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

Hatchery Program: Sherman Creek Hatchery

Species or Hatchery Population/Strain:
Rainbow Trout *(Oncorhynchus mykiss)*

Agency/Operator: Washington Department of Fish and Wildlife

Watershed and Region Upper Columbia River – Lake Roosevelt

Date Submitted: June 20, 2000

Date Last Updated: June 20, 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. Sherman Creek Hatchery (SCH)

1.2) Species and population (or ~~stock~~strain)~~)~~ under propagation, ~~and~~ ESA/population status. Spokane (Cape Cod) and Phalon Lake Wild Redband Rainbow Trout *(Oncorhynchus mykiss).*

1.3) Responsible organization and individuals
Indicate lead contact and on-site operations staff lead.
Name (and title): Mike Lewis, Complex Manager – Mitch Combs, FHS III
Agency or Tribe: Washington Department of Fish and Wildlife (WDFW)
Address: 3825 Mellenberger Road, Kettle Falls, WA 99141
Telephone: (509) 625-5169, (509) 738-6971
Fax: (509) 738-4971
Email: lewismrl@dfw.wa.gov or mcombs@plix.com

Other agencies, Tribes, co-operators, or organizations involved, including contractors, and extent of involvement in the program:

- Spokane Tribe of Indians (Fishery Co-Managers) – Joint Artificial Production through Spokane Tribal Hatchery 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: 1 FTE Fish Hatchery Specialist III, 1 FTE Fish Hatchery Specialist II .8 FTE Complex Manager, and .8 FTE Fish Health Specialist.
- Annual Operational Cost: Currently @ $225,000 can vary depending on any capital

improvements.

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

Sherman Creek Hatchery is located immediately adjacent to Lake Roosevelt, part of the Upper Columbia River, WRIA 58, at the mouth of Sherman Creek, three miles west of Kettle Falls, Washington. Sherman Creek also consists of off shore net pens located directly out from the hatchery facility in Lake Roosevelt.

Sherman Creek Hatchery is part of the WDFW Spokane Complex which includes the Colville Trout, Spokane, Ford, Columbia Basin and Spokane Hatcheries along with the Phalon Lake Wild Rainbow Trapping Facility.

1.6) Type of program(s).

This program is primarily a harvest program but includes components of the APR defined Harvest, Integrated Harvest, and Integrated Programs. See sections 1 and 2 for further detail of program and program area.

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

The Sherman Creek 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 and habitat 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.

Example: " (1) Conserve the genetic and life history diversity of ~~Upper Columbia River spring chinook~~ westslope cutthroat trout populations in the Coeur d'Alene Basin through a~~12~~ x-year duration captive broodstock program; (2) Augment, restore and create viable naturally spawning populations using supplementation and reintroduction strategies; (3) Provide fish to satisfy legally mandated harvest in a manner which minimizes the risk of adverse effects to listed wild populations; (4)...."

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

1.10.1) "Performance Indicators" ~~-~~addressing benefits.

1.10.2) "Performance Indicators" addressing risks.

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. Rainbow trout eggs are allotted to this program while kokanee eggs come from allotment as well as adults returning to collection sites. These collection sites include Sherman Creek as the primary site/source, Little Falls Dam and Hawk Creek, each potential sites/sources. Kokanee spawning channels for natural spawning and collection of kokanee egg sources for artificial production are currently under investigation.

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

Currently rainbow eggs are obtained from the WDFW Spokane and Colville Fish Hatcheries. These stocks are currently being used to restore natural production as well as for artificial production.

1.11.2) Proposed annual fish release levels (maximum number) by life stage and location. (*Use standardized life stage definitions by species presented in* Attachment 2.)

Life Stage	Release Location	Annual Release Level
Eyed Eggs		
Unfed Fry		
Fry		
Fingerling		
Yearling	Lake Roosevelt	5,50,000 (combined project goal)

1.12) Current program performance, including estimated~~smolt-to-adult~~ survival rates, adult production levels, and escapement levels. Indicate the source of these data.
~~*Provide estimated smolt-to-adult survival rate, total adult production number, and escapement number (to the hatchery and natural areas)*~~
Performance of the Lake Roosevelt artificial production projects is determined through the Lake Roosevelt Monitoring Program (LRMP). 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).
Performance of hatchery origin kokanee in Lake Roosevelt is currently under review by the LRMP. For the past 8 years of hatchery production, predation and entrainment have been associated with poor performance and survival of hatchery origin kokanee. Hatchery release strategies have recently shifted and new production measures (i.e., net pen rearing) have been implemented to increase survival by reducing instantaneous post release predation and entrainment.

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

Sherman Creek began operations in March 1992 with the first rainbow trout rearing in June 1995.

1.14) Expected duration of program.

Currently, this program operates under an Intergovernmental agreement with the BPA that began in 1991 and runs through 2016. This agreement includes language pertaining to a 25-year extension at the end of the performance period.

1.15) Watersheds targeted by program.

Lake Roosevelt, (Upper Columbia River) including the Spokane and San Poil Rivers. This includes all or part of WRIA #'s 52, 53, 54, 58 and 61.

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 BPA for operation and maintenance
- All NPPC Columbia River Basin Fish and Wildlife Program and Amendments
- Fish Health Management and Policy

~~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 benefit 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. ~~*Give most attention to interactions between listed and "candidate" salmonids and program fish.*~~

SECTION 43. WATER SOURCE

43.1) 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.

Sherman Creek Hatchery's sole water source is Sherman creek. Sherman creek is surface water originating in the Sherman pass watershed. Water usage at the hatchery represents between approximately 1/5 to 1/20 of the seasonal creek flow.

The water quality at Sherman Creek is plagued by high silt loads and extreme water temperatures that limit the capabilities of the hatchery. We are continually seeking improved methods of intake and raceway silt control / removal. Since we changed from fry to a yearling program these problems have had less of an impact.

Water rights have been applied for or are held by Bonneville Power Administration. ~~*Include information on water withdrawal permits, National Pollutant Discharge Elimination System (NPDES) permits, and compliance with NMFS screening criteria.*~~

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.

Sherman Creek Hatchery is located at the mouth of sherman creek, which flows into the Columbia River (Lake Roosevelt). Lower sherman creek (approximately 1 mile) is managed as part of Lake Roosevelt and is separated from the upper creek by a natural water blockage just upstream of the hatchery.

The hatchery intake consists of a wedge wire screen, which prevents any naturally producing fish from entering the hatchery water system.

Listed species: N/A.

SECTION ~~5~~4. FACILITIES

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

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

Spokane Tribal Hatchery transports the majority of fish transfers to Sherman Creek Hatchery as part of the Lake Roosevelt project.
Please refer to the Spokane Tribal Hatchery HGMP for additional information.

~~5.3) Broodstock holding and spawning facilities.5~~4.~~3~~4) **Incubation facilities**.

~~5~~4.~~4~~5) **Rearing facilities.**

The raceways at Sherman Creek Hatchery consists of three 69' x 9.2' x 4.5' concrete raceways supplied by an upwell intake capable of 1,400 gpm water flow per raceway. Outfall is through the connected fish ladder/trap into Lake Roosevelt via Sherman Creek and is set up for direct release, which minimizes planting stress.

~~5~~4.~~5~~6) **Acclimation/release facilities.**

~~5~~4.~~6~~7) **Describe operational difficulties or disasters that led to significant fish mortality.**

~~5~~4.6.~~1~~8) ~~——~~**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.**

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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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**.
Spokane (Cape Cod) Rainbow Trout
Phalon Lake (Kettle River Tributary) Wild Redband Rainbow Trout

~~6~~5.2) **Supporting information**.

~~6~~5.2.1) History.

~~6~~5.2.2) Annual size.

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

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

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

5.2.6) ESA-Listing status

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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.~~
(e.g., "*The risk of among population genetic diversity loss will be reduced by selecting the indigenous~~chinook salmon~~ white sturgeon population for use as broodstock in the supplementation program.*")

SECTION ~~7~~6. BROODSTOCK COLLECTION

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

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

~~7~~6.3) Identity.

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

~~7~~6.4.1) Program goal (assuming 1:1 sex ratio for adults):

~~7~~6.4.2) **Broodstock collection levels for the last 12 years (e.g., 1988-99), or for most recent years available:**

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

Data source: (Link to appended Excel spreadsheet using this structure. Include hyperlink to main database)

~~7~~6.5) **Disposition of hatchery-origin fish collected in surplus of broodstock needs.** *Describe procedures for remaining within programmed broodstock collection or allowable upstream hatchery fish escapement levels, including culling.*

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

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

~~7~~6.8) **Disposition of carcasses.**

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

SECTION ~~8~~7. MATING

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

~~8~~7.1) **Selection method.**
Specify how spawners are chosen (e.g. randomly over whole run, randomly from ripe fish on a certain day, selectively chosen, or prioritized based on hatchery or natural origin).

~~8.2) Males.~~
~~*Specify expected use of backup males, precocious males (jacks), and repeat spawners.*~~

~~8~~7.~~2~~3) **Fertilization.**

~~8~~7.~~3~~4) **Cryopreserved gametes**.
If used, describe number of donors, year of collection, number of times donors were used in the past, and expected and observed viability.

~~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.**
(*e.g., "A factorial mating scheme will be applied to reduce the risk of loss of within population genetic diversity for the~~small chum salmon~~ westslope cutthroat trout population that is the subject of this supplementation program."*)

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:**

Please refer to the Spokane Tribal Hatchery HGMP's for incubation Information.

~~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~~**
Provide data for the most recent 12 years (1988-99), or for years dependable data are available.

~~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.**
Provide egg size data, standard incubator flows, and standard loading per Heath tray (or other incubation density parameters).

~~9~~8.1.3~~4~~) **Incubation conditions.**
Describe monitoring methods, temperature regimes, minimum dissolved oxygen criteria (influent/effluent), and silt management procedures (if applicable), and any other parameters monitored.

~~9~~8.1.4~~5~~) **Ponding**.
Describe procedures (e.g., dates of ponding, volitional, forced).

~~*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.**
Describe fungus control methods, disease monitoring and treatment procedures, incidence of yolk-sac malformation, and egg mortality removal methods.

~~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.**
(*e.g., "Eggs will be incubated using well water only to minimize the risk of catastrophic loss due to siltation.")*

~~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.**.

During the rearing period at Sherman Creek Hatchery survival rate for rainbow fingerlings has been at 97.67 %.

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

Raceway maximum target loadings are: less than .5 Density Index and 1.5 Flow Index.
Maximum actual levels for rainbow trout at transfer are: .319 Density Index and .84 Flow Index.

~~9~~8.2.3) Fish rearing conditions

In following the Washington department of Fish and Wildlife Hatcheries Program standard operating procedures, fish health guidelines and criteria cited in Fish Hatchery Management, (Piper, Robert, G. et al) the raceways at Sherman Creek are annually loaded with 200,000 (3 @ 67,000 each) rainbow trout for transfer @15 fish per pound each October for the rainbow trout volunteer net pen program.

~~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.

Size counts and feed calculations/increases are preformed biweekly to monthly depending on season size and current water temperature.

~~**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*).

Currently the fish feed used for rainbow rearing is Rangen sinking trout diet, fed at 1.0 % body weight per day. This can fluctuate with water conditions and temperature experienced. Typically with see a .91 conversion on kokanee smolts.

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

Disease prevention and treatments are per WDFW policy. The fish health monitoring for both the Sherman Creek and Spokane Tribal Hatcheries are preformed by the WDFW Fish Health Program with both monthly monitoring and examinations within two weeks prior to transfers or outplanting.

~~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.**

~~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.** (*e.g., "Fish will be reared to sub-yearling ~~smolt size to mimic the natural fish emigration strategy and~~ to minimize the risk of domestication effects that may be imparted through rearing to yearling size.")*

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 kokanee released into Lake Roosevelt 1988 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.** *(Use standardized life stage definitions by species presented in **Attachment 2**. "Location" is watershed planted (e.g., "Elwha River").*

Age Class	Maximum Number	Size (fpp)	Release Date	Location
Eggs				
Unfed Fry				
Fry				
Fingerling				
Yearling				

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

Stream, river, or watercourse: Lake Roosevelt, WRIA # 52, 53, 54, 58 and 61.
Release point: various
Major watershed: Columbia River
Basin or Region: Upper Columbia Sub Basin, Intermountain Province

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

*For existing programs, provide fish release number and size data for ~~the past three fish generations, or approximately~~ the past 12 years, if available. Use standardized life stage definitions by species presented in **Attachment 2**. Cite the data source for this information.*

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.

Fish reared for transfer to the rainbow trout volunteer net pen program are:

1995	101,116 @ 11.2 fpp
1996	142,072 @ 12.5 fpp
1997	140,359 @ 15.7 fpp
1998	192,461 @ 16.4 fpp
1999	238,139 @ 18.2 fpp

~~*and any culling procedures applied for non-migrants.*~~

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

N/A

~~10~~9.6) Acclimation procedures (*methods applied and length of time***).**

N/A

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

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

Surplus is kept below 6 % which follows program goals.

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

Two weeks prior to all fish transfers or releases a fish health monitoring report is completed by the WDFW Fish Health Division.
Prior to receiving any egg shipments to WDFW Facilities each stock/source must first complete the Fish Health Certification process, this includes importation from outside the United States shipped under USFW Title 50.

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

The method for planting fish out of the raceways directly through the fish ladder is identical to the emergency release response in the event of a water supply emergency.
In 1995 we modified the fish ladder to facilitate down stream passage in order to reduce stress during outplanting.

~~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.**

N/A

~~*(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.

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.

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).*

*** To obtain a list of listed species in your area, refer to Attachment 3 for the phone number and address of the nearest ecological field office.***

- 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).

10.2.2) Status of ESA-listed species 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.

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.**

- Describe hatchery activities that may lead to the take of listed species 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.

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- 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 species 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 westslope cutthroat trout are trapped in Lake Creek will be reduced if the total mortality of handled fish is projected inseason to exceed the 1988-99 maximum observed level.")

SECTION 11. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

This section describes how "Performance Indicators" listed in Section 1.10 will be monitored. Results of "Performance Indicator" monitoring will be evaluated annually and used to adaptively manage the hatchery program, as needed, to meet "Performance Standards".

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.

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

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.

~~(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.

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.

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:_____

Table 1. Estimated listed species take levels by hatchery activity.

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*