

**Bonneville Power Administration
Fish and Wildlife Program FY99 Proposal Form**

Section 1. General administrative information

**Spokane Tribal (Galbraith Springs) Hatchery
Operation and Maintenance**

Bonneville project number, if an ongoing project 9104600

Business name of agency, institution or organization requesting funding

Spokane Tribe of Indians

Business acronym (if appropriate) STOI

Proposal contact person or principal investigator:

Name	<u>Tim Peone</u>
Mailing Address	<u>Spokane Tribal Hatchery -POB 100</u>
City, ST Zip	<u>Wellpinit, WA. 99040</u>
Phone	<u>(509) 258-7297, (509) 258-9601</u>
Fax	<u>(509) 258-7497, (509) 258-4013</u>
Email address	<u>tlpshag@aol.com</u>

Subcontractors.

Organization	Mailing Address	City, ST Zip	Contact Name

NPPC Program Measure Number(s) which this project addresses.
10.8B.5

NMFS Biological Opinion Number(s) which this project addresses.
{NA}

Other planning document references.
{NA}

Subbasin.

Upper Columbia River - Grand Coulee Dam Impoundment/Franklin D. Roosevelt Reservoir

Short description.

Operate and maintain the Spokane Tribal Hatchery to provide kokanee salmon and rainbow trout fishery in Lake Roosevelt and Banks Lake.

Section 2. Key words

Mark	Programmatic Categories	Mark	Activities	Mark	Project Types
	Anadromous fish		Construction		Watershed
X	Resident fish	X	O & M		Biodiversity/genetics
	Wildlife	+	Production		Population dynamics
	Oceans/estuaries		Research		Ecosystems
	Climate		Monitoring/eval.		Flow/survival
	Other		Resource mgmt		Fish disease
			Planning/admin.	X	Supplementation
			Enforcement		Wildlife habitat en-
			Acquisitions		hancement/restoration

Other keywords.

{NA}

Section 3. Relationships to other Bonneville projects

Project #	Project title/description	Nature of relationship
9104700	Sherman Creek Hatchery O&M	Managed by Washington Dept. Fish & Wildlife (WDF&W); serves as kokanee salmon egg collection site, kokanee salmon and rainbow trout fingerling/yearling acclimation and rearing facility.
9404300	Lake Roosevelt Monitoring / Data Collection Program	Managed by STOI in cooperation with WDF&W and Colville Confederated Tribes (CCT); serves as management program for operations of Spokane Tribal and Sherman Creek Hatcheries.
9500900	Lake Roosevelt Rainbow Trout Net Pens	Grass roots foundation, annually holds via net pen rearing 500,000

		rainbow trout produced by Spokane Tribal Hatchery for release in Lake Roosevelt after spring reservoir drawdown.
9001800	Habitat Improvement - Lake Roosevelt	Managed by CCT, habitat improvement for rainbow trout juvenile rearing and adult passage.
9501100	Chief Joseph Kokanee Enhancement Project	Managed by CCT, measures entrainment of kokanee from Lake Roosevelt and determines genetic diversity of kokanee stocks in Lake Roosevelt and Rufus Woods Lake.

Section 4. Objectives, tasks and schedules

Objectives and tasks

Obj 1,2,3	Objective	Task a,b,c	Task
1	Egg Collection, Spawning and Incubation.	a	Broodstock capture and holding.
		b	Kokanee egg collection from Sherman Creek Hatchery / Lake Roosevelt.
		c	WDF&W egg allotments.
		d	Viral sampling of Lake Roosevelt kokanee.
		e	Egg enumeration and incubation
2	Fry and fingerling rearing to meet 1999 Annual Production Goal (APG).	a	Incubation and handling.
		b	Feeding and production.
3	Identification of 1999 distribution dates and locations.	a	Oct., 1998, transfer 160,000 BY=97 kokanee to Lake Roosevelt net pen rearing operations.
		b	April-May, 1999, transfer 255,000 BY= 97 kokanee to Sherman Creek Hatchery.
		c	June-July, 1999, outplant 85,000 BY=97 kokanee into Spokane Arm of Lake Roosevelt.
		d	June, 1999, outplant 300,000 BY=98 kokanee into Banks Lake
		e	Oct., 1999, transfer 160,000 BY=98

			kokanee to Lake Roosevelt net pen rearing operations.
		f	Hold 500,000 BY=98 kokanee for release in 1998
		g	June-July, 1999, transfer 30,000 BY=98 rainbow trout to Lake Roosevelt net pen rearing operations.
		h	July, 1999, transfer 120,000 BY=98 rainbow trout to Sherman Creek Hatchery.
		I	Sept.-Nov., 1999, transfer 380,000 rainbow trout to Lake Roosevelt net pen rearing operations.
4	Determine the rearing volume, water quantity and quality necessary to meet the 1999 APG.	a	Raceway loading for fish rearing.
		b	Regulation of water inflow during fish rearing.
		c	Monitoring water quality.
		d	Raceway Hygiene.
		e	Cleaning springs.
		f	Pump maintenance and inspection.

Objective schedules and costs

Objective #	Start Date mm/yyyy	End Date mm/yyyy	Cost %
1	09/1998	011/1998	12%
2	09/1998	010/1999	39%
3	09/1998	010/1999	21%
4	09/1998	010/1999	28%

Schedule constraints.

Kokanee brood/egg source; water quality and quantity, and; reservoir operations.

Completion date.

Current agreement ends 2015 with intentions of renewing additional 25 years.

Section 5. Budget

FY99 budget by line item

Item	Note	FY99
Personnel		\$150,000
Fringe benefits		\$29,000
Supplies, materials, non-expendable property		\$11,000
Operations & maintenance	Utilities and Communication Egg Allotments Fish Food Fish Health & Water Quality Vehicle Operation & Maintenance Equipment Rental	\$83,000 \$15,000 \$36,000 \$3,000 \$10,000 \$10,000
Capital acquisitions or improvements (e.g. land, buildings, major equip.)	2 new verticle turbine pumps @ \$10k ea.	\$20,000
Travel		\$5,000
Indirect costs		\$76,000
Other	Misc. Costs, emergencies...	\$5,000
TOTAL		\$453,000

Outyear costs

Outyear costs	FY2000	FY01	FY02	FY03
Total budget	\$475,000	\$498,000	\$512,000	\$520,000
O&M as % of total	100%	100%	100%	100%

Section 6. Abstract

ABSTRACT

The Spokane Tribal Hatchery was constructed in 1991 to restore and enhance kokanee salmon (*Oncorhynchus nerka*) and rainbow trout (*Oncorhynchus mykiss*) populations in Lake Roosevelt and Banks Lake (Grand Coulee Dam Impoundment). Hatchery production goals and objectives are determined by fishery managers from the Spokane Tribe, Colville Tribe and Washington Department of Fish & Wildlife. The current annual production goal includes 500,000 kokanee yearlings, 960,000 kokanee fingerlings and 530,000 rainbow trout fingerlings. The hatchery is operated in conjunction with the Sherman Creek Hatchery and Lake Roosevelt Net Pen Program which serve as transfer, acclimation and release sites. The hatchery program is evaluated by the Lake Roosevelt Data Collection and Monitoring Program. Since 1991, kokanee runs to Lake Roosevelt tributaries have been established/restored and angler hours, harvest of kokanee salmon and rainbow trout and the economic value have increased. This project serves as partial mitigation for the extinction of salmon and steelhead incurred by the development of the Grand Coulee Dam Hydro Electric Project. Funding for this project is received from the Bonneville Power Administration through mandates included in the Northwest Power

Planning Council's 1987 Columbia Basin Fish and Wildlife Program, Phase IV Resident Fish & Wildlife Amendments and accordingly the 1994 Columbia Basin Fish and Wildlife Program.

Section 7. Project description

a. Technical and/or scientific background.

The Spokane Tribal Hatchery (STH) is a restoration and enhancement project for the Lake Roosevelt and Banks Lake fisheries. The project is a result of a cooperative effort between the Bonneville Power Administration (BPA), Spokane Indian Tribe, Colville Confederated Tribes, Upper Columbia United Tribes Fisheries Research Center, Washington Department of Fish & Wildlife (WDF&W), and National Park Service.

In 1986, a feasibility report on restoring and enhancing the Lake Roosevelt fisheries (Scholz *et al.* 1986) was presented to the Northwest Power Planning Council (NPPC). The report contained a management plan which, among other recommendations, proposed restoring and enhancing kokanee salmon populations in Lake Roosevelt and Banks Lake by large-scale hatchery plants and restoring spawning runs in tributaries by outplanting reared fish at appropriate times for imprinting. The plan called for construction of two hatcheries, one to be located at Metamootes Springs (formerly known as Galbraith Springs) on the Spokane Indian Reservation, and one to be located at Sherman Creek, a tributary in the northern part of Lake Roosevelt. The two hatcheries would be operated complimentary of one another. The Sherman Creek hatchery would be used mainly as an egg collection and fry imprinting site, while the facility at Metamootes Springs would be an egg incubation, fry rearing and outplanting hatchery. The feasibility plan also called for the Spokane Tribe to manage and operate the facility at Metamootes Springs, and the WDF&W to manage and operate the Sherman Creek hatchery.

The feasibility plan was approved by the NPPC and amended in their 1987 Columbia River Basin Fish and Wildlife Program (NPPC 1987). In section 903(g)(1)(c), the Council directed the BPA to construct two kokanee salmon hatcheries as partial mitigation for the loss of anadromous salmon and steelhead incurred by Grand Coulee Dam.

In 1988, BPA organized the Lake Roosevelt Hatcheries Technical Coordination Team (LRHCT) comprised of engineers, fisheries biologists, and hatchery personnel from the cooperative agencies to assist in the design and operation of the two hatcheries. The Spokane Tribe and BPA entered into a Operation and Maintenance Agreement Contract in June 1990, which initiated construction of the hatchery at Metamootes Springs. Construction was completed in April 1991, and the STH officially opened on June 7, 1991.

The STH has since produced the following number of fish annually for Lake

Roosevelt and Banks Lake:

- 1991 - 1,848,709 kokanee salmon, 351,683 rainbow trout;
- 1992 - 2,160,578 kokanee salmon, 562,356 rainbow trout;
- 1993 - 1,920,857 kokanee salmon, 669,450 rainbow trout;
- 1994 - 2,033,509 kokanee salmon, 460,721 rainbow trout;
- 1995 - 1,226,329 kokanee salmon, 427,391 rainbow trout;
- 1996 - 601,409 kokanee salmon, 702,689 rainbow trout;
- 1997 - 1,391,459 kokanee salmon, 584,328 rainbow trout, and;
- 1998 - (under production).

Final reports of STH fish production are submitted to the BPA annually (Peone, 1994, 1995, 1996 & 1997). Effects of the program on the Lake Roosevelt fishery before and after hatchery supplementation is being monitored and evaluated by the Lake Roosevelt Data Collection and Monitoring Program. Results for the past 6 years of the LRMP can be found in the Annual Reports, Peone *et al.* 1989, Griffith and Scholz 1990, Thatcher *et al.* 1991 & 1992, Scholz *et al.* 1992, Tilson *et al.* 1993, and Underwood 1993 through 1997.

b. Proposal objectives.

1999 ANNUAL PRODUCTION GOAL (APG)

The STH facility was constructed to raise up to 13.5 million kokanee fry and 500,000 rainbow fingerlings annually for Lake Roosevelt and Banks Lake. However, the LRHCT has incorporated provisional changes in the production goals for the program to better meet the biological objectives and the management goals of the mitigation waters with respect to adverse reservoir operations and limiting factors effecting hatchery production capacity not known or expected when the hatchery was designed.

The projected Annual Production Goal (APG) for 1999, as set forth by the LRHCT during interim meetings in 1998, is expected to be (based on 80% survival egg to fry/fingerling): 500,000 kokanee yearlings (post-smolts); 960,000 kokanee fingerlings, and; 530,000 rainbow trout fingerlings. Planned production, size and outplant/transfer location for the 1999 APG include:

1999 ANNUAL PRODUCTION GOAL

Number Fish	Size (fish/lb.)	Outplant/transfer Location	Date(s)
-------------	-----------------	----------------------------	---------

500,000 Kokanee

Yearlings: - BY=97

80,000 Kokanee	25/lb	Kettle Falls Net Pen	10/16/98
80,000 Kokanee	25/lb	Two Rivers Net Pen	10/16/98

Number Fish	Size (fish/lb.)	Outplant/transfer Location	Date(s)
255,000 Kokanee	10/lb	Sherman Creek Hatchery Transfer	4/1/99-5/1/99
85,000 Kokanee	8/lb	Spokane Arm Lake Roosevelt	6/1/99-7/1/99
960,000 Kokanee Fingerlings: - BY=98			
300,000 Kokanee	200/lb	Banks Lake	6/1/99
80,000 Kokanee	25/lb	Two Rivers Net Pen	10/1/99
80,000 Kokanee	25/lb	Sherman Creek Net Pens	10/1/99
500,000 BY=98 Kokanee - Held over for release in the year 2000			
530,000 Rainbow Fingerlings: - BY=98			
30,000 Rainbow	50/lb	Kettle Falls Net Pen	6/15/99
150,000 Rainbow	45/lb	Sherman Creek Hatchery Transfer	7/1/99
360,000 Rainbow	25/lb	FDR Net Pens	9/15/99-11/1/99

OBJECTIVES OF THE SPOKANE TRIBAL HATCHERY TO MEET THE 1999 APG

The Spokane Tribal Hatchery annually produces an operating plan to assure the BPA and the LRHCT proceeding functions of the Spokane Tribal Hatchery are to produce resident fish above Chief Joseph Dam, as called for in the NPPC 1987 Fish and Wildlife Program and the Operation and Maintenance Lease/Intergovernmental Agreement between the BPA and the Spokane Tribe of Indians using cost-effective and prudent fish hatchery practices.

The operating plan outlines objectives and tasks that will serve as procedural guidelines and fish cultural protocol for the Spokane Tribal Hatchery. The objectives of the operating plan for 1999 operation will include:

- (1) Egg collection, spawning and Incubation of kokanee and rainbow trout eggs to meet the 1999 APG;
- (2) Fish rearing methods employed to meet the 1999 APG;

- (3) Identification of 1999 distribution dates and locations for outplanting/transferring kokanee and rainbow trout, and;
- (4) Specify the raceway volume, water quantity and quality necessary to meet the 1999 APG.

c. Rationale and significance to Regional Programs.

The Spokane Tribal Hatchery was amended under the resident fish substitution sections of the NPPC's 1987 Columbia River Basin Fish and Wildlife Program [Sections 903(1)(g)(c) and 1403 (7)(7.3)], 1993 Phase IV Amendments [Section 9.4A(1)(d)] and 1994 FWP [Section 10.8B(5)].

This project is essential for restoring and enhancing kokanee salmon and rainbow trout in Lake Roosevelt. Scientific fishery investigations have determined that kokanee and rainbow trout populations in Lake Roosevelt are limited by reservoir operations and suitable habitat for natural production (Nigro et al. 1983, Jagielo 1985, Beckman et al. 1985, Scholz et al. 1986). Since 1991, kokanee runs to Lake Roosevelt tributaries have been established/restored and angler hours, harvest of kokanee salmon and rainbow trout and the economic value have increased

d. Project history

Project numbers:

Same

Project reports and technical papers:

Monthly progress reports submitted to the BPA, 1990 to present. Annual reports submitted to the BPA, 1994 to present. Kokanee Salmon Captive Brood Investigations, 1995.

Summary of major results achieved:

The STH has since produced the following number of fish annually for Lake Roosevelt and Banks Lake:

- 1991 - 1,848,709 kokanee salmon, 351,683 rainbow trout;
- 1992 - 2,160,578 kokanee salmon, 562,356 rainbow trout;
- 1993 - 1,920,857 kokanee salmon, 669,450 rainbow trout;
- 1994 - 2,033,509 kokanee salmon, 460,721 rainbow trout;
- 1995 - 1,226,329 kokanee salmon, 427,391 rainbow trout;
- 1996 - 601,409 kokanee salmon, 702,689 rainbow trout;
- 1997 - 1,391,459 kokanee salmon, 584,328 rainbow trout, and;
- 1998 - (under production).

To summarize, this project has increased reservoir populations of kokanee salmon and

rainbow trout which in turn has increased angler use, catch/harvest rates and the economic value of the fishery. Also, this project has established and restored spawning runs of kokanee salmon throughout the reservoir to complement natural production. For more detailed scientific information refer to the annual reports of the Lake Roosevelt Monitoring Program (Project #94-043), 1989 to present.

Adaptive management implications:

Lake Roosevelt fishery investigation performed 1986 to present have determined artificial production is necessary to restore kokanee salmon and rainbow trout populations. The primary implication associated with the survival of hatchery produced released into Lake Roosevelt and Banks Lake is reservoir operation. Management strategies have changed since the beginning of this program to off set adverse reservoir operations. For example, releases of kokanee salmon fry has changed to yearlings/post-smolt releases to reduce entrainment and predation. This has increased higher survival and adult return of hatchery produced kokanee. In terms of adaptive management concerning hatchery production, this project regularly implements prudent and sound fish culturing techniques and strategies. For example, a direct oxygen injection system was constructed to compensate unfavorable water conditions (temp. and volume) that was limiting hatchery carrying capacity.

Years underway:

7 year; 1991 to present.

Past costs:

\$2,975,597

e. Methods.

OBJECTIVES/TASKS

OBJECTIVE 1. EGG COLLECTION, SPAWNING AND INCUBATION OF 1.2 MILLION KOKANEE EGGS AND 662,500 RAINBOW TROUT EGGS TO MEET 1998 APG.

Task 1.1 Brood stock capture and holding at Little Falls Dam and Hawk Creek.

Kokanee brood stock capture and holding at Little Falls Dam (LFD) will depend on the return size. The Spokane Tribe is currently in the process of designing a permanent fish trap at this site for collecting kokanee spawners. Construction of the trap is planned for the summer (late) of 1999. Initial operation is planned for the fall of 1999. Mature spawners will be spawned on site and the eggs will be transferred to the STH.

Also planned for the fall of 1998 is the collection of spawners from Hawk Creek. A temporary fish weir and collection box will be installed in the creek to collect kokanee spawners migrating upstream. A seasonal worker will be employed to maintain and keep the trap secure. Mature fish will be spawned on site and the eggs will be transferred to the STH. This project will be coordinated with the National Park Service and WDF&W.

Task 1.2 Kokanee egg collection from Sherman Creek.

Collection of kokanee spawners from Sherman Creek will be coordinated by the WDF&W. Kokanee will be spawned on site and the water hardened eggs will be transferred to the STH.

Task 1.3 WDFW egg allotments.

As a safeguard of the success of collecting eggs from fish returning to Lake Roosevelt Kokanee, a request for 1.2 million kokanee eggs will be requested from the Washington Department of Fish and Wildlife. An additional 625,000 rainbow trout eggs will also be requested as a normal procedure for meeting our production goal for the net pen program.

Task 1.4 Infectious hematopoietic necrosis (IHN), infectious pancreatic necrosis (IPN) and viral hemorrhagic septicemia (VHS) virus sampling of Lake Roosevelt Kokanee.

Mature female kokanee captured in Lake Roosevelt will be tested for presence of IHN, IPN and VHS viruses. Samples of ovarian fluid, spleen and kidney tissue will be collected from approximately 60 ripe females. In collecting samples, an incision will be made from the anal fin to the isthmus and a separate syringe used to extract ovarian fluid from egg skeins. Whole spleen and kidney tissue will be collected and kept in separate vials. Samples will be chilled on ice and delivered to the WDFW pathology laboratory in Olympia, WA., where they will be analyzed by WDFW personnel.

Collection and delivery of samples will be coordinated with WDFW pathologist, Steve Roberts. If any samples are tested positive, then Lake Roosevelt eggs will either be restricted from entering the hatchery facilities or incubated in isolation buckets. If all samples are tested negative, WDFW will notarize a Fish Health Certificate.

Task 1.5 Egg enumeration and incubator loading.

Fertilized eggs will be disinfected before entering the Spokane Tribal Hatchery as a precaution in case Lake Roosevelt kokanee contain disease. Eggs in each chest cooler will be bathed in a 100 part per liter Argentine solution (Piper *et al.* 1987) for approximately 15 minutes and then rinsed with clean water.

The Von Bayer method will be used for enumeration of eggs. This method is efficient and considered the least stressful technique of enumerating eggs (Piper *et al.* 1982).

Vertical flow incubators (Heath Trays) and cylindrical upwelling incubators (upwellors) will be used for egg incubation. Loading rate for the vertical flow incubators will be 12,000 eggs per vertical flow tray (7 trays in each stack) while upwelling incubator loading rates will be 67,000 rainbow eggs per unit and 100,000

kokanee eggs per unit. Total anticipated incubator use will be 2 verticle flow incubator stacks and 16 upwelling incubators.

OBJECTIVE 2. FRY AND FINGERLING REARING METHODS TO MEET 1999 APG.

Task 2.1 Incubation and hatching kokanee and rainbow trout..

Water will be drawn from the production well for incubating and hatching kokanee and rainbow eggs. The water temperature from this source ranges averages 10EC during this time of year. In respect to this, approximately 31 days or 558 centigrade temperature units (CTU's) are expected for hatching the kokanee and rainbow eggs (Piper *et al.* 1982). The number of days to egg eye-up, hatch and fry emergence, as well as daily water temperature will be recorded.

At 90% swim-up, kokanee fry will be released from the upwelling incubators by simply removing the lids and letting the fry swim out into the raceways. At about the same life stage, rainbow fry will be released by removing the lids and pouring the fry into the raceways. Mortality rates will be recorded throughout the incubation period and swim-up stage.

Task 2.2 Feeding and production of kokanee and rainbow trout.

Feed training of kokanee and rainbow trout will begin at the 90% swim-up stage. The following feeding projections are based on a relatively constant temperature of 10EC. Feeding rates and amounts will change with varying water temperatures and will actually be calculated on a daily amount basis determined from monthly growth rates recorded from the Spokane Tribal Hatchery, 1991 to 1998.

Bio-diet starter (moist) will be used for feed training kokanee fry, while silver cup starter (dry) will be used for feed training rainbow fry. For feed training, both species of fry will be fed 3 to 4% body weight 8 times per day. Bio-diet grower and silver cup dry trout feed will be used for production feeding. A frequency of five feedings per day will be performed during production.

OBJECTIVE 3. IDENTIFICATION OF 1999 DISTRIBUTION DATES AND LOCATIONS FOR OUTPLANTING/TRANSFERRING KOKANEE AND RAINBOW TROUT.

Listed below is a tentative schedule for outplanting/ transferring fish from the Spokane Tribal Hatchery. Changes in these plans may be made interim during the semi-annual meeting of the Lake Roosevelt Hatcheries Coordination Team. For the most part, this schedule should be followed. However, other plants may also be arranged if overloading at the hatchery seems to be a problem.

1999 ANNUAL PRODUCTION GOAL

Number Fish	Size (fish/lb.)	Outplant/transfer Location	Date(s)
500,000 Kokanee			
Yearlings: - BY=97			
80,000 Kokanee	25/lb	Kettle Falls Net Pen	10/16/98
80,000 Kokanee	25/lb	Two Rivers Net Pen	10/16/98
255,000 Kokanee	10/lb	Sherman Creek Hatchery Transfer	4/1/99-5/1/99
85,0000 Kokanee	8/lb	Spokane Arm Lake Roosevelt	6/1/99-7/1/99
960,000 Kokanee			
Fingerlings: - BY=98			
300,000 Kokanee	200/lb	Banks Lake	6/1/99
80,000 Kokanee	25/lb	Two Rivers Net Pen	10/1/99
80,000 Kokanee	25/lb	Sherman Creek Net Pens	10/1/99
500,000 BY=98 Kokanee - Held over for release in the year 2000			
530,000 Rainbow			
Fingerlings: - BY=98			
30,000 Rainbow	50/lb	Kettle Falls Net Pen	6/15/99
150,000 Rainbow	45/lb	Sherman Creek Hatchery Transfer	7/1/99
360,000 Rainbow	25/lb	FDR Net Pens	9/15/99-11/1/99

A 1,450 gallon insulated stainless steel fish transportation tanker and 300 gallon portable insulated fiberglass tank will be used for outplanting fish. Each tank is equipped with oxygen and aeration devices and have excellent temperature retention. Maximum loading rate of the tanker is 500 pounds of fingerling size fish per haul and 1,500 pounds for yearling or larger size fish. Loading rate for the portable tank, which is only used for transporting fingerlings, is 150 pounds per haul.

KOKANEE YEARLING PLANTS/TRANSFERS

Task 3.1 Transfer of 160,000 kokanee yearlings to Lake Roosevelt net pen rearing

operations.

Lake Roosevelt net pen rearing operations will receive 160,000 kokanee yearlings. The fish are expected to be 25 per pound and will take approximately 4 trips to transfer the fish. Transfer date is set for early October, 1998. Kokanee transferred to the pens will be marked with coded wire tags and fins clips prior to transfer.

Task 3.2 Transfer of 255,000 kokanee yearlings to the Sherman Creek Hatchery..

Approximately 255,000 kokanee averaging 10 fish per pound will be transferred to the Sherman Creek Hatchery in April, 1999. At a loading rate of 1,500 pounds per haul, approximately 17 trips will be required.

Task 3.3 Outplanting 85,000 kokanee yearlings into the Spokane Arm of Lake Roosevelt.

Approximately 85,000 kokanee yearlings averaging 8 fish per pound will be outplanted into the Spokane Arm of Lake Roosevelt in June, 1999. The main outplanting sites will be the Blue Creek and Owl Creek (known as "A-Frame") tributaries. Approximately 8 trips will be required to outplant these fish.

KOKANEE FINGERLING PLANTS/TRANSFERS

Task 3.4 Outplanting 300,000 kokanee fingerlings into Banks Lake.

Approximately 300,000 Kokanee fingerlings averaging 200 fish per pound will be outplanted into Banks Lake in June, 1999. At a loading rate of 500 fish per haul, 3 trips will be required to plant these fish. Planting will be coordinated with WDF&W.

Task 3.5 Transfer 160,000 kokanee fingerlings to Lake Roosevelt net pen rearing operations.

Lake Roosevelt net pen rearing operations will receive 160,000 kokanee yearlings by October 1, 1999. The fish are expected to be 25 per pound in size and will require 2 trips to each site. Kokanee transferred to the pens will be marked with coded wire tags and adipose fin clips prior to transfer.

Task 3.6 Hold 500,000 kokanee fingerlings for planting in the year 2000.

Approximately 500,000 kokanee fingerlings will be held over at the STH for outplanting in the year 2000. A planting schedule for these fish will be developed during the 1998 LRHCT meetings.

RAINBOW TROUT TRANSFERS

Task 3.7 Transfer of 30,000 rainbow trout to the Kettle Falls summer net pen rearing program.

Approximately 30,000 rainbow fingerlings averaging 45 fish per pound will be transferred to the Kettle Falls net pen rearing operation in July, 1999. Transfer of these fish will require 2 trips.

Task 3.8 Transfer 150,000 rainbow trout to Sherman Creek Hatchery.

Approximately 150,000 rainbow fingerlings averaging 45 fish per pound will be transferred to the SCH in July, 1999. A total of 4 trips will be required to transfer these fish. The SCH will hold these fish for later transfer to fall net pen rearing operations at Kettle Falls and Hall Creek. The STH will assist in the later transfer to the pens.

Task 3.9 Transfer of 360,000 rainbow trout to fall FDR net pen rearing operations.

Approximately 360,000 rainbow fingerlings averaging 25 fish per pound will be transferred to Lake Roosevelt Net Pen rearing sites at Keller Ferry, Seven Bays, Two Rivers and Hunters from September 15, 1999 to November 1, 1999. Each site will have 4 net pens (16 total) and will receive approximately 16,500 fish each. A total of 15 trips will be required to transfer these fish. Transfer dates will be coordinated with the Lake Roosevelt Development Association Net Pen Coordinator.

OBJECTIVE 4. DETERMINE THE REARING VOLUME, WATER QUANTITY AND QUALITY NECESSARY TO MEET THE 1999 APG.

Task 4.1 Raceway loading for fry, fingerling and adult rearing.

A maximum volume of 24,320 cubic feet (ft³), or 40 raceways, rearing volume will be used to produce the 1999 APG. Fish will be loaded in raceways relative to a density index of 0.5 (or less) and spread out as they increase in size.

Task 4.2 Regulation of water inflow during incubation.

Upwelling incubators containing un-eyed eggs will be supplied with 5-8 gallons per minute (gpm) per incubator until eye-up and then increased to 12-15 gpm until swim-up. Vertical flow incubators containing un-eyed eggs will be supplied with 5 gpm per incubator until eye-up and increased to 8 gpm until swim-up. The maximum water inflow needed should be 450 gpm (1.01 cfs) during incubation.

Task 4.3 Water inflow regulation during fry, fingerling and adult rearing.

Water inflow required during fry, fingerling and adult rearing will be calculated using a flow index of 1.5 associated with projected lengths and weights in the following formula:

$$I = \frac{W}{L \times 1.5} \quad \text{where: } I = \text{total inflow} \\ W = \text{projected weight} \\ L = \text{projected length}$$

This formula, as well as size estimates, will be entered into a computer program as needed for determining water volume needed.

Task 4.4 Monitoring water quality during fry and fingerling rearing.

Daily temperatures (EC) will be recorded and used in determining feeding

amounts and raceway loading rates. Dissolved oxygen (DO) is expected to be near 100% saturation level (10 to 12 mg/l) while nitrogen (N₂) levels should remain below 100% saturation level. Packed column aerators in the head box should produce acceptable D.O. and N₂ levels. However, D.O. will be measured with a YSI meter and N₂ levels will be measured periodically with a WEISS satumeter. Other parameters monitored by the hatchery manager will include pH, conductivity, ammonia, nitrate and nitrite salinity and total settleable solids concentration in the hatchery effluent. At least two broad spectrum analysis of water quality will be contracted to an EPA certified laboratory.

Task 4.5 Raceway hygiene..

Raceways will be sanitized and disinfected with 600 parts per million solution of Hyamine 3500 before initial incubator loading and transfer of fry to raceways. Daily raceway sanitization of fecal matter will be performed when production feeding begins. All waste water will be drained to the settling pond.

Task 4.6 Routine cleaning of spring pond waters.

The spring ponds will be routinely cleaned as needed using a vacuum/trash boat. The cleaning will help keep algal and macrophyte densities at a low level to assure a clean water source flowing into the hatchery.

f. Facilities and equipment.

The Spokane Tribal Hatchery, which is actually the first fish hatchery designed and constructed by the BPA, is a state of the art facility with modern fish production equipment. Structurally, the facility consists of 44 indoor/outdoor raceways, packed column aeration towers, direct oxygen injection per 37 raceway units, standby by aerators, 2 water wells with 50 hp verticle turbine pumps, 2 30hp surface water verticle turbine pumps, laboratory capable for moderate water analysis and fish necropsy, digital alarms system, 250kw emergency generator, 1 residence (manager) and 4 full time employees and 1 seasonal.

g. References.

Please Note: Although, these references were not cited, and not referred to in the Abstract, they have been used for development and operation of the Spokane Tribal Hatchery project.

REFERENCES

NPPC. 1987. Columbia River Basin Fish and Wildlife Program--Amended February 11, 1987. Northwest Power Planning Council, Portland, OR. 246 p.+ Appendices.

Peone, T.I., A.T. Scholz, J.R. Griffith, S. Graves, and M.G. Thatcher. 1990. Lake Roosevelt Monitoring Program, August 1988 to December 1989, Annual report. U.S. Department of Energy, Bonneville Power Administration. Project No. 88-

63, Contract DE-8179-88BD91819. 234 pp.

Piper, R.G., I.B. McElwain, L.O. Orme, J.P. McCracen, L.G. Fowler and J.R. Leonard. 1982. Fish Hatchery Management. U.S. Department of Interior, Fish and Wildlife Service, Washington, D.C. 517 pp.

Scholz, A.T., J. Uehara, J. Hisata and J. Marco. 1986. Feasibility report on restoration and enhancement of Lake Roosevelt Fisheries. Northwest Power Planning Council. Applications for Amendments Vol. 3:1375-1489.

Scholz, A.T., R.J. White, V.A. Koehler and S.A. Horton. 1992. Measurement of thyroxine concentration as an indicator of the critical period for imprinting in kokanee salmon (*Oncorhynchus nerka*): Implications for operating Lake Roosevelt kokanee hatcheries. Supplement to 1991 Annual Report. Prepared by Upper Columbia United Tribes Fisheries Research Center for Bonneville Power Administration. Portland, Or.

Scholz, A.T., R.J. White, M.B. Tilson and S.A. Horton. 1993. Artificial imprinting of Lake Roosevelt kokanee salmon (*Oncorhynchus nerka*) with synthetic chemicals: Measurement of thyroxine content as an indicator of the sensitive period for imprinting to olfactory cues. Annual Report 1992. Prepared by Upper Columbia United Tribes Fisheries Research Center for Bonneville Power Administration. Portland, OR. 60p.

Thatcher, M.G., J.R. Griffith, A.C. McDowell, and A.T. Scholz. (In press submitted 1993). Lake Roosevelt Fisheries Monitoring Program, Annual Report 1992. Bonneville Power Administration. Portland OR. Project No. 88-63. 237 pp plus appendices.

Thatcher, M.G., J.R. Griffith, A.C. McDowell, and A.T. Scholz. (In press submitted 1993). Lake Roosevelt Fisheries Monitoring Program, Annual Report 1991. Bonneville Power Administration. Portland, OR. Project No. 88-63. 237 pp plus appendices.

Tilson, M.B., A.T. Scholz, R.J. White and J. Galloway. 1994. Thyroid Induced Chemical Imprinting in Early Life Stages and Assessment of Smoltification in Kokanee Salmon: Implication for operations Lake Roosevelt Kokanee Salmon Hatcheries, Annual Report 1993. Bonneville Power Administration. Portland, OR. Project No. 88-63. 156pp.

Tilson, M.B., A.T. Scholz, R.J. White, and H. Galloway. 1993. Thyroid-induced chemical imprinting in early life stages and assessment of smoltification in kokanee salmon: Implications for operating Lake Roosevelt Kokanee Salmon Hatcheries. Annual Report 1993. Prepared by Upper Columbia United Tribes Fisheries Research Center for Bonneville Power Administration. Portland, OR.

156p.

Voeller, A.C. 1996. Measurements of Lake Roosevelt Biota in Relations to Reservoir Operations. Annual Report 1993. Bonneville Power Administration. Portland, OR. Project No. 94-43. 109pp.

Section 8. Relationships to other projects

The Spokane Tribal Hatchery is a restoration and enhancement project for the Lake Roosevelt and Banks Lake fisheries. The project is a result of a cooperative effort between the Bonneville Power Administration, Spokane Indian Tribe, Colville Confederated Tribes, Upper Columbia United Tribes Fisheries Research Center, Washington Department of Fish & Wildlife, and National Park Service. Hatchery production goals and operations are coordinated through quarterly meetings of the Lake Roosevelt Hatcheries Coordination Team. This group consists of representatives from the Spokane Tribe, Colville Tribe Washington Department of Fish and Wildlife, Bonneville Power Administration, Upper Columbia United Tribes and Lake Roosevelt Development Association. Members of this group are involved in related FWP including the Lake Roosevelt Monitoring Program, Sherman Creek Hatchery, Lake Roosevelt Net Pen Rearing Operation, Chief Joseph Kokanee Enhancement, Lake Roosevelt Rainbow Trout Habitat Improvement Project and Implications for Operating Kokanee Hatcheries Project. During quarterly meetings each respective project shares information with the group to assure all projects are collaborating and operating complementary of one another. In some cases direction is given to guide the projects and make sure FWP goals and objectives are being met.

Section 9. Key personnel

RESUME
TIM L. PEONE
HATCHERY MANAGER

Project Duties: Manages and supervises fish hatchery and staff, applying knowledge of management and fish culturing techniques. Determines, administers, and executes policies relating to administration, standards of hatchery operation, and maintenance of facilities. Modifies and/or changes working conditions and use of equipment to increase efficiency. Budget and contract writing. Confers with Biologists and other fishery personnel obtain data concerning fish habits; food and environmental requirements; and techniques for collecting, fertilizing, incubating spawn, and treatment of spawn and fry. Participates in various committees, teams and forums that pertain the management and coordination of this resource.

EDUCATION

Eastern Washington University; Cheney, WA; 1988.

**Bachelor of Science in Biology (3.0 GPA).

EMPLOYMENT EXPERIENCE

- 07/90 - Present Spokane Tribal Hatchery, Ford, Washington.**
Hatchery Manager. Duties include management of daily fish culturing of 3 million kokanee salmon and 500,000 rainbow trout. Budget and contract writing.
- 10/88 - 07/90 Upper Columbia United Tribes Fisheries Center, Department of Biology, Eastern Washington University, Cheney, Washington.**
Fisheries Biologist. Duties include the collection and spawning of kokanee at Little Falls Dam, culturing of kokanee eggs in incubates at Galbraith Springs, and field training and release of kokanee fry.
- 06/88 - 12/88 Upper Columbia United Tribes Fisheries Center, Department of Biology, Eastern Washington University, Cheney, Washington.**
Fisheries Biologist. Duties include developing the monitoring programs research proposal and contract, coordination from the collection and analysis of creel survey fisheries, zooplankton and water quality samples, supervising field and laboratory personnel, and responsible for reporting BPA by monthly progress and annual reports.
- Wtr 1988 Idaho Department of Fish and Game; Cabinet Gorge Kokanee Salmon Hatchery; Clark Fork, Idaho.**
Hatchery Internship. Duties include selection and spawning of brood stock, spawning of kokanee eggs, culturing and fungal treatment of eggs, and quantification of fertilized eggs. Extensive overview of the hatchery design and year round hatchery operations discussed.
- Wtr/Spr 1987 Washington Department of Wildlife Rainbow Trout Hatchery; Spokane, Washington.**
Hatchery Internship. Duties included spawning, culturing and fungal treatment of rainbow trout eggs, food training and fish grading or rainbow trout fry and release of juvenile rainbow fingerlings.

MEMBERSHIP ON REGIONAL COMMITTEES

- Columbia Basin Fish and Wildlife Authority (CBFWA), Resident Fish Committee Member, 1989.**
UCUT representative participating in review and evaluating resident fish program measures, identify impacts on resident fish caused by hydro-power development, and assisting CBFWA in prioritizing resident fish research protection and mitigation needs.
- Lake Roosevelt Forum, Member, 1989.**
Communicating as a Spokane Tribal fisheries and water quality representative, with those responsible for the management and protection of resources along Lake Roosevelt.

Lake Roosevelt Development Association, Member, 1988.

Plan, review and develop activities relating the enhancement of Lake Roosevelt resources.

PUBLICATIONS AND TECHNICAL REPORTS

- 1994-97 Peone, T. Annual Reports of the Spokane Tribal Hatchery. Prepared for Bonneville Power Administration, Division of Fish & Wildlife (Contract No.: DE-MS79-90BP92906; Project No.: 91-046).
- 1995 Peone, T. Kokanee Captive Brood Investigations at the Spokane Tribal Hatchery. Prepared for 1995 International Kokanee Workshop.
- 1990 Peone, T., A.T. Scholz, J.R. Griffith, M. Thatcher, D. Brown, L. Hill, and C. Abrahamson. Lake Roosevelt Monitoring Program: July 1988-December 1989. Annual Report. Upper Columbia United Tribes Fisheries Center. Submitted Bonneville Power Administration (Project No. 88-63).
- 1989 Peone, T., A.T. Scholz and J. Griffith. Kokanee Salmon investigation as at Grand Coulee Reservoir (Lake Roosevelt). In: Proceedings of the symposium on Native American Fisheries, Western Regional Conference, American Fisheries Society. 24 p.
- 1989 Scholz, A.T. and T. Peone. Assessment of rainbow trout net pen program in Lake Roosevelt, WA. Submitted N. Amer. J. Fish. Mgmt.

Other Key Personnel:

Fish Culturist II, Assist. Mngr. - Delbert Brown
Fish Culturist II - James Andrews
Office Manager/Assist. Fish Culturist I - Darla Ford
Part-time Seasonal Fish Culturist I - Jayne Abrahamson

Resumes will be provided upon request for the aforementioned employees.

Section 10. Information/technology transfer

Monthly and Annual Reports are submitted to the BPA and members of the LRHCT. Annually this project participates in the Spokane Bighorn Show to display and talk to the public about the programs protection, mitigation, restoration and enhancement efforts called for through the NPPC=s FWP. This display and public interface is in collaboration with the Lake Roosevelt Forum, Lake Roosevelt Monitoring Program, Lake Roosevelt Rainbow Habitat Improvement Project, Lake Roosevelt Rainbow Trout Net Pen Rearing Project, Chief Joseph Kokanee Enhancement Project, Sherman Creek Hatchery Project, BPA and the Bureau of Reclamation. This project is also involved with other public and agency fish and wildlife events ranging from seminars to workshops.