BONNEVILLE POWER ADMINISTRATION

Spokane Tribal Hatchery

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SPOKANE TRIBAL HATCHERY

Annual Report
January 1, 2004 - December 31, 2004

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EXECUTIVE SUMMARY

Due to the construction and operation of Grand Coulee Dam (1939), anadromous salmon have been eradicated and resident fish populations permanently altered in the upper Columbia River region. Federal and private hydropower dam operations throughout the Columbia River system severely limits indigenous fish populations in the upper Columbia. Artificial production has been determined appropriate for supporting a harvestable fishery for kokanee salmon (*Oncorhynchus nerka*) and rainbow trout (O*ncorhynchus mykiss*) in Lake Roosevelt and Banks Lake (Grand Coulee Dam impoundments).

A collaborative multi-agency artificial production program for the Lake Roosevelt and Banks Lake fisheries exists consisting of the Spokane Tribal Hatchery, Sherman Creek Hatchery, Ford Trout Hatchery and the Lake Roosevelt Kokanee and Rainbow Trout Net Pen Rearing Projects. These projects operate complementary of one another to target an annual release of 1 million yearling kokanee and 500,000 yearling rainbow trout for Lake Roosevelt and 1.4 million kokanee fry/fingerlings for Banks Lake.

Fish produced by this project in 2004 to meet collective fish production and release goals included: 1,655,722 kokanee fingerlings, 537,783 rainbow trout fingerlings and 507,660 kokanee yearlings. Kokanee yearlings were adipose fin clipped before release. Stock composition consisted of Lake Whatcom kokanee, 50:50 diploid-triploid Spokane Trout Hatchery (McCloud River) rainbow trout and Phalon Lake red-band rainbow trout. All kokanee were marked with either thermal, oxytetracyline or fin clips prior to release.

Preliminary 2004 Lake Roosevelt fisheries investigations indicate hatchery/net pen stocking significantly contributed to harvestable rainbow trout and kokanee salmon fisheries. An increase in kokanee harvest was primarily owing to new release strategies. Walleye predation, early maturity and entrainment through Grand Coulee Dam continues to have a negative impact on adult kokanee returns and limits the success of hatchery/net pen stocking on the number of harvestable fish.

Recommendations for future hatchery/net pen operations include use of stocks compatible or native to the upper Columbia River, continue hatchery-rearing practices to reduce precocity rates of kokanee and continue new kokanee stocking strategies associated with increased kokanee harvest rates.

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AKNOWLEDGEMENTS

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INTRODUCTION

Project History – Implementation of Artificial Production

Various fisheries investigations from the 1940's to the early 1990's concluded reservoir operations effect on reproduction and early rearing habitat limited the ability of existing rainbow trout and kokanee salmon of producing a viable fishery while noting a substantial biological productivity base (primary and secondary) capable of supporting a large number adult fish.

Continued fishery investigations in the 1980's indicated the use of artificial production as a viable way to restore and enhance kokanee salmon and rainbow trout in Lake Roosevelt and Banks Lake. In 1987, the Northwest Power Conservation Council amended its Columbia Basin Fish and Wildlife Program to include measures calling for two hatcheries, a rainbow habitat improvement project and a program for monitoring and evaluating these projects. The hatcheries included one constructed in 1991 at Galbraith Springs on the Spokane Indian Reservation operated by the Spokane Tribe of Indians (Spokane Tribal Hatchery), and one constructed in 1992 at Sherman Creek (a northern tributary in Lake Roosevelt) operated by the Washington Department of Fish and Wildlife. Operation of the two hatcheries compliments each other. Kokanee eggs collected from Sherman Creek along with rainbow trout eggs received from state allotments are incubated at the Spokane Tribal Hatchery. Resulting progeny are reared at the Spokane Tribal Hatchery before release into Lake Roosevelt or transfer to either net pen rearing operations or the Sherman Creek Hatchery. Kokanee and rainbow fingerlings/yearlings are reared at these sites and also released into Lake Roosevelt after the spring drawdown period.

In the 1980's, volunteers from Lake Roosevelt initiated a successful rainbow trout net pen-rearing program. Fingerlings reared at state and federal hatcheries were transferred to net pens in the fall and the volunteers reared the fish to the following spring before release. Prompted by excellent harvest returns and growth rates of net pen reared rainbow trout, as well as insufficient space at state and federal hatcheries, additional space was incorporated in the design of the kokanee hatcheries to rear 500,000 rainbow trout needed for the Lake Roosevelt net pen program. In 1994, the Northwest Power Planning Council amended the Lake Roosevelt Net Pen Project in its Fish and Wildlife Program to employ a coordinator, support operation and maintenance needs and provide fish feed.

Initial stocking from 1987 to 1994 focused on releasing up to 13-million kokanee fry and 500,000 rainbow trout yearlings. However, 1989 to 1994 Lake Roosevelt fisheries monitoring and evaluation data indicated kokanee released as yearlings performed significantly better than fry releases. Accordingly, the hatcheries have since shifted to a yearling kokanee release program for Lake Roosevelt. The current stocking program established by fishery managers from the WDF&W, Colville Confederated Tribes and Spokane Tribe of Indians consists of 1 million yearling kokanee and 500,000 yearling rainbow trout for Lake Roosevelt and 1.4 million kokanee fry/fingerlings for Banks Lake.

Spokane Tribal Hatchery

Lake Roosevelt Kokanee

ARTIFICIAL PRODUCTION PROGRAM OVERVIEW

Multi-Agency Artificial Production Program

The Spokane Tribal Hatchery is one component of a multi-agency artificial production program for restoring and enhancing the Lake Roosevelt and Banks Lake kokanee and rainbow trout fishery. The other components include the Sherman Creek Hatchery, Ford Trout Hatchery and the Lake Roosevelt Kokanee and Rainbow Trout Net Pen Rearing Projects. Each project has its own production goal to collectively produce up to 1 million kokanee yearlings, 1.4 million kokanee fry/fingerlings and 500,000 rainbow trout yearlings for annual stocking into Lake Roosevelt and Banks Lake.

Spokane Tribal Hatchery

Designed and constructed by the BPA in 1990, the Spokane Tribal Hatchery, is a state of the art facility with modern fish production equipment. The hatchery consists of 44 indoor/outdoor raceways with 26,752 cubic feet of rearing space, utilizes ground and surface water, incubates fish eggs using self fabricated upwelling units, and uses modern fish handling and transportation equipment. The hatchery has a laboratory consisting of microscopes (phase contrast and dissecting), analytical balances and fish necropsy tools. Detailed description of the Spokane Tribal Hatchery fish production methods can be found in the 2003 Scope of Work - Annual Operating Plan.

Stocks Used

In 2003, stock composition consisted of Lake Whatcom kokanee, Spokane Trout Hatchery (McCloud River) rainbow trout and Phalon Lake redband rainbow trout. These stocks are identified in Hatchery and Genetic Management Plans for Lake Roosevelt artificial programs developed in 2000. Stock identification methods included marking hatchery kokanee with distinguishing fin clips, oxytetracycline marking and thermal otolith marking.

Operational Summary & Stocking Strategy

The Spokane Tribal Hatchery cultures kokanee and rainbow trout eggs allotted or obtained from Lake Roosevelt and rears resulting progeny through fry, fingerling and yearling stages for annual stocking, inter-program transfer and/or carry over. Stocking includes kokanee fry and yearling releases into Banks Lake and Lake Roosevelt. Inter-program transfers for subsequent stocking into Lake Roosevelt includes kokanee yearlings transferred to the Sherman Creek Hatchery, rainbow trout fingerlings transferred to the Sherman Creek Hatchery and kokanee and rainbow trout fingerlings transferred to Lake Roosevelt Net Pen Projects, all for subsequent release into the project area.

Lake Roosevelt Hatcheries Coordination

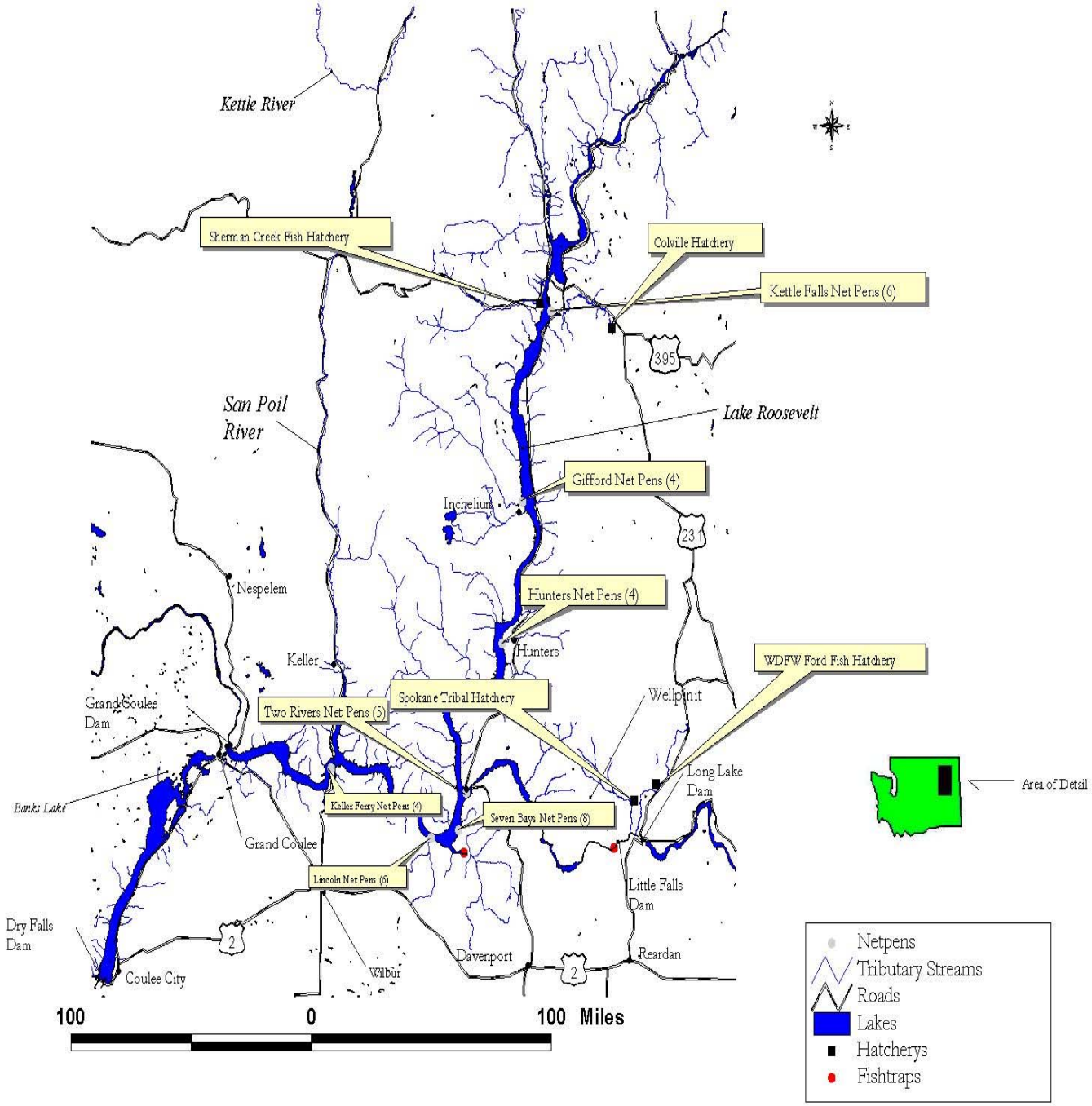
Fishery managers from the Washington Department of Fish and Wildlife, Spokane Tribe of Indians and Colville Confederated Tribes comprise the Lake Roosevelt Hatcheries Coordination Team responsible for directing hatchery and net pen rearing operations.

Monitoring and Evaluation

The Lake Roosevelt and Banks Lake Fisheries Evaluation Programs monitor hatchery and net pen releases including performance and impact on biota. Management implications are brought for to the Lake Roosevelt Hatcheries Coordination Team for implementation.

DESCRIPTION OF PROJECT/PROGRAM AREA

Lake Roosevelt is a mainstem Columbia River impoundment formed by Grand Coulee Dam in 1941. The reservoir, located in Northeast Washington, inundates 33,490 hectares at a full pool elevation of 393 m above sea level. Lake Roosevelt has a maximum width of 3.4 km, and maximum depth of 122 m. The map below illustrates the project area including sites of the hatcheries and net pen rearing projects.



2004 SPOKANE TRIBAL HATCHERY OJECTIVES AND TASKS

Table 1 lists status of 2004 Scope of Work Objectives and Tasks implemented during this report period. Supplemental information of total Lake Roosevelt Artificial Production Program stocking is also included in this report.

Table 1. Scope of Work Objectives and Task implemented in 2004.

SOW Objective	Task & Activity	Status
1. Egg Collection, Spawning & Incubation of 1.625 million Kokanee Eggs and 645,000 Rainbow Trout to Meet 2004 APG.	**1.1 & 1.2** Lake Roosevelt kokanee brood stock capture, holding & spawning; Kokanee Egg Collection from Sherman Creek.	Limited by adverse reservoir operation and elevation; Insufficient return of viable adults.
	1.3 WDF&W & British Columbia egg allotments.	Completed
	1.4 Infectious hematopoietic necrosis (IHN), infectious pancreatic necrosis (IPN) and viral hemorrhagic septicemia (VHS) virus sampling of Lake Roosevelt Kokanee.	Completed
	1.5 Egg enumeration and incubator loading.	Completed
2. Fry & Fingerling Rearing Methods to Meet 2004 APG.	**2.1** Incubation and hatching kokanee and rainbow trout.	Completed
	2.2 Feeding & production of kokanee and rainbow trout.	Completed
	2.3 Raceway loading for fry, fingerling and adult rearing.	Completed
3. Distribution Dates & Locations for Kokanee and Rainbow Trout Releases & Transfers	**3.1** Release 225,000 BY'01 kokanee yearlings at Ft. Spokane.	Completed
	3.2 Release 25,000 BY'01 kokanee yearlings at Little Falls Dam.	Completed
	3.3 Release 25,000 BY'01 kokanee yearlings at Colville River.	Completed
	3.4 Transfer 225,000 kokanee yearlings to the Sherman Creek Hatchery.	Completed
	3.5 Release 300,000 kokanee fingerlings at Banks Lake.	Completed
	3.6 Transfer 500,000 kokanee fingerlings to Lake Roosevelt Net Pens.	Completed
	3.7 Transfer 250,000 rainbow trout fingerlings to the Sherman Creek Hatchery.	Completed
	3.8 Transfer 250,000 rainbow trout fingerlings to Lake Roosevelt Net Pens.	Completed
4. Water Quantity & Quality Necessary to Meet the 2004 APG.	**4.1** Regulation of water inflow during incubation.	Completed
	4.2 Water inflow regulation during fry, fingerling & adult rearing.	Completed
	4.3 Monitoring water quality during fry & fingerling rearing.	Completed
	4.4 Raceway hygiene.	Completed
	4.5 Routine cleaning of spring pond waters.	Completed
5. Adipose Clip Kokanee Salmon Before Release Into Lake Roosevelt	**5.1** Kokanee fin clipping.	Completed
6. Maintenance of Hatchery Building & Grounds, Visitation Improvements & Cultural Preservation	**6.1** Building improvements, capital acquisition & general hatchery maintenance.	Completed
	6.2 Visitation improvements.	Completed
	6.3 Cultural preservation.	Completed
7. Travel & Training Necessary for Meeting 2004 Annual Production Goal &/Or Operation & Maintenance Related.	**7.1** Attending monthly meetings of the Lake Roosevelt Fisheries Managers.	Completed

2004 FISH PRODUCTION

Stock identification format - Species: Stock: Brood Year: Brood Origin
Species - KO = kokanee, RB = rainbow trout
Stock - WHAL = Lake Whatcom, SPOK = Spokane Trout Hatchery (McCloud River), PHAL = Phalon Lake
Brood Year - 01 = 2000, 02=2002
Brood Origin - H = Hatchery, W = Wild

Egg Culturing
Listed below is a summary of the 2004 incubation results.

Table 2. Spokane Tribal Hatchery egg incubation results for 2004.

STOCK	DATE RECEIVED	NO. EGGS RECEIVED	HATCH DATE	LOSS @ HATCH	NO. TRANS. TO FRY	% SURVIVAL
KO:WHAL:03:H	12/28/2003	347,360	01/14/2004	12,110	335,250	96%
KO:MEAD:03:W	10/28/2003	1,646,400	11/22/2004	86,048	1,560,352	94%
RB:SPOK:03:H	12/17/2003	639,144	01/01/2004	90,880	548,264	82%
	Summary:	**2,632,904**		**189,038**	**2,443,866**	**93%**

KO:WHAL:03:H - (Lake Whatcom Kokanee, Brood Year 2003)
A total of 347,360 kokanee eggs were incubated in 2004 from allotments received from WDF&W Lake Whatcom Hatchery. Mortality from initial incubation to hatch was 12,110 for a 96% survival rate and approximately 335,250 transferred to fry.

KO:MEAD:03:W - (Meadow Creek Kokanee, Brood Year 2003)
A total of 1,646,400 kokanee eggs were incubated in 2004 from allotments received from British Columbia Meadow Creek Hatchery. Mortality from initial incubation to hatch was 86,048 for a 94% survival rate and approximately 1,560,352 transferred to fry.

RB:SPOK:03:H - (Spokane Trout Hatchery, Brood Year 2003)
A total of 639,144 rainbow trout eggs were incubated in 2004 from allotments received from WDF&W Spokane Trout Hatchery. Mortality from initial incubation to hatch was 90,880 for a 82% survival rate and approximately 548,264 transferred to fry.

Fry, fingerling and yearling production.
Listed below is a summary of the 2004 fish production results.

Table 3. Spokane Tribal Hatchery fish production summary for 2004.

Stock	KO:WHAL:03:H	KO:MEAD:03:W	RB:SPOK:03:H	KO:WHAL:02:H
No. Fish @ Beginning	335,100	1,553,558	522,526	597,930
Lbs. @ Beginning	167	398	249	13,939
No. Fish Shipped	319,275	828,075	578,283	594,610
Lbs. Shipped	655	16,638	25,467	30,496
% Mortality	4%	7.2%	3.5%	1%
No. Fish @ End	0	508,372	0	0
Lbs. @ End	0	23,374	0	0
Lbs. Gain	488	39,614	25,218	16,557
Lbs. Fed	730	44,500	33,200	18,450
Feed Conv.	1.50	1.12	1.32	1.11

KO:WHAL:02:H - (Lake Whatcom Kokanee, Brood Year 2002)
A total of 594,610 Lake Whatcom kokanee yearlings totaling 30,496 pounds were produced from this stock in 2004. Total weight gain during this rearing cycle was 16,557 pounds. The total food fed was 18,450 pounds ensuing a final feed conversion 1.11 pounds fed per pound of growth for this lot. Diet consisted of Moore-Clark Apollo feed fed at 1.5 to 1% biomass. Mortality during this rearing cycle was 1%.

KO:WHAL:03:H - (Lake Whatcom Kokanee, Brood Year 2003)
Production of this stock began with the initial rearing of 335,100 fry produced from cultured eggs. A total of 319,275 Lake Whatcom kokanee fingerlings totaling 655 pounds were produced from this stock in 2004. Total weight gain during this rearing cycle was 488 pounds. The total food fed was 730 pounds ensuing a final feed conversion 1.50 pounds fed per pound of growth for this lot. Diet consisted of Moore-Clark Nutra & Apollo feeds normally fed at 2.5 to 2% biomass. Mortality during this rearing cycle was 4

KO:MEAD:03:W - (Meadow Creek Kokanee, Brood Year 2003)
Production of this stock began with the initial rearing of 1,553,558 fry produced from cultured eggs. Average size at feed training was 4,500 fish per pound. Total fish from this stock produced in 2004 was 1,336,447 fingerlings weighing 40,012 pounds. Total weight gain during this rearing cycle was 39,614 pounds. The total food fed was 44,500 pounds ensuing a final feed conversion 1.12 pounds fed per pound of growth for this lot. Diet consisted of Moore-Clark Nutra Starter fed at 2.5% biomass, Nutra Fry fed at 2% and Apollo fed at 1% biomass. Mortality during this rearing cycle was 7.2%.

RB:SPOK:03:H - (Spokane Trout Hatchery, Brood Year 2003)
Production of this stock began with the initial rearing of 522,526 fry produced from cultured eggs. Average size at feed training was 2,500 fish per pound. Total fish from this

stock produced in 2004 was 578,283 fingerlings weighing 25,467 pounds. The greater number produced was likely from over-calculated/approximated egg, fry and fingerling mortality. Total weight gain during this rearing cycle was 25,218 pounds. The total food fed was 33,200 pounds ensuing a final feed conversion 1.32 pounds fed per pound of growth for this lot. Diet consisted of Moore-Clark Nutra Starter fed at 2.5% biomass, Moore-Clark Trout AB fed at 2% and Apollo trout fed at 1% biomass. Mortality during this rearing cycle was 3.5%.

Kokanee Carried Over at the Spokane Tribal Hatchery for Release in 2005
A total of 508,372 brood-year 2003 Meadow Creek kokanee were carried over for production and subsequent release in 2004.

Fish Marking
Fish marked in 2004 was inclusive of brood year 2003 Lake Whatcom and Meadow Creek kokanee stocks. A total of 1.6 million kokanee were marked in 2003. Types of marks are listed in the table 4.

Table 4. Fish marked and produced at the Spokane Tribal Hatchery in 2004.

Number Marked	Mark Type	Release Location - Date	Comments
14,400	Adipose Fin Clip	Lake Roosevelt/Spring Canyon – Spring 2004	CCT Strobe Light Study Group
52,080	Left Ventral Fin Clip	Banks Lake – March 2004	One time Banks yearling Release
33,600	Adipose Fin Clip	Lake Roosevelt/Little Falls Dam – March 2004	Yearling Release
322,200	Thermal Otolith	Lake Roosevelt/Big Sheep – March 2004	Tributary Fry Release
251,853	Adipose Fin Clip	Lake Roosevelt/ Ft. Spokane, Little Falls Dam – May 2004	Yearling Release
319,275	Thermal Otolith	Banks Lake – May 2004	Marked by WDFW
63,009	Right Pectoral & Adipose Fin Clip	Sherman Creek Hatchery - Spring 2004	Yearling Release Precocity Test Group
79,956	Left Pectoral & Adipose Fin Clip	Sherman Creek Hatchery - Spring 2004	Yearling Release Precocity Test Group
74,880	Left Ventral & Adipose Fin Clip	Sherman Creek Hatchery - Spring 2004	Yearling Release Precocity Test Group
52,240	Left Ventral	Banks Lake – Spring 2004	Ford Trout Hatchery Exchange
505,875	Adipose Fin Clip	Lake Roosevelt/ Little Falls Dam – Oct. 2004	One time fall release

2004 FISH RELEASES AND INTER-PROGRAM TRANSFERS

Fish released by this project in 2004 included 1,147,350 kokanee fry/fingerlings and 366,915 kokanee yearlings. Table 5 lists the number released for each stock produced by the Spokane Tribal Hatchery in 2004.

Table 5. Summary of fish releases by the Spokane Tribal Hatchery in 2004.

Kokanee yearlings BY'02 Lake Whatcom Stock

Date(s)	No. Released	Release Location	Identifying Mark
03/22&23/2004	52,080	Banks Lake – Norup Creek	Left Ventral Fin Clip
03/24/2004	33,600	Lake Roosevelt – Little Falls Dam	Adipose Fin Clip
05/12/2004	24,480	Lake Roosevelt – Little Falls Dam	Adipose Fin Clip
05/17/2004	24,832	Lake Roosevelt – Meyers Falls	Adipose & Right Ventral Fin Clip
05/06-14/2004	227,373	Lake Roosevelt – Ft. Spokane	Adipose Fin Clip

Kokanee Fry/Fingerlings BY'03 Lake Whatcom Stock

Date(s)	No. Released	Release Location	Identifying Mark
05/18&19/2004	319,275	Banks Lake – Norup Creek	Thermal Otolith

Kokanee Fingerlings BY'03 Meadow Creek Stock

Date(s)	No. Released	Release Location	Identifying Mark
10/25-28/2004	505,875	Little Falls Dam	Adipose Fin Clipped

Fish produced for inter-program transfer in 2004 included 232,245 kokanee yearlings and 537,783 rainbow trout fingerlings. Inter-program fish transfers for subsequent stocking in 2005 are listed in Table 6.

Table 6. Summary of 2004 Inter-Project Transfers for Subsequent Release in 2005.

Dates	ID Code (Spc:Stk:BY:BO)	No. Transferred	Project From	Project To
04/1/2004	KO:WHAL:02:H	14,400	Spokane Tribal Hatchery	Colville Confederated Tribes – Grand Coulee Dam Strobe Light Study
04/2-9/2004	KO:WHAL:02:H	217,845	Spokane Tribal Hatchery	Sherman Creek Hatchery
06/01-04/2004	RB:SPOK:03:H	258,454	Spokane Tribal Hatchery	Sherman Creek Hatchery
9/27/2004 – 10/8-22/2004	RB:SPOK:03:H	279,329	Spokane Tribal Hatchery	LRDA – Lake Roosevelt Net Pens

DISCUSSION

During the first 4 years (1991 to 1995) of hatchery stocking, the emphasis was for production and release of kokanee fry/fingerlings. However, coded wire tag recoveries and a study to chemically imprint and assess smoltification of hatchery produced kokanee indicated that kokanee released as residualized smolts (e.g. yearlings) were captured in higher numbers than kokanee released as fry/fingerlings. Additionally, entrainment losses and predation have a greater impact on kokanee released as fry as opposed to residualized smolts. As a result, the hatcheries have shifted from kokanee fry releases to residualized smolts/yearlings. The current stocking levels for Lake Roosevelt and Banks Lake are based upon artificial production capacities well as the number of fish impoundments can support.

A shift in kokanee stocking strategy in 2003 to increase chances of angler harvest appears successful. Increased stocking levels at Ft. Spokane and Gifford sites resulted in increased catch rates and adult returns reservoir wide. The rainbow trout program continues to sustain a viable fishery. Entrainment and predation continues to be a limiting factor for artificial production success in terms of amount of harvest and escapement. Draft results of 2002 LRFEP investigations to evaluate current stocks used and stocking strategies are being reviewed for future implementation. In terms of economic feasibility, the hatcheries and net pen projects are responsible for a thriving economic base surrounding the sport fishery that has been established. In 1985, the U.S. Fish and Wildlife survey estimated the economic value of the Lake Roosevelt fishery at $2.8 million while post-artificial production program results estimates as much as $12.8 million.

RECOMMENDATIONS

Fishery management recommendations for 2004 fish production that will be implemented accordingly include:

Kokanee Salmon Program

1. Continue current stocking level and adipose clip kokanee before release into Lake Roosevelt.
2. Continue stocking strategies implemented in 2004.
3. Continue thermal manipulation of water and feed protein source.
4. Unique mark (fin clips, thermal) specific release groups.
5. Investigate tributary fry releases for run restoration and possible future egg collection sources.
6. Utilize compatible stocks, Lake Roosevelt and Meadow Creek priorities.

Rainbow Trout Program

1. Continue utilizing 50% triploid/sterile Spokane Trout Hatchery stock.
2. Continue current stocking level and strategy.
3. Continue investigating use of Phalon Lake Redband Trout stock.