SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of Program
Klickitat Spring Chinook production program - Klickitat Hatchery.

1.2) Population (or stock) and species
Klickitat spring chinook salmon (*Oncorhynchus* tshawytscha)

1.3) Responsible organization and individual:
Name(and title): Washington Department of Fish and Wildlife
Organization
Address: 600 Capitol Way North, Olympia, WA 98501-1091
Telephone: (Ted Anderson, Complex Mgr.) 509-364-3310
Fax: 509-364-3639
Email: andercta@dfw.wa.gov

Other organizations involved, and extent of involvement in the program:
The spring chinook production program is funded through the Mitchell Act via NMFS for the purpose of mitigation for lost fish production due to development within the Columbia River Basin. The program is authorized under the Columbia River Fisheries Development Program, Columbia River Fish Management Plan and U.S. vs. Oregon and the parties to this program, plan and court case are therefore involved in short and long-term production planning. The Yakama Indian Nation has a significant role in determining the production activities.

1.4) Location(s) of hatchery and associated facilities:
With the exception of some fingerling releases, all activity from broodstock capture through release take place at the Klickitat Hatchery, river mile 42.5 (WRIA 30), Washington. Fingerling releases take place most years in the spring in the upper watershed at approximately river mile 70 (WRIA 30).
GIS coordinates for Klickitat Hatchery X=121.182, Y=46.041

1.5) Type of program:
The Klickitat spring chinook program is a mitigation program, the production is to mitigate for activities within the Columbia River Basin that have decreased salmonid populations. This population of spring chinook is from indigenous brood and can coexist and not jeopardize the fitness of the natural population.

1.6) Purpose (Goal) of program:

The goal of this program is to produce fish to contribute to NE Pacific and Columbia River Basin commercial and sport fisheries and to provide for the maintenance of this stock of spring chinook.

1.7) Specific performance objective(s) of program

Objectives are designed to achieve the program goal, and are generally measurable, realistic, and time specific. Example: The goal of this program will be achieved by (1) using supplementation to increase by five folds the number of natural spawners in Deer Creek, by year 2012; (2)....; (3)....

1.8) List of Performance Indicators designated by "benefits" and "risks"

(Note: This section and section 10 (monitoring and evaluation) are being rewritten for compatibility with current work on performance indicators in the Columbia River basin, and in the Hood Canal Summer Chum Hatchery Plan.)

Performance indicators determine the degree that program objectives have been achieved, and provide the specific parameters to be monitored and evaluated.

Separate indicators into two categories of "benefits" and "risks" the hatchery program will provide to the listed species. Where possible, use indicator list already compiled in ESU-wide hatchery plan or other strategic plans.

Some indicators examples are (1) adult:adult replacement rates of program fish; (2) trends in spawning abundance in Deer Creek measured by natural return rates and egg-to-smolt survivals; (3) predation on other species by program fish as measured by stomach content analyses; (4) genetic effects on other populations by program fish as measured by stray rates; (5) etc.

1.9) Expected size of program

Expected releases:

The program was initiated in the early 1950s. Recently (at least the past 10 years) the program release goals have been 600,000 yearling fish and up to 1.2 million fingerlings. The actual releases have been:

Table 1. Releases of Spring Chinook from Klickitat Hatchery

Year	Yearlings	Fingerlings
1992	310,800	0
1993	604,300	98,000

1994	606,400	305,400
1995	562,000	1,275,000
1996	550,000	255,900

Escapement goal:
The program requires the return and spawning of 500 adults each year to meet current program production objectives. (The escapement goal is set for yearling production, the fingerling plant is not currently managed for in escapement. There currently is a proposal under consideration by the co-managers to increase the escapement goal and set the production goal at 600,000 yearlings and 200,000 fingerlings).

1.10) Date program started or is expected to start:
The program started in the early 1950s.

1.11) Expected duration of program:
The mitigation program will continue with the objective of mitigating the loss of spring chinook salmon productivity caused by human activities in the Columbia River Basin.

1.12) Watersheds targeted by program:
Spring chinook salmon production originated from broodstock indigenous to the Klickitat River and this is the watershed targeted by the program. All releases occur into the Klickitat River. GIS coordinates for Klickitat Hatchery X=121.182, Y=46.041

SECTION 2. RELATIONSHIP OF PROGRAM TO OTHER MANAGEMENT OBJECTIVES

2.1) List all existing cooperative agreements, memoranda of understanding, memoranda of agreement, or other management plans or court orders under which program operates. Indicate whether this HGMP is consistent with these plans and commitments, and explain any discrepancies.

The mitigation program, and the HGMP describing it, are consistent with the following:

- The Columbia River Fish Management Plan
- The U.S. vs Oregon court decision

The now expired CRFMP indicated a strong desire for the parties to cooperate and provide for the continued existence and rebuilding of populations of salmon. The Klickitat spring chinook program provides for the continued existence of the indigenous stock and also provides for a portion of the production to be used within the Klickitat Basin for rebuilding.

2.2) Status of natural populations in target area.

For "integrated" programs (i.e., supplementation programs or other programs that involve close integration with a specific natural population), identify the natural population targeted for integration.

While WDFW considers this population depressed, these fish are not listed under the Endangered Species Act.

2.2.1) Geographic and temporal spawning distribution.

Spring chinook spawning occurs between Leidl Bridge (RM 32.2) and McCormick Meadows (RM 84). The bulk of spawning (96% in 1998) occurs between the confluence with Big Muddy Creek (RM 53.8) and Castille Falls (RM 64.2). Castille Falls has been laddered but continues to be a partial barrier to spawners (3% in 1998). Spawning activity from Leidl Bridge up to the Klickitat Hatchery (RM 42.6) involves hatchery fish that did not recruit into the hatchery. Spawning is very limited in the reach between the confluence with Big Muddy Creek and the Klickitat Hatchery (none in 1998). Spawning generally occurs from mid-August to mid-September in the area above the hatchery and from mid to late September in the area downstream from the hatchery.

2.2.2) Annual spawning abundance for as many years as available.

Klickitat River spring chinook natural spawn escapement by return year.

	Age						
Return Year	2	3	4	5	6	Total	Adult Total
1977						126	126
1978						150	150
1979						70	70
1980						63	63
1981						245	245
1982						113	113
1983						63	63
1984						102	102
1985						79	79
1986						142	142
1987						312	312
1988 1/	0	50	513	594	1	1,158	1,108
1989 2/	0	98	84	209	2	393	295
1990	0	7	39	178	7	231	224
1991	0	4	58	179	4	245	241
1992	0	4	121	188	9	322	318
1993	0	2	70	334	26	432	430
1994	0	9	17	77	2	105	96
1995	0	33	48	20	4	105	72
1996	0	16	248	24	2	290	274
1997	0	4	383	211	1	599	595
1998	0	48	112	119	9	288	240
1999	0	94	88	31	0	213	119

1/Includes 5 (age 3) Carson Stock. Estimate includes 1,000 fish that spawned below the hatchery.
2/Includes 30 (age 4) Carson stock.

2.2.3) Progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for as many brood years as available.
Not available at this time.

2.2.4) Annual proportions of hatchery and natural fish on natural spawning grounds for as many years as possible.
Not available at this time.

2.2.5) Status of natural population relative to critical and viable population thresholds.
There is a natural spawner escapement short range goal of 500 adults for the area upstream from the hatchery. (A long range goal of 1,100 adults was set in anticipation of improved passage at Castille Falls.) The short range goal has only been achieved once since 1977. Average natural spawn escapement to the upper area is approximately 200 adults.

2.3) Relationship to harvest objectives

Include past harvest rates and expected future harvest rates on fish propagated by the program and on natural populations in the target area. Explain whether artificial production and harvest management have been integrated to provide as many benefits and as few biological risks as possible to the listed species.

The sport fishery occurs from April through May in the two miles from the mouth upstream to the Fisher Hill Bridge and is generally one to two days per week. The harvest rate ranges from 1% to 16% of the total adult return (average is 8%). The harvest rate on natural fish would approach zero once mass marking of the hatchery fish is complete for all returning broods. At that point WDFW would most likely shift the sport fishery to a hatchery fish retention only fishery.

The tribal fishery occurs from April through May in the area around Fishway #5 (RM 2.2) and is usually four days per week. The harvest rate ranges from 9% to 55% of the total return (average is 26%).

Both sport and tribal fisheries may be extended if in-season run size updates show increased run size from pre-season forecasts. Both fisheries are clean. CWT recoveries show very little harvest of non-Klickitat stock and no ESA fish.

2.4) Relationship to habitat protection and recovery strategies.

Describe the major factors inhibiting natural production (if known), such as habitat protection efforts with expected natural production benefits over the short-term and long-term.

Castille Falls ladder is a barrier to most spring chinook and prevents adequate access to excellent spawning habitat above the falls. The area downstream from the confluence of Big Muddy Creek is subject to heavy silt load (glacial stream).

2.5) Ecological interactions

Describe salmonid and non-salmonid fishes or other species that could (1) negatively impact program; (2) be negatively impacted by program; (3) positively impact program; and (4) be positively impacted by program. Give careful considerations to the unlisted but listable indigenous species.

(1) negatively impact program

Large numbers of northern pikeminnows tend to congregate at the mouth of the Klickitat River during the spring chinook juvenile emigration time frame. Heavy predation on the juvenile chinook, both hatchery and "natural", by the northern pikeminnow could have a strong negative effect on this stock of chinook. In addition, avian predation by species such as common merganser, double crested cormorant, and caspian tern does pose a large threat.

(2) be negatively impacted by program

Minor. As mentioned earlier, hatchery fish tend to spawn downstream from the hatchery while most to all of the "natural" fish tend to spawn several miles upstream from the hatchery, thus we believe interactions or impacts during spawning range from minor to none.

Juvenile hatchery smolts are released volitionally from ponds on the hatchery grounds thus minimizing the interaction with and/or impacts on the juvenile "natural" fish. The planting of hatchery fry occurs in the watershed above Castille Falls. At this time habitat in this reach is under-seeded. For this reason we believe interactions and impacts on the juvenile "natural" fish are minimal to non-existent. Fry plants will most likely continue until the passage problems at Castille Falls are remedied and the natural spawner escapement goals are being achieved on a regular basis. A representative subset (usually about 200,000) of the fry released in the upper watershed are coded-wire tagged. Evaluation of these fish should be feasible using data collected at the YIN screw trap operated just upstream from Klickitat Hatchery.

(3) positively impact program

None.

(4) be positively impacted by program

Nutrient enhancement using hatchery carcasses (a program that is being discontinued) could increase the productivity of this watershed. Hatchery fish spawning naturally could also provide additional nutrients upon dying. Current "natural" spring chinook productivity could be limited by a nutrient poor stream environment.

Masses of hatchery reared fish may overwhelm established predators providing a beneficial, protective effect to co-occurring wild fish.

SECTION 3. WATER SOURCE

Adult spring chinook used as broodstock in the mitigation program are captured at the Klickitat Hatchery on the Klickitat River, which is the home water source for the target population. The water flowing into the holding pond and trap is re-use rearing water from the hatchery and is made up primarily of spring water from Indian Ford A springs originating across the river from the hatchery. This is the same spring water which is used for the incubation and early rearing of all juveniles. Approximately 60% of the yearling production is reared in pond 26 through the final winter and spring which is supplied with spring water from Wonder Springs approximately one-half mile downstream and across the river from the main hatchery. These water sources naturally flow into the Klickitat River and make up a part of its total volume, however they were not historically available as separate spawning/rearing waters.

SECTION 4. FACILITIES

Provide descriptions of the physical plants listed in this section:

The Klickitat Hatchery consists of the following buildings: hatchery, shop, freezer, main water supply, generator, storage and three residences. The rearing facilities are made up of twenty-two raceways and three release ponds with six water intakes. In addition, there are an adult holding pond, fish ladder and trap, and pollution abatement pond.

One, for programs that directly take listed fish for use as brood stock, provide detailed information on catastrophe management, including safeguards against equipment failure, water loss, flooding, disease transmission, or other events that could lead to a high mortality of listed fish.

This program does not directly take listed fish for use as brood stock.

Two, describe any instance where construction or operation of the physical plant results in destruction or adverse modification of critical habitat designated for the listed species.

There is no instance where construction or operation of the physical plant results in destruction or adverse modification of critical habitat designated for listed species. The program complies with NPDES permit effluent discharge conditions, which act to protect the quality of receiving waters adjacent to Klickitat Hatchery.

Three, describe any inconsistencies with standards and guidelines provided in any ESU-wide hatchery plan approved by the co-managers and NMFS.

The spring chinook supplementation program is fully consistent with standards and guidelines set forth in the Columbia River Fish Management Plan.

4.1) Brood stock collection

The Klickitat Hatchery trap is located adjacent to the Klickitat River and is sited at the top of a fish ladder. Water supplied to the holding pond, trap and fish ladder is re-use hatchery rearing water which is diverted for the purpose of attracting adults returning to the hatchery. No physical barrier exists preventing fish from migrating further upstream past the hatchery. All adults entering the fish ladder and trap do so as volunteers. The trap has a "V" entry and fish entering are prevented from returning to the river. The upper gate in the trap is maintained in a closed position, being opened only when counting fish into the holding pond. The holding pond measures 40' x 60' x 4' deep and is divided down the middle into two sections used for sorting the fish during handling and spawning.

4.2) Spawning

All adults voluntarily entering the trap are held until maturity in the holding pond. These fish are inoculated up to three times during holding with Erythromycin to retard BKD. All fish are spawned directly from the holding pond and resulting eggs are fertilized and transported to the hatchery building. Each female is sampled for BKD levels and the resulting eggs are incubated separately until ELISA results are known.

4.3) Incubation

Klickitat Hatchery has 72 stacks of FAL incubators and up to 24 of these are used for spring chinook incubation and hatching.

4.4) Rearing

Spring chinook fry are reared in up to 12 raceways from December through May of the following year. In May, any fingerlings not needed for yearling production are transported to the upper watershed and planted. Remaining fingerlings are reared in two large release ponds until release the following spring.

4.5) Acclimation/release

Yearlings are reared to release in two large release ponds at the Klickitat Hatchery. GIS coordinates for Klickitat Hatchery X=121.182, Y=46.041

4.6) Other

No other physical plants associated with spring chinook supplementation are used.

SECTION 5. ORIGIN AND IDENTITY OF BROOD STOCK

5.1) Source

Broodstock used in the program are trapped from the run reaching the Klickitat Hatchery. Since the adults enter the trap voluntarily, the vast majority of the fish can be assumed to be of hatchery origin, however, adults of natural origin are capable of entering the trap as well. All adults entering the trap and surviving to spawning time are spawned on a random basis.

5.2) Supporting information

5.2.1) History

Broodstock used in the mitigation program since 1988 originated from adults returning to the Klickitat Hatchery trap. No other source of broodstock has been used since that time.

5.2.2) Annual size

The current broodstock collection goal is 500 fish with approximately a 50% male and 50% female split between the sexes. The actual collection figures are as follows:

Table 2.

Return Year	Males Collected	Females Collected	Total
1999	210	265	475
1998	102	218	320
1997	226	603	829
1996	204	346	550
1995	196	288	484
1994	321	302	623
1993	811	971	1782
Averages	296	428	723

5.2.3) Past and proposed level of natural fish in brood stock.

Broodstock used in the supplementation program are secured through the trap at the Klickitat Hatchery. All fish entering the trap are volunteers and are assumed to be of hatchery origin. However, naturally produced adults have free access to the trap and could be incorporated into the broodstock.

5.2.4) Genetic or ecological differences

There are no known genotypic, phenotypic, or behavioral differences between hatchery stocks and natural stocks in the target area.

5.2.5) Reasons for choosing
Spring chinook propagated through this mitigation program represent the indigenous Klickitat River spring chinook population, which is the target of this mitigation program.

5.3) Unknowns
None.

SECTION 6. BROOD STOCK COLLECTION

Describe any inconsistencies with standards and guidelines provided in any ESU-wide hatchery plan approved by the co-managers and NMFS.

6.1) Prioritized goals
List in order of priority the general goals for brood stock collection. Refer to sections 1.5 and 1.6.

6.2) Supporting information

6.2.1) Proposed number of each sex.
The total number of broodstock in the escapement goal is 500, with a target sex ratio of 50:50. This number allows for variance in the sex ratio while allowing egg take goals to be met.

6.2.2) Life-history stage to be collected
The collected life stage is adult.

6.2.3) Collection or sampling design
Include information on the location, time, and method of capture. Describe capture efficiency and measures to reduce sources of bias that could lead to a non-representative sample of the desired brood stock source. Also, describe the method of capture (e.g. weir trap, beach seine, etc.) and quantify as take handling, behavior modification, stress, or mortality of listed fish.
Adults are captured as volunteers into the trap at the Klickitat Hatchery. The trap is in operation from early May until mid to late September when spawning is complete. Fish enter the ladder through an opening on the right bank of the river on a volunteer basis. Any fish entering the trap are used as broodstock. Since the river does not have a weir, and all fish enter on a volunteer basis, the majority of the fish entering the trap are of hatchery origin. The trap is a “V” trap design and fish are allowed to pass out of the trap and into the holding pond at least once per day. The fish are visually counted, but no handling is necessary. Adults in excess of spawning needs are returned to the river.

6.2.4) Identity

Adults are identified only if coded- wire tagged, and the tags are read only at the end of the spawning season when all spawning is complete. All adults entering the trap and holding pond are utilized for broodstock. Since the river does not have a weir, and all fish enter on a volunteer basis, the majority of the fish entering the trap are of hatchery origin.

6.2.5) Holding

Spring chinook broodstock collected at Klickitat Hatchery trap are held to maturity in the holding pond adjacent to the trap. No takes of listed fish occur through the spring chinook broodstock holding operation.

6.2.6) Disposition of carcasses

Carcasses of spring chinook spawned through the program are buried in a dry land site on the hatchery grounds. The only exception to this was the 1999 brood which were seeded into the upper watershed (above RM 62) for nutrient enhancement purposes. This program is scheduled to be discontinued with the 2000 brood return and a return is predicted to the earlier practice of on-site burial of all carcass.

6.3) Unknowns

The effects of the broodstock collection program on the timing of spawning of the target population and on the composition of the spawning population (e.g. hatchery versus wild origin, age class distribution, sex ratios) are unknown.

SECTION 7. MATING

Use standards and guidelines provided in any ESU-wide hatchery plan, or other regionally accepted protocols (e.g. IHOT) approved by the co-managers and NMFS. Explain and justify any deviations.

7.1) Selection method

For the past nine seasons all fish returning to the hatchery trap have been spawned with the exception of 1993 when the total return far exceeded egg take needs. That year, and in any year the run size was well above needs, adults for spawning were randomly chosen from the entire return. Adults in excess of spawning needs are returned to the river.

7.2) Males

Males are utilized for a 1:1 spawning ratio whenever possible. If insufficient adult males are present, jacks are used to achieve the 1:1 ratio. Each male or jack is used only once whenever possible. After part of one male's milt has been added to the eggs of one female and mixed, a part of a second male's milt is added and mixed, as a backup.

7.3) Fertilization

See 7.2 above. The carcass of each female spawned is individually numbered and the eggs are kept separate from all other females. Each carcass is sampled for BKD levels and eggs are not co-mingled until the ELISA results are know and segregation on BKD levels is possible.

7.4) Cryopreserved gametes

Cryopreservation of gametes has not been used in this program.

7.5) Unknowns

The effects of the mitigation program on population diversity of the spring chinook ESU are not known.

SECTION 8. REARING AND INCUBATION

(Note: The information requested in this section is under evaluation to determine if additional standardization is needed to assure relevancy and utility.)

Provide current and previous goals and data. Include historic data for three generations or for years dependable data are available. Use standards and guidelines provided in any ESU-wide hatchery plan, or other regionally accepted protocols (e.g. IHOT) approved by the co-managers and NMFS. Explain and justify any deviations.

INCUBATION:

8.1) Number of eggs taken and survival objective to ponding

The egg take goal for yearling production of 600,000 is 708,000. This indicates an expected survival from egg take to yearling plant of 85%. Survival of green eggs to eyeing is expected at 95% and eyeing to ponding at 98%. In addition, a program goal for up to 1.2 million fingerlings exists, however this program is not managed for in either escapement or egg take goals. (A proposal is being considered by the co-managers which would set the production goals at 600,000 yearlings and 200,000 fingerlings, with escapement and egg take goals set accordingly.)

8.2) Loading density

FAL vertical incubators are used for eyeing and hatching spring chinook eggs at Klickitat Hatchery. Eggs are loaded at the rate of one female's eggs per tray to eyeing, and 6,500 eggs per tray for hatching. Average egg size is approximately 1500 eggs per pound, with a great deal of variation expected.

8.3) Influent and effluent gas concentration

Influent dissolved oxygen is at saturation for the water temperature and elevation and effluent saturation is not monitored.

8.4) Ponding

Ponding is carried out when fry are nearly completely buttoned up, based on a visual inspection. Temperature units are not tracked and length measurements are not taken. Average sample at ponding is approximately 1100 fish per pound with a great deal of variation expected.

8.5) Fish Health monitoring

No fish disease outbreaks have been experienced during the incubation to ponding period in the spring chinook program and mortality levels have remained within program standards. Fish health is continuously monitored in compliance with Co-manager Fish Health Policy standards (WDFW and WWTIT 1998).

REARING:

8.6) Number of fish ponded and survival objective to release

The target number of fish ponded is 660,000 with a survival objective of 91% to release.

8.7) Density and loading.

Fish are ponded in from eight to twelve flow through raceways, depending on the overall population. Densities are kept within IHOT guidelines throughout rearing.

8.8) Influent and effluent gas concentrations

Influent dissolve oxygen is at saturation for the temperature and elevation. Effluent gas concentrations are not monitored.

8.9) Length, weight, and condition factor.

The following is a list of lengths and CV's for the 1997 brood spring chinook production at Klickitat:

Table 3.	Fork Length							
Date	mm		SD		CV		Weight (fpp)	
July 30, 1998	105.1		7.7		7.3		35	
August 25, 1998	115.1		10.9		9.4		27	
Sept. 30, 1998	131.8	13.2		10.0		16		
Oct. 28, 1998	142.3		15.6		10.9		12.4	
Nov. 25, 1998	144.9		16.6		11.5		12.1	
Jan. 4, 1999	155.9		20.7		13.3		9.6	
Jan. 27, 1999	160.1		22.1		13.6		8.4	

March 1, 1999	163.1	13.4	7.5

8.10) Growth rate, energy reserves

Fish health and condition is monitored frequently by fish health professionals during the rearing cycle. Spring chinook generally exhibit internal organ and body conditions that are normal for a healthy fish population with some indications of elevated BKD levels present most years.

8.11) Food type and amount fed, and estimates of feed conversion efficiency.

Commercial-grade moist fish feed is used in the operation, and applied at sizes appropriate for the size of the fish being fed. The daily amount fed is determined by the number of fish in the population and sample weight. Feed is therefore applied at a daily rate ranging from 2.0% of the total population weight per day (fry and small fingerlings) to 0.7% of the total population weight per day (larger fingerlings and smolts). The expected feed conversion efficiency rate is 1.2.

8.12) Health and disease monitoring.

Fish health is continuously monitored in compliance with Co-manager Fish Health Policy standards (WDFW and WWTIT 1998).

8.13) Smolt development indices, if applicable

(e.g. gill ATPase activity).

8.14) Use of "natural" rearing methods.

8.15) Unknowns

Describe data gaps that lead to uncertainty in the incubation and rearing protocols.

SECTION 9. RELEASE

Provide current and previous goals and data. Include historic data for three generations or for years dependable data are available. Also, describe any inconsistencies with standards and guidelines provided in any ESU-wide hatchery plan approved by the co-managers and NMFS.

9.1) Life history stage, size, and age at release.

The current production goal for Klickitat Hatchery is the annual release of 600,000 yearling smolts @ 64.7gms (7fpp) at the hatchery, and up to 1,200,000 sub-yearling smolts @ approximately 9.1gms (50fpp) in the upper Klickitat watershed. Yearling

smolts have been reared approximately 15 months prior to release in mid March, and sub-yearling smolts have been reared approximately 4 months prior to release. Table 4 presents Klickitat yearling smolt, sub-yearling, and unfed fry size at release data for brood years 1989-97.

Table 4. Size at release data for brood year 1989-97 spring chinook yearling smolt releases from Klickitat hatchery.

Brood Year	Size at Release Avg. Range (gms) (fpp)
1989	8.2-49 55-9.2
1990	50 9.0
1991	0.4- 9.4 1173-9
1992	0.4-50 1170-9
1993	5.4-9.1-64.8 50-83.7-7
1994	8.2-64.7 55.5-7
1995	8.3-64.7 54-7
1996	9.2-64.7 49.5-7
1997	0.4 6.2--60.5 1106-73.6-7.5

9.2) Life history stage, size and age of natural fish of same species in release area at time of release.

Unknown.

9.3) Dates of release and release protocols.

Rearing and release strategies are designed to limit the amount of ecological interactions occurring between hatchery and naturally produced fish. Fish are reared to sufficient size such that smoltification occurs within nearly the entire population, which will reduce retention in the streams after release. Rearing on parent river water or acclimation for several weeks to parent river water is done to ensure strong homing to the hatchery, thus reducing the stray rate to natural populations.

Various release strategies are used to ensure that fish migrate from the hatchery with the least amount of interaction with native populations. Spring chinook yearling smolts are volitionally released into the Klickitat River adjacent to the hatchery. Table 5 presents release date ranges for 1989-97 brood year yearling chinook produced at Klickitat

Hatchery. Yearlings are presently allowed to volitionally migrate from the hatchery rearing ponds in mid March. Fingerlings are trucked to the upper river.

Table 5. Release date ranges for brood year 1989-97 spring chinook yearling volitional releases from Klickitat Hatchery.

Brood Year	Smolt Release Date	Sub-Yearling Release Date
1989	March1-May1	June 8-29
1990	Mar.10-May 1	
1991	Mar15-April30	July 16
1992	Mar.3-April29	Jan. 1
1993	March 1	April15-June1
1994	Feb. 2-March16	April 31-July14
1995	March 1-15	May 28-29
1996	March 2	May 26-28
1997	March1	Dec.9-29 May6-7/June30

9.4) Location(s) or release.

Spring chinook produced through the program are released into the Klickitat River (WRIA 30) Rkm 351.8. GIS coordinates for Klickitat Hatchery X=121.182, Y=46.041

9.5) Acclimation procedures.

Spring chinook are acclimated to the release site through rearing on spring water, or on river and spring water. They are acclimated for several weeks to ensure strong homing to the hatchery, thus reducing the stray rate to upper Columbia watersheds. River water is introduced to the rearing pond by pumps while spring water is introduced by gravity feed..

9.6) Number of fish released

Table 6 presents annual releases numbers for the Klickitat Hatchery spring chinook program brood year 1989-97.

Table 6.

Brood Year	Smolt Releases	Fingerling Releases
1989	778,900	139,600
1990	310,800	
1991	604,300	61,000/98,000
1992	606,400	41,000
1993	562,000	1,238,400
1994	610,000	255,900
1995	580,600	223,000
1996	584,500	382,500
1997	538,000	854,700 343,380

9.7) Marks used to identify hatchery adults.

A proportion of each year's release of spring chinook from Klickitat Hatchery receive an adipose clip and coded-wire tag marking combination. Approximately 17% of the annual release of 600,000 smolts released at the hatchery have received this marking combination, our program requires that up to 220,000 fingerlings be marked in this manner for upper river releases by the Yakama Indian Nation. The spring chinook are marked to determine the stray rates and to allow for assessment of brood year fishery contribution and survival rates for fish released from Klickitat Hatchery.

9.8) Unknowns

Describe data gaps that lead to uncertainty in the release protocols.

SECTION 10. MONITORING AND EVALUATION OF PERFORMANCE INDICATORS

(Note: This section and Section 1.8 are being rewritten for compatibility with current work on performance indicators in the Columbia River basin, and in the Hood Canal Summer Chum Hatchery Plan.)

This section describes how the benefit or risk performance indicators listed in Section 1.8 will be monitored and evaluated, including whether funding, staffing, and other support logistics are available or committed to allow full implementation.

The items below should be incorporated into the performance indicator list and the attendant monitoring and evaluation program.

10.1) Marking

A proportion of each years release of spring chinook from Klickitat Hatchery receive an adipose clip and coded-wire tag marking combination. Approximately 17% of the annual release of 600,000 smolts released at the hatchery have received this marking combination, our program requires that up to 220,000 fingerlings be marked in this manner for upper river releases by the Yakama Indian Nation. The spring chinook are marked to determine the stray rates and to allow for assessment of brood year fishery contribution and survival rates for fish released from Klickitat Hatchery.

10.2) Genetic data

Provide available and relevant genetic baseline information.

None available.

10.3) Survival and fecundity

10.3.1) Average fecundity

Fecundity will be monitored by sampling throughout the weigh down period to Heath tray incubators of individual egg weights applied to the weight of eyed eggs taken from returning spawners and the total number of females spawned. Spring chinook females returning to Klickitat Hatchery have an estimated mean fecundity of 4,000 based on 1989-97 brood year egg take and adult broodstock trapping.

10.3.2) Survival

a) Collection to spawning

Spring chinook adult losses during trapping and holding will be monitored through removal and enumeration of mortalities from the Klickitat Hatchery trap and adult holding pond. The survival rate ranges from 75.0-98.6% with 92.3% being the 5 year average. The adult pre-spawning survival standards for the program are 90.0% (IHOT 1995).

b) Green eggs to eyed eggs

Egg losses during incubation monitored through removal and enumeration of green egg mortalities upon shocking from Heath trays at Klickitat Hatchery. The green egg to fry survival standard is 90.0%(IHOT1995).

c) Eyed eggs to release

Eyed egg and juvenile fish losses during incubation and rearing will be monitored through removal and enumeration of eyed egg mortalities from Heath trays, and daily removal and enumeration of fish mortalities occurring during the rearing period at the hatchery. The fry to smolt survival standard applied to the Klickitat Hatchery program is 90.0% (IHOT 1995).

d) Release to adult, to include contribution to:

(i) harvest

Contribution of Klickitat Hatchery program-origin spring chinook salmon to fisheries in the mainstem Columbia River and ocean will be monitored and evaluated through the regional coded-wire tag recovery and evaluation program implemented by WDFW, the Tribes, and other fisheries management agencies in the Columbia Basin and the Pacific Northwest.

(ii) hatchery brood stock

Contribution of Klickitat hatchery-origin fish to the hatchery broodstock will be monitored post-season by WDFW. Snouts from adipose clipped fish spawned at the hatchery will be collected and transported to Olympia for tag removal and identification of fish origin. It is assumed that all adults voluntarily returning to hatchery trap are hatchery-origin fish therefore 100% are spawned.

(iii) natural spawning

Information pertaining to natural spawners can be obtained from the Yakama Indian fisheries HGMP.

10.4) Monitoring of performance indicators in Section 1.8

The following are examples.

10.4.1) Proportions of hatchery spawners in natural populations in target area (list all populations or spawning areas that are monitored).

Without mass marking of hatchery fish, it is difficult to differentiate hatchery from wild fish. Some estimates can be made using coded-wire tag recoveries; however, CWT recovery data collected by YIN biologists have not been made available. At this time, the fish returning to the hatchery are considered to be of hatchery origin and the bulk of the fish choosing to remain in the river are considered to be of “natural” origin.

10.4.2) Ecological interactions between program fish and natural fish (same and other species) in target area.

As mentioned elsewhere in this document, yearling hatchery spring chinook are volitionally released to minimize interaction and/or impacts on juvenile “natural” spring

chinook. The goal of the hatchery program is to produce high quality smolts which have low levels of residualism, thereby minimizing ecological interactions such as competition and predation. Fry are planted in the upper watershed upstream of Castille Falls, a barrier to most spawner escapement. Interactions between hatchery fry planted in this area and "natural" fry are most likely minimal since this reach is under-seeded.

10.4.3) Disease control in the hatchery, and potential effects on natural populations.
Objective: Maximize survival at all life stages using disease control and disease prevention techniques. Prevent introduction, spread, or amplification of fish pathogens.

The primary objective of fish health management programs at WDFW hatcheries is to produce healthy smolts that will contribute to the fisheries and natural spawning if the goal is supplementation. Equally important is to prevent the introduction, amplification, or spread of certain fish pathogens which negatively affect the health of both hatchery and naturally reproducing stocks. WDFW has implemented both disease control and disease prevention programs at all of its facilities toward achieving these objectives. These programs include the following standard elements:

Disease Control (Reactive)
-Perform necropsies of diseased and dead fish to diagnose the cause of loss.
-Prescribe appropriate treatments and remedies to disease.
-Use a disease control policy which dictates how specific disease problems will be addressed and what restrictions may be placed on movements of diseased stocks.
-Conduct applied research on new and existing techniques to control disease epizootics.

Disease Prevention (Proactive)
-Routinely perform necropsies of clinically healthy fish to assess health status and detect problems before they progress to clinical disease or mortality.
-Implement disease preventative strategies in all aspects of fish culture to produce a quality fish. This includes prescribing the optimal nutritional needs and environmental conditions in the hatchery rearing container based on historical disease events. It also involves the prophylactic use of vaccines in order to avoid disease problems.
-Use disease prevention policy which restricts the introduction of stocks into a facility which may result in the introduction of a new disease condition or mortality.
-Use sanitation procedures which prevent introduction of pathogens into and/or within a facility.
-Conduct applied research on new and existing disease prevention techniques.
-Utilize pond management strategies (e.g. Density Index and Flow Index) to help optimize the quality of the aquatic environment and minimize fish stress which can induce infectious and noninfectious diseases. From IHOT (1995)

10.4.4) Behavior (migration, spawning, etc.) of program fish.
Klickitat spring chinook begin entering the Klickitat River in early April with peak recruitment in mid-May. Returns to Klickitat Hatchery begin in early May and peak in mid-June. Spawning of hatchery fish occurs from mid-August through mid-September.

10.4.5) Homing or straying rates for program fish.
Hatchery fish from Klickitat Hatchery do not tend to stray to other watersheds. No Klickitat Hatchery CWTs were recovered at other hatcheries on Washington tributaries in 1998. Very few strays from other watersheds arrive at the Klickitat Hatchery (none in 1998). Homing rates cannot be accurately estimated as CWTs recovered from the natural spawn population have not been made available by YIN biologists.

10.4.6) Gene flow from program fish into natural populations.
Accurate measures of gene flow are difficult to obtain. In places where gene flow data could be obtained (adult traps) we are excluding most if not all hatchery spawners from the area above traps to maintain or improve genetic integrity. WDFW has often used the proportion of hatchery spawners as a surrogate measure of gene flow.

10.5) Unknowns or uncertainties identified in Sections 5 through 9
Unknowns and uncertainties identified in previous sections will be addressed through monitoring and evaluation measures proposed in Section 10.4.

10.6) Other relevant monitoring projects
YIN biologists operate two screw traps , one just upstream from the Klickitat Hatchery and one downstream from the Little Klickitat River. They also conduct extensive stream surveys to count spawner activity and collect CWTs and biosamples in August and September. Fish spawned at the hatchery are sampled for CWTs, biosamples, and tissue samples are collected for disease control.

SECTION 11. RESEARCH

11.1) Objective or purpose
1) Measure fecundity of Spring Chinook salmon at Klickitat Hatchery each year to determine temporal changes.
2) Compare these data to calculated fecundities obtained from hatchery records
3) Compare these data to data obtained at other Columbia Basin hatcheries.

11.2) Cooperating and funding agencies
National Marine Fisheries Service, WDFW

11.3) Principle investigator or project supervisor and staff

Howard Fuss
Research Scientist
600 Capitol Way N
Olympia, WA 98501-1091

Jim Byrne
Fish and Wildlife Biologist
600 Capitol Way N
Olympia, WA 98501-1091

11.4) Status of stock, particularly the group affected by project

Hatchery progeny only.

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

Individual females are measured to determine length and the age of the fish is determined by removing the snout if it contains a coded-wire tag or by removing and aging of scales if not tagged. The measured fecundity of the female is determined by passing the eggs through an electronic fish counter with accuracy of better than 95%. Fecundity by age is determined and the average measured fecundity of the brood is compared among broods and age classes.

11.6) Dates or time period in which research activity occurs

September through December

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

Each lot of eggs is carefully passed through the fish counter before standard shocking and picking activities by the hatchery crew. Total number o f eggs are counted and the lot of eggs is replaced in the incubator for subsequent incubation and care by the hatchery crew.

11.8) Level of take: number or range of fish handled, injured, or killed by sex, age, or size

A total of 20-30 females are used in the study.

11.9) Potential for / estimates of injury or mortality, and methods to reduce either

No mortality to adults due to activity. Unfertilized eggs are usually identified by the mechanical shock received in the process. Live eyed eggs are unharmed.

11.10) Alternative methods to achieve project objectives

Two alternatives exist. The first is to use estimated fecundities obtained by dividing total egg collection by total females spawned (however this study is being done to check the accuracy of this method) and the second method is to hand count the eggs..

11.11) List species similar or related to the threatened species; provide number and causes of mortality related to this research project
Fall chinook, coho, steelhead. No associated mortality to other species due to this activity.

SECTION 12. ATTACHMENTS AND CITATIONS

Attach or cite (where commonly available) relevant reports that describe the hatchery operation and impacts on the listed species or its critical habitat. Include any EISs, EAs, Biological Assessments, or other analysis or plans that provide pertinent background information to facilitate evaluation of the HGMP.

Busack, C., and A. Marshall. 1991. Genetic analysis of YFP chinook salmon stocks. Pages 2-45 *in* C. Busack, C. Knudsen, A. Marshall, S. Phelps, and D. Seiler. Yakima Hatchery Experimental Design. Progress Report, DOE/BP-00102. Bonneville Power Administration, Portland, OR.

Byrne, J. and H.J. Fuss. 1998. Annual coded-wire tag program Washington: Missing Production Groups. Annual Report 1998. Bonneville Power Administration, Portland, Or. Project Number 89-066. 107 pp.

Fuss, H.J., J. Byrne, and C. Ashbrook. 1998. Stock characteristics of hatchery-reared salmonids and Washington Department of Fish and Wildlife Columbia River Hatcheries. Washington Department of Fish and Wildlife, Annual Report H98-03. 65 pp.

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IHOT (Integrated Hatchery Operations Team). 1995. Operation plans for anadromous fish production facilities in the Columbia River basin. Volume III-Washington. Annual Report 1995. Bonneville Power Administration, Portland Or. Project Number 92-043. 536 pp.

Washington Department of Fish and Wildlife. 998. Water resource inventory area river mile indices for the Columbia and Snake river basins. Unpublished document. Habitat Management Division, Washington Department of Fish and Wildlife, Olympia, WA.

Washington Department of Fisheries (WDF) and Washington Department of Wildlife (WDW). 1993. 1992 Washington State salmon and steelhead stock inventory - Appendix three Columbia River stocks. Washington Dept. Fish and Wildlife, 600 Capitol Way N, Olympia, WA. 98501-1091. 580 pp.

Washington Department of Fisheries (WDF), Washington Department of Wildlife (WDW), and Western Washington Treaty Indian Tribes (WWTIT). 1992. 1992 Washington State salmon and steelhead stock inventory (SASSI). Washington Dept. Fish and Wildlife, 600 Capitol Way N, Olympia, WA. 98501-1091 . 212 pp.

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