival of supplemented Lyons Ferry fall chinook (Snake River stock) in the Snake and Clearwater Rivers. We are also cooperating with these entities and the WDFW on similar and expanded studies in 1997.

OPPORTUNITIES FOR COOPERATION:

Ongoing cooperation will continue with the WDFW in rearing and obtaining fall chinook salmon subyearlings from Lyons Ferry Hatchery for supplementation research purposes in the lower Clearwater River and with the WDFW, NMFS and USFWS in PIT tagging subyearlings at Lyons Ferry Hatchery and in transporting fish to the lower Clearwater and Snake Rivers. PIT tag and transport equipment will be shared between entities. Ongoing cooperation will continue with the U.S. Corp of Engineers, NMFS, and the USFWS at the Lower Granite Dam juvenile collection facility in separating PIT tagged fish using the "separation by code" system. Ongoing cooperation will continue with the USFWS and Idaho Power Company in conducting fall chinook aerial redd surveys on the Grande Ronde and Imnaha Rivers. Ongoing cooperation will continue with the Bureau of Land Management in conducting fall chinook aerial redd surveys on the lower Salmon River. Cooperation and coordination will continue with the USFWS and WDFW for similar cooperative studies i.e. Monitoring and Evaluation of Lyons Ferry Hatchery Fall Chinook above Lower Granite Dam.

COSTS AND FTE

1997 Planned: \$286,000

FUTURE FUNDING NEEDS:

PAST OBLIGATIONS (incl. 1997 if done):

<u>FY</u>	<u>\$ NEED</u>	<u>% PLAN</u>	<u>% IMPLEMENT</u>	<u>% O AND M</u>	<u>FY</u>	<u>OBLIGATED</u>
1998	\$220,000	0%	100%	0%	1994	\$241,262
1999	\$180,000	10%	40%	50%	1995	\$225,997
2000	\$180,000	10%	40%	50%	1996	\$225,953

2001	\$180,000	10%	40%	50%
2002	\$180,000	10%	40%	50%

TOTAL: \$693,212

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

<u>FY</u>	<u>OTHER FUNDING SOURCE</u>	<u>AMOUNT</u>	<u>IN-KIND VALUE</u>
1998	BLM		\$2,000
1999	BLM		\$2,000
2000	BLM		\$2,000
2001	BLM		\$2,000
2002	BLM		\$2,000

OTHER NON-FINANCIAL SUPPORTERS:

N/A

LONGER TERM COSTS: 180,000/yr for monitoring and evaluation of fall chinook subyearling supplementation.

1997 OVERHEAD PERCENT: Indirect costs: 29.5%

HOW DOES PERCENTAGE APPLY TO DIRECT COSTS:

Total direct project costs.

CONTRACTOR FTE: Four full time staff.

SUBCONTRACTOR FTE: One