HATCHERY AND GENETIC MANAGEMENT PLAN

HGMP

Lake Roosevelt Fisheries Restoration and Enhancement Program

Rainbow Trout

Spokane Tribal Hatchery

Spokane Tribe of Indians
Department of Natural Resources
Water, Fish & Wildlife Division

June 19, 2000

HATCHERY AND GENETIC MANAGEMENT PLAN
RESIDENT FISH VERSION
(HGMP-RF)

Hatchery Program: Spokane Tribal Hatchery

Species or Hatchery Population/Strain:
Spokane Stock Rainbow Trout

Agency/Operator: Spokane Tribe of Indians

Watershed and Region: Upper Columbia River - Lake Roosevelt & Banks Lake Region

Date Submitted: June 19, 2000

Date Last Updated: June 19, 2000

Note to HGMP-RF Reviewers: In terms of artificial production, the Lake Roosevelt Fisheries Restoration and Enhancement Program includes four production projects working in conjunction with each other to produce one release goal each of kokanee salmon and rainbow trout. These projects include the Spokane Tribal Hatchery (rainbow trout and kokanee), the Sherman Creek Hatchery (rainbow trout and kokanee), the Lake Roosevelt Rainbow Trout Net Pen Rearing Project and the Lake Roosevelt Kokanee Net Pen Rearing Project. This should be noted when reviewing each respective projects species specific HGMP to understand the context of restoration and enhancement through the use of artificial production in Lake Roosevelt.

SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of hatchery or program: Spokane Tribal Hatchery

1.2) Species and population (or ~~stock~~strain)~~)~~ under propagation, ~~and~~ ESA/population status:

Spokane stock rainbow trout *(Onchorynchus mykiss)* is primary source. Use of Phalon Lake (redband) stock, is possible.
Not endangered, population stable and healthy

1.3) Responsible organization and individuals

Name (and title): Tim Peone, Manager Spokane Tribal Hatchery
Agency or Tribe: Spokane Tribe of Indians
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Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:

- Washington Department of Fish & Wildlife (Fishery Co-Managers) – Joint Artificial Production through Sherman Creek Hatchery & Lake Roosevelt Kokanee Net Pen Rearing Project, Monitoring & Evaluation through Lake Roosevelt Monitoring Program, Project Direction & Oversight through Lake Roosevelt Hatcheries Coordination Team
- Colville Confederated Tribes (Fishery Co-Managers) - Monitoring & Evaluation through Lake Roosevelt Monitoring Program and Chief Joseph Kokanee Enhancement Project, Project Direction & Oversight through Lake Roosevelt Hatcheries Coordination Team
- Lake Roosevelt Development Association – Joint Artificial Production through Lake Roosevelt Rainbow Trout Rearing Project
- Lake Roosevelt Forum – Public Inter-face Source
- Eastern Washington University - Monitoring & Evaluation through Lake Roosevelt Monitoring Program, Peer Review of Project

1.4) Funding source, staffing level, and annual hatchery program operational costs.

- Funding Agency: Bonneville Power Administration
- Staff Level: 4 Fish Culturists (including manager) and 6 Seasonal Fish Markers/Taggers
- Annual Operational Cost: Currently @ $550,000, varied depending on hatchery capital improvements under plan and hatchery reform measures

1.5) Location(s) of hatchery and associated facilities.

The Spokane Tribal Hatchery is located in eastern Washington at Metamooteles Springs, formally known as Galbraith Springs, which effluent flows into Chamokane Creek, a tributary of the Spokane River.

GIS Code UTM: X-436191, Y-5305957
Sub-Basin: Lake Roosevelt, Upper Columbia River
Township Range Section: T28N, R39E, Sect. 23

1.6) Type of program(s).

Harvest Program

1.7) Purpose (Goal) of program(s).

The Spokane Tribal Hatchery serves as a mitigation *project* with a goal of aiding the Lake Roosevelt fisheries restoration and enhancement *program*. The intention of artificial production in the restoration and enhancement program is to provide a long term readily accessible and harvestable fishery compatible with the ecological stability of the Lake Roosevelt biota as partial mitigation for hydropower–caused fish losses caused by the construction of Grand Coulee Dam.

1.8) Justification for the program.

Need of program:

Several past and present fisheries and hydrological related investigations (ie,, Gangmark and Fulton 1949; Bryant and Parkhurst 1950; Earnest et al. 1966; Stober et al. 1977; Beckman et al. 1985; Scholz et al. 1985 Peone et al. 1989, Griffith and Scholz 1990; Thatcher et al. 119 & 1992; Scholz et al. 1992; Tilson and Scholz 1991 through 1998; Underwood et al. 1993 through 1995; Chiosz et al. 1996, and Underwood et al. 1997 to present – in print) have cited that the construction and operation of Grand Coulee Dam completely blocked and subsequently extinguished anadromous fish runs in the upper Columbia, disrupted several hundred miles of fish spawning and rearing habitat, and adversely affected the conditions and stability of the Upper Columbia River biota.

Fishery investigations from the 1940's to the present have continually determined the need for artificial production to support a viable sport fishery. Scholz et al. (1986) investigated the feasibility of restoring the fishery in Lake Roosevelt and its tributaries and formulated a restoration plan that centered around artificial propagation of kokanee salmon. The management plan also included the following elements: i) maintain existing walleye stocks via natural production and strict harvest management controls; ii) enhancing natural spawning populations of rainbow trout by improving spawning and rearing habitat and access into tributary streams, and; iii) conducting a monitoring program designed to evaluate the effectiveness of the above measures (Scholz et al.

1986).

In 1987, the Northwest Power Planning Council included two hatcheries, a rainbow habitat improvement project and a program for monitoring and evaluating these Lake Roosevelt fishery restoration measures in its 1987 Fish and Wildlife Program. The measure for 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.

In the 1980's, volunteers from Lake Roosevelt initiated a successful rainbow trout net pen rearing project. Fingerlings raised by state and federal hatcheries were transferred to net pens in the fall and the volunteers reared the fish to the following spring before release. Creel surveys performed by Peone et al. (1989) estimated 65,515 rainbow trout were harvested from January to December, 1989. In comparison, Harper et al. (1981) estimated anglers harvested 1,517 rainbow trout from April 15, 1981 to September 15, 1981. This large increase in harvest was attributed to the net pen rearing program (Peone et al. 1989). Fishery surveys in 1986 and 1987 conducted by the Upper Columbia United Tribes Fisheries Center indicated net pen reared trout grew in length at rates ranging from 22 to 36 mm/month and anglers caught most of the fish within 14 months after release (Peone et al. 1989). 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 implemented the net pen rearing operation in its Fish and Wildlife Program.

Fishery managers from the Spokane Tribe of Indians, Colville Confederated Tribes and Washington Department of Fish and Wildlife establish production goals and release strategies annually based upon ongoing scientific research activities on Lake Roosevelt. Initial stocking from 1988 to 1994 focused on annual target release goals of 13.5 million kokanee fry and 500,000 and rainbow trout yearlings. However, in 1995 fishery managers changed the target release goals to 1 million yearlings for Lake Roosevelt, 300,000 kokanee fingerlings for Banks Lake and 550,000 rainbow trout yearlings for Lake Roosevelt. This release goal is anticipated to be met in 2000 with the implementation of the Kokanee Net Pen Rearing Project and each artificial production project working in conjunction with each other.

Benefit of program:

The hatcheries programs effect on the biota of Lake Roosevelt is under constant review by the Lake Roosevelt Monitoring Program. Most recent results of the monitoring program (Underwood et al. 1997, Tilson and Scholz 1997) indicate the impact of the hatchery and net pen programs have been beneficial to restoring and enhancing the Lake Roosevelt fishery while not negatively impacting wild (natural & native) stocks within the lake. Since 1988, the principle sport fishery has shifted from walleye *(Stizostedion*

vitreum) to rainbow trout and kokanee, kokanee runs have been established and restored in Lake Roosevelt tributaries and the angler use, harvest rates for kokanee and rainbow trout and the economic value of the fishery have increased substantially. Technical reports summarizing the Spokane Tribal Hatchery fish production and accomplishments are submitted to the Bonneville Power Administration annually (Peone 1994 through 1997). Effects of the program on the Lake Roosevelt fishery before and after hatchery supplementation continues to be monitored and evaluated by the Lake Roosevelt Monitoring Program. Monitoring and evaluation results for the past 8 years 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 and Scholz 1991 through 1998; Underwood et al. 1993 through 1995; Cichosz et al. 1996, and; Underwood et al. 1997 & 1998 (in print).

Program operation to minimize adverse effects on listed fish:

At this time there are no listed fish in the project area. However, there are listed fish downstream of project area which actually cause adverse effects on Lake Roosevelt fishery restoration and enhancement efforts through Columbia River system operations called for in the National Marine Fisheries Service Biological Opinion.

1.9) List of program "Performance Standards."

Not applicable at this time (see note below).

Species specific biological objectives formulated by fishery managers for mitigating fish losses in blocked area above Grand Coulee Dam were implemented in the Northwest Power Planning Council's 1994 Fish and Wildlife Program as amended in 1995. The objectives include numerical targets for total adult populations, harvest and escapement, as well as timelines to achieve targets, based upon best available scientific evidence. The objectives were based upon the theoretical number of fish that could be supported by the primary and secondary productivity of the reservoir (Jagielo 1984, Beckman et al. 1985, reviewed by Scholz et al. 1986), the first 4 years of hatchery production and new data from the Lake Roosevelt Monitoring Program (Peone et al. 1989, Griffith and Scholz 1990 & 1991 and Underwood and Shields 1995). Included in the objectives is an annual target of 1 million age 1+ residualized smolt kokanee for release into Lake Roosevelt and 500,000 age 0+ rainbow trout for the net pen program. At the present time, the hatcheries in conjunction with the net pen programs are operated in accordance to aid in meeting these biological objectives. Performance standards and indicators are currently limited to these biological objectives. At this time, artificial production specific performance standards with indicators and methods of monitoring and evaluating them need to be compiled and implemented in Inter-Mountain Provincial Review Sub-Basin Planning Process. Further information for this section may be supplied at such a time.

1.10) List of program "Performance Indicators", designated by "benefits" and "risks."

1.10.1) "Performance Indicators" addressing benefits.

Not applicable at this time; see note under section 1.9.

1.10.2) "Performance Indicators" addressing risks.

Not applicable at this time; see note under section 1.9.

1.11) Expected size of program.

The expected size of the program, in terms of fish artificially produced through joint efforts of the Spokane Tribal Hatchery, Sherman Creek Hatchery and Lake Roosevelt Net Pen Rearing Program, includes annual target release goals of 1 million kokanee yearlings, 300,000 kokanee fingerlings and 550,000 rainbow trout yearlings.

1.11.1) Proposed annual broodstock~~collection level~~ need (maximum number of~~adult~~ fish).

Broodstock need is not directly applicable to the Spokane Tribal Hatchery Project because rainbow trout eggs are allotted from the WDF&W Spokane Trout Hatchery.

1.11.2) Proposed annual fish release levels (maximum number) by life stage and location.

Life Stage	Release Location	Annual Release Level
Eyed Eggs		
Unfed Fry		
Fry		
Fingerling		
Yearling	Lake Roosevelt	550,000

1.12) Current program performance, including estimated~~smolt-to-adult~~ survival rates, adult production levels, and escapement levels. Indicate the source of these data.

Performance of the Lake Roosevelt artificial production projects is determined through the Lake Roosevelt Monitoring Program. Data such as CPUE and condition factors can be found in annual reports by Peone *et al*. 1989; Griffith and Scholz 1990; Thatcher *et al.* 1991 & 1992; Scholz *et al.* 1992; Tilson and Scholz 1991 through 1998; Underwood et al. 1993 through 1995; Cichosz et al. 1996, and; Underwood et al. 1997 & 1998 (in print).

As a generalized statement, results of 10 years of monitoring indicate hatchery origin rainbow trout have performed quite well by significantly contributing (90+%) to the total

creel (catch and harvest) of rainbow trout. Condition factor of rainbow in the creel and collected during fishery surveys are excellent, generally ranging from 0.8 to 1.5. Escapement for natural production is irrelevant to this program because of the spawning time (winter) of these fish and limited spawning and rearing area. Hatchery origin rainbow trout are released with the intention that they are 100% harvestable.

1.13) Date program started (years in operation), or is expected to start.

Program initiated in 1990; first fish releases related to this project were in the early 1980's.

1.14) Expected duration of program.

Currently, this program operates under an Intergovernmental agreement with the BPA that includes a performance period of June 7, 1990 to June 7, 2015. This agreement includes language pertaining to a 25-year extension at the end of the performance period.

1.15) Watersheds targeted by program.

~~*of return*~~Lake Roosevelt including the Spokane and San Poil Rivers.

1.16) Indicate alternative actions considered for attaining program goals, and reasons why those actions are not being proposed.

Management implications for operating Lake Roosevelt hatcheries has been continually reviewed each year with measures for attaining production goals derived. For example, in terms of meeting the target release goal of 1 million kokanee yearlings, the Lake Roosevelt Kokanee Net Pen Rearing Project was implemented. It is anticipated further alternative actions will be considered during regional sub-basin programmatic review and planning processes. Measurable salmonid enhancement and restoration, in terms of providing a stable long term fishery, in Lake Roosevelt is limited to the use of artificial production due to shifting reservoir operations influenced by ever changing flood control rule curves and system operation requests related to ESA listed species recovery measures.

~~**SECTION 2. PROGRAM EFFECTS ON ESA-LISTED SALMONID POPULATIONS.**~~

~~**2.1) List all ESA permits or authorizations in hand for the hatchery program.**~~

~~**2.2) Provide descriptions, status, and projected take actions and levels for ESA-listed natural populations in the target area.**~~

~~**2.2.1) Description of ESA-listed salmonid population(s) affected by the program.**~~
~~*Include information describing: adult age class structure, sex ratio, size*~~

range,migrational timing, spawning range, and spawn timing; and juvenile life history strategy, including smolt emigration timing. Emphasize spatial and temporal distribution relative to hatchery fish release locations and weir sites

- Identify the ESA-listed population(s) that will be directly affected by the program. *(Includes listed fish used in supplementation programs or other programs that involve integration of a listed natural population. Identify the natural population targeted for integration).*

- Identify the ESA-listed population(s) that may be incidentally affected by the program.
(Includes ESA-listed fish in target hatchery fish release, adult return, and broodstock collection areas).

2.2.2) Status of ESA-listed salmonid population(s) affected by the program.

- Describe the status of the listed natural population(s) relative to "critical" and "viable" population thresholds (*see definitions in "Attachment 1").*

- Provide the most recent 12 year (e.g. 1988-present) progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for the listed population. Indicate the source of these data.

- Provide the most recent 12 year (e.g. 1988-1999) annual spawning abundance estimates, or any other abundance information. Indicate the source of these data. *(Include estimates of juvenile habitat seeding relative to capacity or natural fish densities, if available).*

- Provide the most recent 12 year (e.g. 1988-1999) estimates of annual proportions of direct hatchery-origin and listed natural-origin fish on natural spawning grounds, if known.

2.2.3) Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of listed fish in the target area, and provide estimated annual levels of take *(see "Attachment 1" for definition of "take").*

- Describe hatchery activities that may lead to the take of listed salmonid populations in the target area, including how, where, and when the takes may occur, the risk potential for their occurrence, and the likely effects of the take.
(e.g. "Broodstock collection directed at sockeye salmon has a "high" potential to take listed spring chinook salmon, through migrational delay, capture, handling, and upstream release, during trap operation at Tumwater Falls Dam between July 1 and October 15. Trapping and handling devices and methods may lead to injury to listed fish through descaling, delayed migration and spawning, or delayed mortality as a result of injury or increased susceptibility to predation").

~~- Provide information regarding past takes associated with the hatchery program, (if known) including numbers taken, and observed injury or mortality levels for listed fish.~~

~~- Provide projected annual take levels for listed fish by life stage (juvenile and adult) quantified (to the extent feasible) by the type of take resulting from the hatchery program (e.g. capture, handling, tagging, injury, or lethal take).~~
~~*Complete the appended "take table" (**Table 1**) for this purpose. Provide a range of potential take numbers to account for alternate or "worst case" scenarios.*~~

~~- Indicate contingency plans for addressing situations where take levels within a given year have exceeded, or are projected to exceed, take levels described in this plan for the program.~~
~~*(e.g. "The number of days that steelhead are trapped at Priest Rapids Dam will be reduced if the total mortality of handled fish is projected inseason to exceed the 1988-99 maximum observed level of 100 fish.")*~~

SECTION ~~3~~2. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

~~3~~2.1) Describe alignment of the hatchery program with other hatchery plans~~any ESU-wide hatchery plan (e.g. *Hood Canal Summer Chum Conservation Initiative*) or other regionally accepted~~ and policies (e.g., the NPPC *Annual Production Review* Report and Recommendations - NPPC document 99-15). Explain any proposed deviations from the plan or policies.

Lake Roosevelt artificial production programs are operated under the review, guidance, and direction of the Lake Roosevelt Hatcheries Coordination Team. This group consists of personnel from the Spokane Tribe, Colville Confederated Tribes and Washington Department of Fish and Wildlife, the responsible fishery management agencies for the project area. Further hatchery plans, policies and reform measures may be implemented through regional sub-basin programmatic review and planning processes.

~~3~~2.2) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates.

- Intergovernmental agreement with the BPA for operation and maintenance
- All NPPC Columbia River Basin Fish and Wildlife Program and Amendments
- Fish Health Management and Policy
- Investigational New Animal Drug Policy
- National Pollutions Discharge Policy (under development)

This project is consistent with these plans and commitments.

~~3~~2.3) Relationship to harvest objectives.

2.3.1) ~~3.3.1)~~ Describe fisheries benefiting from the program, and indicate harvest levels and rates for program-origin fish for the last 12 years (1988-99), if available.

Lake Roosevelt fisheries specifically benefits from this program by increased harvest of hatchery origin fish and alleviation of fishing pressure on limited naturally producing populations. The annual harvest of rainbow trout was estimated at 79,638 by Peone et al. (1989) and has since increased to 226,809 fish in 1998 (Underwood et al. 1998 – in print).

~~3~~2.4) Relationship to habitat protection and ~~recovery strategies~~ purposes of artificial production.

Major factors affecting natural production include reservoir operations adverse affects on fish populations (entrainment) and likewise on the limited spawning and rearing habitat.

From the 1940's to the late 1960's fishery surveys indicated a prominent population of kokanee salmon were abundant in Lake Roosevelt. Large numbers of kokanee were reportedly harvested in the forebay of Lake Roosevelt and high gill net and purse seine catches were made in the forebay in 1966 and 1967 by Bureau of Commercial Fisheries personnel (Snyder 1967, reviewed by Stober et al. and Scholz 1986). There were additional reports of large numbers of kokanee that outmigrated through Grand Coulee Dam during this time period. Interviews of local residents as well as National Park Service and Bureau of Reclamation personnel indicated that there was a salvage fishery for the "tens of thousands to hundreds of thousands" of disable kokanee in the tail race of Grand Coulee Dam (Cash 1985). These observations indicate that ecological conditions after 1939 to the late 1960's were favorable for successful reproduction and survival of kokanee.

Kokanee abundance declined precipitously, commencing in 1968, after the reservoir was drawn down for the construction of a third powerhouse at Grand Coulee Dam. The drawdown was thought to negatively effect kokanee in at least two ways; first, through increased entrainment through the dams because of the higher flushing rate; second, by reducing access to tributaries and shoreline areas for spawning. Since completion of the third powerhouse, the magnitude and duration of reservoir level fluctuations has been

altered (U.S. Geological Survey reports for water years 1960-1984; reviewed by Scholz 1986). Analysis of the increased annual drawdown over time, specifically 1941 to 1976, indicated the kokanee decline after 1968 was because reservoir elevations reduced egg and fry survival rates (Stober 1977).

Stober et al. (1977) evaluated the historical drawdown patterns of Lake Roosevelt in relation to spawning and incubation timing of kokanee and concluded that the decline in kokanee during the 1960's and 1970's could be explained by the impact of the annual drawdown regime on kokanee reproductive success (Scholz et al. 1985). Since 1968, the reservoir has been operated to produce more power, follow flood control rule curves and meet ESA requirements (1990's), thus causing lower water elevations and reduced water retention times from winter through spring. Since kokanee spawn in late fall when water levels are high, maintenance of reservoir levels in winter and spring are critical importance to the normal development of eggs and the early life history stages. Given these current reservoir operations, any type of natural production to support a sustainable kokanee salmon or fishery would be impossible (Scholz et al. 1986, Peone et al. 1989).

Comparison of zooplankton standing crops in Lake Roosevelt to those of other good kokanee producing lakes indicates zooplankton densities in Lake Roosevelt are greater than, or comparable to, other kokanee lakes (Jagielo 1984, Beckman et al. 1985, Peone et al. 1989, Griffith and Scholz 1990). Taking into account that kokanee are primarily planktivorous feeders and analyzing the high productivity of zooplankton (e.g., Daphnia sp.), Beckman et al. (1985) estimated the forage base in Lake Roosevelt could support about 16 million fingerling and 5.9 million adult kokanee (Scholz et al. 1986, Peone et al. 1989).

Nigro et al. (1983) determined that 27,200 m of suitable natural spawning habitat was available for kokanee in Lake Roosevelt and tributaries, and calculated that 181,000 adult fish or 5.4 fish/hectare could be produced by natural spawning if the habitat was fully utilized. Thus, the ability of naturally spawned kokanee to populate the reservoir was far less than the number that could be produced given the food availability in the reservoir. The primary (phytoplankton) and secondary (zooplankton) biological productivity of the reservoir can support 5.9 million adults, whereas the maximum number that can be produced, if all natural spawning habitat is used, is 0.18 million adults (Scholz et al. 1986, Peone et al. 1989). The amount of spawning habitat and fluctuating reservoir levels also effect the ability for Lake Roosevelt to sustain an adequate population of rainbow trout as noted by Stober et al. (1977) and Scholz et al (1986). However, these factors less severely impact the reproductive success of walleye due to a spawning and incubation cycle that compliments reservoir operations (Stober et al. 1977, Beckman et al. 1985 and Scholz et al. 1986).

In 1989, the Lake Roosevelt Tributaries Rainbow Trout Habitat and Passage Improvement Project was implemented to promote natural production of Lake Roosevelt rainbow trout by improving passage for migrating adults and instream habitat for fry and fingerling rearing in selected tributaries. Monitoring natural populations of rainbow trout in Lake Roosevelt is included in the Lake Roosevelt Monitoring/Data Collection Project.

In 1994, the Chief Joseph Kokanee Enhancement Project was implemented into the Council's Fish and Wildlife Program to evaluate the status of naturally producing kokanee in Lake Roosevelt and the feasibility of using them for the hatchery programs. This includes the identification of an actual native stock unique to Lake Roosevelt. In the past, Lake Whatcom kokanee stock were used for building runs in Lake Roosevelt. Since initiation of the hatchery programs, adult kokanee returns have varied. A combination of factors include release size/age, entrainment, predation and lake operations effect the survival of kokanee to adulthood in Lake Roosevelt. Various stocking strategies have been employed to increase the adult returns. An additional recommendation from the monitoring program, which has been incorporated into the hatchery program, includes using alternative stocks that may be more compatible with the characteristics of Lake Roosevelt. This measure takes into account maintain the genetic integrity of existing stocks. Currently, multiple stocks from Lake Whatcom, Kootenai Lake and Lake Roosevelt are used. In the past, a stock from Flathead Lake was also used, however this stock as well as the Lake Whatcom and existing Lake Roosevelt stocks are believed to be genetically related to Lake Whatcom. In respect to this, the Chief Joseph Kokanee Enhancement Project and Lake Roosevelt Monitoring/Data Collection Program are investigating the genetic diversity of Lake Roosevelt kokanee to aid in management implications of the hatchery programs (Underwood et al. 1995 and Cichosz et al. 1996). The monitoring program is performing a coded wire tagging program to differentiate stocks and analyze their effectiveness (e.g. survival, harvest benefit, return to spawning sites).

~~3~~2.5) Ecological interactions.

The species that primarily negatively impact Lake Roosevelt artificial production programs are limited to predators such as walleye and northern pike minnow (*Ptychocheilus oregonensis*). Other predators such as bald eagles and ospreys are positively impacted by this project by the creation of a supplemental forage base. There are no identified species negatively impacted by artificial production in Lake Roosevelt.

SECTION 43. WATER SOURCE

~~4~~3.1) Provide a quantitative and narrative description of the water source (spring, well, surface), water quality profile, and natural limitations to production attributable to the water source.

Water source for fish production at the Spokane Tribal Hatchery includes both surface and ground water supplies. In terms of surface water, the project site is near a series of springs that emerge at the foot of a terrace west of the Chamokane Creek. The effluent of surface water is intercepted near the lower gradient area of the project site and pumped via two 25 hp verticle turbine pumps to a tower head box at the northern end of the hatchery facility where it is deposited through a series of aeration devices and hence gravity flows to the fish culturing. The average total discharge flow of the springs near the interception site is estimated at 5 cfs. In terms of ground water, two wells with

submersible 50 hp pumps supply 2 to 3 cfs to the hatchery is similar fashion of the surface water. There are actually two aquifers, an upper and lower, that exist at the project site. Both aquifers are composed of glacial lake deposits of clays and silts. The upper aquifer is unconfined and perched on a 200 foot layer of clay and silt. The upper aquifer is the primary source of hatchery water while the lower supplies the domestic water. Investigations of the upper aquifer and springs indicate evidence of the possibility of a hydrological connection/overlap of the two sources.

43.2) Indicate any appropriate risk aversion measures that will be applied to minimize the likelihood for the take of listed ~~natural fish~~ species as a result of hatchery water withdrawal, screening, or effluent discharge.

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Not applicable to this project site.

SECTION ~~5~~4. FACILITIES

~~5~~4.1) Broodstock collection, holding, and spawning facilities ~~(or methods)~~.

At this time, brood collection and spawning is not applicable to rainbow trout production because the eggs are allotted from WDF&W. However, egg source for kokanee production includes WDF&W and B.C. Environment allotments as well as Lake Roosevelt adult kokanee collection at Sherman Creek Hatchery, Little Falls Dam and Hawk Creek. The Sherman Creek Hatchery site was designed to collect adults and subsequently eggs for transfer to this project site.

At Little Falls Dam (south /eastern border on the Spokane Arm of Lake Roosevelt) the Spokane Tribe built an experimental fish trap and acclimation facility to complement kokanee enhancement efforts. Additional kokanee eggs may potentially be collected from Hawk Creek (mid-reservoir tributary) where a run of kokanee has established. However, please note that at this time the use of brood from Little Falls Dam is under investigation and not considered a reliable source.

Lake Roosevelt fishery managers are considering the implementation of a spawning channel at this site to complement artificial and natural production of Lake Roosevelt kokanee. Implementation of spawning channels is being coordinated in regional sub-basin programmatic review and planning processes.

~~5~~4.2) Fish transportation equipment (description of pen, tank truck, or container used).

A 1,450 gallon insulated stainless steel fish transportation tanker and 300 gallon portable insulated fiberglass tank is used for transporting 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.

~~5.3) Broodstock holding and spawning facilities.~~54.~~.~~34) **Incubation facilities**.

Vertical flow incubators (Heath Trays) and cylindrical upwelling incubators (upwellors) are used for egg incubation. Loading rate for the verticle flow incubators will be 12,000 eggs per verticle 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.

~~54.45~~) **Rearing facilities.**

Rearing facilities at the project site include 44 raceways with approximately 608 ft^3 rearing space. Fish are loaded in raceways relative to a density index of <0.5 lbs/ft^3.

~~54.56~~) **Acclimation/release facilities.**

There are no acclimation facilities applicable to rainbow trout production and release. However, release facilities include approximately 40 net pens at 8 to 10 rearing sites. In terms of kokanee, the Sherman Creek Hatchery and Little Falls Dam Fish Trap and Acclimation Facility serve in the capacity of acclimation and release sites.

~~54.67~~) **Describe operational difficulties or disasters that led to significant fish mortality.**

~~54~~.6.~~18~~) ~~———~~**Indicate available back-up systems, and risk aversion measures ~~that will be applied,~~ that minimize the likelihood for the take of listed~~natural fish~~ species that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.**

Risk aversion measures for the take of listed species are not applicable at the project area. In terms of back up power and water loss systems, the facility is equipped with a generator for power loss with an automatic transfer system and a digital alarm system for notifying hatchery staff of such problems. The project is also in the process of designing and constructing an emergency escapement pond at the effluent of the hatchery site to avoid catastrophic losses. Construction of the emergency escapement pond should be completed by the end of 2001.

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 may limit hatchery carrying capacity and also serve as a back up system in case of power failure.

In terms of disease transmission, the project has a strict sanitation protocol for use of tools. Additionally, all sources of kokanee egg collection are tested for presence of IHN, IPN and VHS viruses. Samples of ovarian fluid, spleen and kidney tissue are collected

from approximately 60 ripe females. Samples are chilled on ice and delivered to the WDFW pathology laboratory in Olympia, WA., where they are analyzed by WDFW personnel. Collection and delivery of samples is 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.

Upon reception of any eggs, rainbow trout or kokanee salmon eggs are disinfected before entering the Spokane Tribal Hatchery by bathing in a 100 part per liter Argentine solution (Piper *et al.* 1987) for approximately 15 minutes and then rinsed with clean water.

4.6.2) Indicate needed back-up systems and risk aversion measures that minimize the likelihood for the take of listed species that may result from equipment failure, water loss, flooding, disease transmission, or other events that could lead to injury or mortality.

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See note of emergency escapement pond in section 4.6.1**.**

SECTION ~~6~~5. BROODSTOCK ORIGIN AND IDENTITY

~~**Describe the origin and identity of broodstock used in the program, its ESA listing status, annual collection goals, and relationship to wild fish of the same species/population.**~~

~~6~~5.1) Source.

Source of rainbow trout includes the Spokane stock of rainbow trout which are a McCloud River (California) derivative and potentially the use of Phalon Lake (redband) rainbow trout which may have a genetic similarity to native Lake Roosevelt rainbow trout.

~~6~~5.2) Supporting information.

Spokane stock rainbow trout: Originally obtained from the McCloud River near Mr. Shasta, California (Crawford 1979). This stock is commonly used in eastern Washington and has been a sole source for this project since initiation.

Phalon Lake (redband) rainbow trout stock: Although this stock is not reared at this facility, its potential use for Lake Roosevelt is currently under investigation. According to WDF&W personnel, this stock was initiated in 1991 and have indicated a genetic analysis of near 100% redband thus demonstrating a potential component of coastal pre-dam steelhead influence (Mitch Combs – agency letter response).

Lake Whatcom kokanee stock: Earliest records indicate original kokanee plants (1904) in the northwest were tied to Lake Whatcom, Lake Chelan, Wenatchee Lake, Lake Sammamish and Lake Washington (Crawford 1979). The Lake Whatcom stock of kokanee was cited by Crawford (1979) as *"pure, having no known introductions from other kokanee sources"*. The genetic definition of this stock, as well as other stocks used for Lake Roosevelt and in Lake Roosevelt, is currently being performed by the Chief

Joseph Kokanee Enhancement Project.

Kootenay Lake (Meadow Creek) kokanee stock: According to broodstock investigations performed by WDFW personnel (Mitch Combs – agency letter response) Meadow Creek kokanee is one of three stocks found in British Columbia and has been a source since 1938. This stock is believed to be a native stock inherent to Kootenay Lake and is currently under propagation for compatibility, both genetic and performance wise, in Lake Roosevelt fisheries restoration and enhancement programs.

~~6~~5.2.1) History.

See narratives in sections 5.1 and 5.2. For further information, please review Washington State Game Department Fishery Research Report (Crawford 1979) and attached WDF&W agency letters in Appendix A.

~~6~~5.2.2) Annual size.

See narratives in sections 5.1 and 5.2. For further information, please review Washington State Game Department Fishery Research Report (Crawford 1979) and attached WDF&W agency letters in Appendix A.

~~6~~5.2.3) Past and proposed level of natural fish in broodstock.

See narratives in sections 5.1 and 5.2. For further information, please review Washington State Game Department Fishery Research Report (Crawford 1979) and attached WDF&W agency letters in Appendix A.

~~6~~5.2.4) Genetic or ecological differences.

See narratives in sections 5.1 and 5.2. For further information, please review Washington State Game Department Fishery Research Report (Crawford 1979) and attached WDF&W agency letters in Appendix A.

5.2.5) ~~6.2.5)~~ Reasons for choosing Broodstock traits

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See narratives in sections 5.1 and 5.2. For further information, please review Washington State Game Department Fishery Research Report (Crawford 1979) and attached WDF&W agency letters in Appendix A.

~~5.2.5)~~5.2.6) **ESA-Listing status**

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Not applicable to the project brood sources.

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~~*Describe any special traits or characteristics for which broodstock was selected.*~~

~~6~~5.3) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects that may occur as a result of using the broodstock source. ~~to listed natural fish that may occur as a result of broodstock selection practices.~~

See narratives in sections 5.1 and 5.2. For further information, please review Washington State Game Department Fishery Research Report (Crawford 1979) and attached WDF&W agency letters in Appendix A.

SECTION ~~7~~6. BROODSTOCK COLLECTION

Information/response for section 6: At this time, reliable broodstock collection is not applicable to this project; please note narratives in sections 4.1, 5.1 and 5.2 response and defer review to WDF&W Sherman Creek Hatchery HGMP's for rainbow trout and kokanee salmon.

~~7~~6.1) Life-history stage to be collected (~~adults, eggs, or juveniles~~ eggs, juveniles, adults).

See note under section 6 caption.

~~7~~6.2) Collection or sampling design.

See note under section 6 caption.

~~7~~6.3) Identity.

See note under section 6 caption.

~~7~~6.4) Proposed number to be collected:

~~7~~6.4.1) Program goal (assuming 1:1 sex ratio for adults): See note under section 6 caption.

~~7~~6.4.2) Broodstock collection levels for the last 12 years (e.g., 1988-99), or for most recent years available: See note under section 6 caption.

Year	Adults Females	Males	Jacks	Eggs	Juveniles
1988					
1989					
1990					
1991					
1992					
1993					
1994					
1995					
1996					
1997					
1998					
1999					

~~7~~6.5) Disposition of hatchery-origin fish collected in surplus of broodstock needs.

See note under section 6 caption.

~~7~~6.6) Fish transportation and holding methods.

See note under section 6 caption.

~~7~~6.7) Describe fish health maintenance and sanitation procedures applied.

See note under section 6 caption.

~~7~~6.8) Disposition of carcasses.

See note under section 6 caption.

~~7~~6.9) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed ~~d natural fish~~ species resulting from the broodstock collection program.

See note under section 6 caption.

SECTION ~~8~~7. MATING

Describe fish mating procedures that will be used, including those applied to meet performance indicators identified previously.

Information/response for section 7: At this time, reliable broodstock collection is not applicable to this project; please note narratives in sections 4.1, 5.1, 5.2 and 6.0 response and defer review to WDF&W Sherman Creek Hatchery HGMP's for rainbow trout and kokanee salmon.

~~8~~7.1) Selection method.

See note under section 7 caption.

~~**8.2) Males.**~~

~~*Specify expected use of backup males, precocious males (jacks), and repeat spawners.*~~

~~8~~7.2~~3~~) Fertilization.

See note under section 7 caption.

~~8~~7.3~~4~~) Cryopreserved gametes.

See note under section 7 caption.

~~8~~7.4~~5~~) ~~———~~Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic or ecological effects to listed natural fish resulting from the mating scheme.

See note under section 7 caption.

SECTION ~~9~~8. INCUBATION AND REARING

~~**Specify any management *goals* (e.g. "egg to smolt survival") that the hatchery is currently operating under for the hatchery stock in the appropriate sections below. Provide data on the success of meeting the desired hatchery goals.**~~

~~9~~8.1) Incubation:

~~9~~8.1.1) Number of eggs taken/received and survival rate at stages of egg development ~~and survival rates to eye-up and/or ponding~~

To meet the target release goals of 1 million kokanee yearlings, 300,000 kokanee fingerlings and 550,000 rainbow trout yearlings, 1.8 million kokanee eggs and 625,000 rainbow trout eggs will cultured. This assumes a survival rate of 80% from initial culturing of eggs to shipping of fish. Historically, survival rates this project have been 80% or greater. Technical reports summarizing survival and production information by this project are annually submitted to the Bonneville Power Administration.

~~**9.1.2) Cause for, and disposition of surplus egg takes.**~~
~~*Describe circumstances where extra eggs may be taken (e.g. as a safeguard against potential incubation losses), and the disposition of surplus fish safely carried through to the eyed eggs or fry stage to prevent accedence of programmed levels.*~~

~~9~~8.1.2~~3~~) Loading densities applied during incubation.

Loading rate for the verticle flow incubators will be 12,000 eggs per verticle 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.

~~9~~8.1.3~~4~~) Incubation conditions.

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

~~9~~8.1.4~~5~~) Ponding.

Fish are loaded in raceways relative to a density index of >0.5 lbs/ft^3.

~~*degree of button up, cumulative temperature units, and mean length and weight (and distribution around the mean) at ponding. State dates of ponding, and whether swim up and ponding are volitional or forced.*~~

~~9~~8.1.5~~6~~) Fish health maintenance and monitoring.

Raceways are 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.

This project operates in compliance with Fish Health Management and Investigational New Animal Drug Policies.

~~9~~8.1.6~~7~~) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to ~~listed~~ fish during incubation.

Eggs are incubated using well water with the back up option of spring water.

~~9~~8.2) Rearing:

~~9~~8.2.1) Provide survival rate data (*average program performance*) by hatchery life stage (fry to fingerling; fingerling to release~~smolt~~) for the most recent twelve years (1988-99), or for years dependable data are available..

Survival from egg to fry is typically greater than 80%, from fry to fingerling and fingerling to release survival is typically greater than 95%. Technical reports with details of survival and production information by this project are annually submitted to the Bonneville Power Administration.

~~9~~8.2.2) Density and loading criteria (goals and actual levels).

Fish are loaded in raceways relative to a density index of <0.5 lbs/ft^3. A standard flow index of 1.5 lbs fish/gpm is used for flow calculations in relation to the determined density.

~~9~~8.2.3) Fish rearing conditions

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:

$$I = \frac{W}{L \times 1.5}$$

where: I = total inflow
W = projected weight
L = projected length

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

Daily temperatures (°C) are 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 (N_2) levels should remain below 100% saturation level. Packed column aerators in the head box should produce acceptable D.O. and N_2 levels. However, D.O. is measured with a YSI meter and N_2 levels will be measure periodically with a WEISS saturometer. 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. Water sample analysis from each source includes a measurement of 34 properties associated with the Alaska Dept. of Fish and Game Water Quality Standards for coldwater fish culturing. Samples to date indicate results compatible for cold water fish culturing.

Refer to sections 3, 4 and 8 for further information.

~~9~~8.2.4) Indicate biweekly or monthly fish growth information (*average program performance*), including length, weight, and condition factor data collected

during rearing, if available.

Monthly growth for rainbow trout and kokanee salmon averages approximately 0.5 inches per month. USF&WS standardized condition factors in relation to historical recorded growth is used (Piper et al. 1982).

~~**9.2.5) Indicate monthly fish growth rate and energy reserve data (*average program performance*), if available.**~~

~~*Contrast fall and spring growth rates for yearling smolt programs. If available, indicate hepatosomatic index (liver weight/body weight) and body moisture content as an estimate of body fat concentration data collected during rearing.*~~

~~9~~8.2.~~5~~6) **Indicate food type used, daily application schedule, feeding rate range (e.g. % B.W./day and lbs/gpm inflow), and estimates of total food conversion efficiency during rearing (*average program performance*).**

Feed training of kokanee and rainbow trout begins at the 90% swim-up stage. The following feeding projections are based on a relatively constant temperature of 10°C. Feeding rates and amount 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 present.

Bio-diet semi-moist or Moore Clark Nutra Plus starter feeds may be used for feed training For feed training, both species of fry will be fed 3 to 4% body weight 8 times per day. Moore Clarks Fry and Silver Cups dry trout feeds will be used for production feeding. A frequency of 5 feedings per day will be performed during production. Conversions typically range between 0.6 and 2.5, depending on life stage and production conditions.

Technical reports with details of survival and production information by this project are annually submitted to the Bonneville Power Administration.

~~9~~8.2.~~6~~7) **Fish health monitoring, disease treatment, and sanitation procedures**.

Raceways are 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.

This project operates in compliance with Fish Health Management and Investigational New Animal Drug Policies. Disease treatments include use of Chloramine-T and hydrogen peroxide for bacterial gill disease. Use of oxytetracycline may be used if systemic bacterial infections are diagnosed.

The Spokane Tribal Hatchery is equipped with a laboratory capable of performing fish pathology (necropsy, bacterial isolation/identification). However, most pathology work is performed by Steve Roberts, certified fish pathologist of WDFW.

~~9.2.8) Smolt development indices (e.g. gill ATPase activity), if applicable.~~

~~9~~8.2.~~7~~9) Indicate the use of "natural" rearing methods as applied in the program.

Currently, natural rearing methods is limited to the use of low level light conditions and gravel substrate during culturing. However, more natural rearing methods may be implemented as hatchery reform measures associated with regional sub-basin programmatic review and planning processes

~~9~~8.2.~~8~~10) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to~~listed~~ fish under propagation.

At this time there are no measures associated with the genetic and ecological effects to fish under propagation. This has not been identified as a program measure prudent to ongoing hatchery practices.

SECTION ~~10~~9. RELEASE

Describe fish release levels, and release practices applied through the hatchery program.

The data in this section includes fish released by this project which operates in conjunction with the Lake Roosevelt Net Pen Rearing Projects (rainbow trout and kokanee) and the Sherman Creek Hatchery to meet a final target release goal of 550,000 rainbow trout yearlings, 1 million kokanee yearlings and 300,000 kokanee fingerlings into project area. Actual total release data into the project area is compiled into a database through the upper Columbia Joint Stock Assessment Program as well as WDF&W. A summary of hatchery origin rainbow trout released into Lake Roosevelt 1986 through 1998 is listed in Appendix B at the end of this plan.

~~10.1) Proposed fish release levels.~~ *~~(Use standardized life stage definitions by species~~* **~~9~~.1) Proposed fish release levels.**

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling				
Yearling	550,000	2 to 5/lb	May 15 to July 15	Lake Roosevelt

~~10~~9.~~.~~2) Specific location(s) of proposed release(s).

Stream, river, or watercourse: Lake Roosevelt including Spokane, Kettle and San Poil River arms.

Release point: 8 to 10 sites in Lake Roosevelt including (south to north): Keller Ferry, Lincoln, Seven Bays, Two Rivers, Hunters, Hall Creek, Colville River, Sherman Creek and Kettle Falls.

Major watershed: Lake Roosevelt

Basin or Region: Inter-Mountain Province/Upper Columbia River Basin/Grand Coulee Dam Impoundment.

~~10~~9.3) Actual numbers and sizes of fish released by age class through the program.

See note under section 9.0 about total release into program area. This project does not release rainbow trout, but rather rears and transfers them to the Sherman Creek Hatchery, for later transfer to Lake Roosevelt net pens, and also direct transfers to the net pen programs. A summary of hatchery origin rainbow trout released into Lake Roosevelt 1986 through 1998 is listed in Appendix B at the end of this plan.

Release year	Eggs/ Unfed Fry	Avg size	Fry	Avg size	Fingerling	Avg size	Yearling	Avg size
1988								
1989								
1990								
1991								
1992								
1993								
1994								
1995								
1996								
1997								
1998								
1999								
Average								

~~10~~9.4) Actual dates of release and description of release protocols.

Target release date is dependent on reservoir operations (ie, refill period) and zooplankton abundance. Generally, fish are released between June 1 and July 15.~~*and any culling procedures applied for non-migrants.*~~

~~10~~9.5) Fish transportation procedures, if applicable.

Same as section 4.2.

~~10~~9.6) Acclimation procedures.

Not applicable to rainbow trout production. In terms of kokanee, fish are held a minimum of 1 week (LFD Facility) and may be held as longs as 3 months (Sherman Creek). Fish are forced released.

~~10~~9.7) Marks applied, and proportions of the total hatchery population marked, to identify hatchery component~~adults~~.

Approximately 10,000 rainbow trout may be marked with floy tags in groups of 1,000. All kokanee (100%) are marked with adipose fin clips. Up to 500,000 kokanee may be marked with binary and numerical encoded wire tags.

~~10~~9.8) Disposition plans for fish identified at the time of release as surplus to programmed or approved levels.

Not applicable to this program.

~~10~~9.9) Fish health certification procedures applied pre-release.

WDF&W Fish Health Monitoring Report performed before release.

~~10~~9.10) ~~)~~ Emergency release procedures in response to flooding or water system failure.

See note of emergency escapement pond in section 4.6.1**.**

~~10~~9.11) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed ~~fish~~ species resulting from fish releases.

Not applicable to this program.

~~*(e.g. "All yearling coho salmon will be released in early June in the lower mainstem of*~~

~~*the Green River to minimize the likelihood for interaction, and adverse ecological effects, to listed natural chinook salmon juveniles, which rear in up-river areas and migrate seaward as sub-yearling smolts predominately in May").*~~

SECTION 10. PROGRAM EFFECTS ON ALL ESA-LISTED, PROPOSED, AND CANDIDATE SPECIES (FISH AND WILDLIFE)

10.1) List all ESA permits or authorizations in hand for the hatchery program.

Not applicable to this program.

10.2) Provide descriptions, status, and projected take actions and levels for ESA-listed natural populations in the target area.

10.2.1) Description of ESA-listed, proposed, and candidate species affected by the program.

Not applicable to this program.

10.2.2) Status of ESA-listed species affected by the program.

Not applicable to this program.

10.2.3) Describe hatchery activities, including associated monitoring and evaluation and research programs, that may lead to the take of listed species in the target area, and provide estimated annual levels of take *(see "Attachment 1" for definition of "take")***. Provide the rationale for deriving the estimate.**

Not applicable to this program.

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

11.1) Monitoring and evaluation of "Performance Indicators" presented in Section 1.10.

11.1.1) Describe the proposed plans and methods necessary to respond to the ~~proposed to collect data~~ appropriate "Performance Indicators" that have been identified for the program.

Not applicable at this time; see note under section 1.9.

11.1.2) Indicate whether funding, staffing, and other support logistics are ~~-~~available or committed to allow implementation of the monitoring and evaluation program.

Not applicable at this time; see note under section 1.9.

11.2) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse genetic and ecological effects to listed ~~fish~~ species resulting from monitoring and evaluation activities.

Not applicable at this time; see note under section 1.9.
~~(*e.g. "The Wenatchee River smolt trap will be continuously monitored, and checked every eight hours, to minimize the duration of holding and risk of harm to listed spring chinook and steelhead that may be incidentally captured during the sockeye smolt emigration period.)"*~~

SECTION 12. RESEARCH

Research related activities associated with this project are confined to monitoring and evaluation program (Peone *et al*. 1989; Griffith and Scholz 1990; Thatcher *et al.* 1991 & 1992; Scholz *et al*. 1992; Tilson and Scholz 1991 through 1998; Underwood et al. 1993 through 1995; Cichosz et al. 1996, and; Underwood et al. 1997 & 1998-in print).

In the past, such studies as artificial imprinting and homing traits of hatchery origin kokanee have been investigated (Scholz et al. 1992; Tilson and Scholz 1991 through 1998). These programs have multiple research related purposes for Lake Roosevelt and include objectives of aiding in management implications for operating fish production projects (Spokane Tribal Hatchery, Sherman Creek Hatchery, Lake Roosevelt Rainbow Trout and Kokanee Net Pen Rearing Projects) in the program area.

Throughout the duration of this project, the Department of Biology from Eastern Washington University Department has peer reviewed Lake Roosevelt fisheries restoration efforts. Currently, professionals and students in the icthyology department aid the hatcheries in collecting mature Lake Roosevelt kokanee for spawning, help analyze the kokanee coded wire tag returns and, in conjunction with the Lake Roosevelt Monitoring Program, indepently reviews Lake Roosevelt fisheries restoration enhancement efforts. Their comments and recommendations are facilitated through the Lake Roosevelt Hatcheries Coordination Team.

Further information for this section may be provided at a later time.

12.1) Objective or purpose.

12.2) Cooperating and funding agencies.

12.3) Principle investigator or project supervisor and staff.

12.4) Status of population, particularly the group affected by project, if different than the

population(s) described in Section 2.

12.5) Techniques: include capture methods, drugs, samples collected, tags applied.

12.6) Dates or time period in which research activity occurs.

12.7) Care and maintenance of live fish or eggs, holding duration, transport methods.

12.8) Expected type and effects of take and potential for injury or mortality.

12.9) Level of take of listed ~~fish~~ species: number or range of ~~fish~~ individuals handled, injured, or killed by sex, age, or size, if not already indicated in Section 2 and the attached "take table" (Table 1).

12.10) Alternative methods to achieve project objectives.

12.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project.

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12.12) Indicate risk aversion measures that will be applied to minimize the likelihood for adverse ecological effects, injury, or mortality to listed ~~fish~~ species as a result of the proposed research activities.

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SECTION 14. CERTIFICATION LANGUAGE AND SIGNATURE OF RESPONSIBLE PARTY

"I hereby certify that the foregoing information is complete, true and correct to the best of my knowledge and belief. I understand that the information provided in this HGMP is submitted for the purpose of receiving limits from take prohibitions specified under the Endangered Species Act of 1973 (16 U.S.C.1531-1543) and regulations promulgated thereafter for the proposed hatchery program, and that any false statement may subject me to the criminal penalties of 18 U.S.C. 1001, or penalties provided under the Endangered Species Act of 1973."

Name, Title, and Signature of Applicant:

Certified by_____ Date:_____

APPENDIX A

BROOD SOURCE ORIGIN AND IDENTITY DESCRIPTION

WDF&W AGENCY LETTER

(April 12, 2000 WDF&W Agency Letter to the Lake Roosevelt Hatcheries Coordination Team)

STATE OF WASHINGTON
DEPARTMENT OF FISH AND WILDLIFE
SHERMAN CREEK HATCHERY

Phalon Lake (redband) Rainbow Trout

The Phalon Lake redband rainbow trout broodstock project was initiated in 1991. Staff from the Colville Fish Hatchery and area fisheries biologists were seeking to secure a source of locally adaptive rainbow trout to supplement the Kettle River. At that time gillnetting was used to remove as many eastern brook char from Phalon Lake, Stevens County, as was practical. Following the gillnetting, native redband trout were taken from tributaries of the Kettle River, Ferry County, and transferred to the lake. Approximately 150 fish were taken from Deadman Cr., Boulder Cr., and Little Boulder Cr. In subsequent years 100-150 fish have been transferred from the wild to the lake annually. Fish have been taken from other tributaries since 1991. These include Toroda Cr., and Tonata Cr.

Genetic analysis of this stock of fish has been done. At the time of analysis it was found that 80% of the fish were 100% redband and the remainder had some coastal component. The coastal component could be due to pre-dam steelhead influence.

Each spring adult fish are collected at Phalon Lake using an oneida floating trap. Eggs are taken and fertilized onsite then transported to the Colville Fish Hatchery for incubation and rearing. In 1999 egg to fingerling survival was 61% and overwinter survival of fry at the hatchery was above 90%.

The primary goal of this project is to augment wild rainbow populations of the Kettle River. Offspring of these fish have been stocked back into the mainstem Kettle River as yearlings at 26,000 per year. Subsequently, the project has expanded to include net pen rearing. Fish are reared at the Kettle Falls net pens to assess their ability to avoid entrainment at Grand Coulee Dam. In 1999 10,000 fish at 2.2 fish per pound were reared in net pens at Kettle Falls then tagged and released into Lake Roosevelt. In March of 2000, 30,000 fish were transferred to the net pens and will be tagged and released as in 1999 with the monitoring and evaluation coordinated through the Lake Roosevelt Monitoring Program.

APPENDIX B

LAKE ROOSEVELT

HATCHERY ORIGIN RAINBOW TROUT RELEASES

1986 - 1998

Summary of hatchery origin rainbow trout (catchables) released into Lake Roosevelt from 1986 to 1998.

Year	Hatchery/Program	Number
1986	Spokane (WDFW) & FDR Net Pens	50,000
1987	Spokane (WDFW) & FDR Net Pens	80,000
1988	Spokane (WDFW) & FDR Net Pens	150,000
1989	Spokane (WDFW) & FDR Net Pens	175,000
1990	Spokane (WDFW) & FDR Net Pens	276,500
1991	Lake Roosevelt Hatcheries & FDR Net Pens	326,461
1992	Lake Roosevelt Hatcheries & FDR Net Pens	424,395
1993	Lake Roosevelt Hatcheries & FDR Net Pens	446,798
1994	Lake Roosevelt Hatcheries & FDR Net Pens	449,183
1995	Lake Roosevelt Hatcheries & FDR Net Pens	415,844
1996	Lake Roosevelt Hatcheries & FDR Net Pens	565,172
1997	Lake Roosevelt Hatcheries & FDR Net Pens	565,172
1998	Lake Roosevelt Hatcheries & FDR Net Pens	541,447

Spokane (WDF&W) – Spokane Trout Hatchery, 1986 to 1990
Lake Roosevelt Hatcheries – Spokane Tribal and Sherman Creek Hatcheries, 1990 to present

Table 1. Estimated listed species take levels by hatchery activity. NOT APPLICABLE TO THIS PROJECT.

Listed species affected: _____ ESU/Population:_____ Activity:_____				
Location of hatchery activity:_____ Dates of activity:_____ Hatchery program operator:_____				
Type of Take	Annual Take of Listed Fish By Life Stage *(Number of Fish)*			
	Egg/Fry	Juvenile/Smolt	Adult	Carcass
Observe or harass a)				
Collect for transport b)				
Capture, handle, and release c)				
Capture, handle, tag/mark/tissue sample, and release d)				
Removal (e.g. broodstock) e)				
Intentional lethal take f)				
Unintentional lethal take g)				
Other Take (specify) h)				

a. Contact with listed fish through stream surveys, carcass and mark recovery projects, or migrational delay at weirs.
b. Take associated with weir or trapping operations where listed fish are captured and transported for release.
c. Take associated with weir or trapping operations where listed fish are captured, handled and released upstream or downstream.
d. Take occurring due to tagging and/or bio-sampling of fish collected through trapping operations prior to upstream or downstream release, or through carcass recovery programs.
e. Listed fish removed from the wild and collected for use as broodstock.
f. Intentional mortality of listed fish, usually as a result of spawning as broodstock.
g. Unintentional mortality of listed fish, including loss of fish during transport or holding prior to spawning or prior to release into the wild, or, for integrated programs, mortalities during incubation and rearing.
h. Other takes not identified above as a category.

Instructions:
1. *An entry for a fish to be taken should be in the take category that describes the greatest impact.*
2. *Each take to be entered in the table should be in one take category only (there should not be more than one entry for the same sampling event).*
3. *If an individual fish is to be taken more than once on separate occasions, each take must be entered in the take tabl*