SECTION 1. GENERAL PROGRAM DESCRIPTION

1.1) Name of Program

Klickitat URB Fall Chinook produciton program - Klickitat Hatchery.

1.2) Population (or stock) and species

Up River Bright Fall chinook salmon (Onchorynchus tshawytscha)
Priest Rapids, Snake River Mix, Bonneville,and Wells Hatcheries HGMP.

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:(Bob Foster, IPG) 360-902-2658
Fax:360-902-2182
Email:fosterwf@dfw.wa.gov

Other organizations involved, and extent of involvement in the program:
The URB fall chinook produciton 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.

1.4) Location(s) of hatchery and associated facilities:

Broodstock Capture:
Priest Rapids, Lyons Ferry, Bonneville, and Wells Hatcheries refer to that HGMP.

Broodstock Holding to Maturity:
Priest Rapids, Lyons Ferry, Bonneville, and Wells Hatcheries refer to that HGMP.

Fish Spawning, Incubation, Rearing:
Spawning: Priest Rapids, Lyons Ferry, Bonneville, and Wells Hatcheries refer to that HGMP.
Incubation*:* Priest Rapids, Lyons Ferry,Bonneville, Wells,and Klickitat Hatchery (transfers to Klickitat Hatchery).

Rearing to release:
Klickitat Hatchery, Rkm 351.8 (WRIA 30), Washington.
GIS coordinates for Klickitat Hatchery X=121.182, Y=46.041

1.5) Type of program:

The Klickitat fall chinook program is a mitigation program, the production is to mitigate for activities within the Columbia River Basin that have decreased salmonid populations.

1.6) Purpose (Goal) of program:

The fall chinook program is important as a source of fish for tribal mitigation programs. The goal is to provide production to sustain tribal Zone 6 fisheries, sport and tribal fisheries for fall chinook at the mouth of the Klickitat River, in-river sport fisheries, and mixed stock ocean fisheries. Broodstock maintenance to perpetuate the hatchery mitigation program.

1.7) Specific performance objective(s) of program

(1) produce (4,000,000 @ 80fpp) of sub-yearling up-river (URB) fall chinook for on-station release as mitigation for the Klickitat Hatchery Project;
(2) minimize interactions with other fish populations through proper rearing and release strategies;
(3) maximize survival at all fall chinook life stages using disease control and disease prevention techniques. Prevent introduction, spread or amplification of fish pathogens;
(4) conduct environmental monitoring to ensure that hatchery operations comply with water quality standards and to assist in managing fish health;
(5) communicate effectively with other salmon producers and managers in the Columbia River Basin

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

(Note: This section and section10 (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 current and future, expected size of the Klickitat Hatchery fall chinook program is to release 4,000,000 @ 80fpp sub-yearling smolts. Fall Chinook releases shown in table 1.

Table 1. Klickitat Hatchery annual releases in to Klickitat River

Brood Year	Annual Releases
1989	4,212,900
1990	4,314,800
1991	4,196,000
1992	4,152,000
1993	4,463,000
1994	4,207,000
1995	4,380,000
1996	3,625,870
1997	4,044,100
1998	4,289,100

Adult fish harvested:

Adult fish harvested not determined at this facility. Refer to Priest Rapids HGMP.

Escapement goal: This stock is not managed to provide adequate escapement to Klickitat Hatchery.

1.10) Date program started or is expected to start:

The program started in the early 1950's

1.11) Expected duration of program:

The supplementation program will continue with the objective of mitigation for tribal and sport fisheries for fall chinook at the mouth of the Klickitat River, in-river sport fisheries.

1.12) Watersheds targeted by program:

Klickitat River is the targeted watershed by program, from mouth to hatchery location (WRIA 30). 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 supplementation program, and the HGMP describing it, are consistent with the following:

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

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.

This stock of fall chinook was introduced to the Klickitat River for mitigation for tribal and sport fisheries and is not managed to provide adequate escapement to Klickitat Hatchery, but the naturally spawning population appears to be healthy.

2.2.1) Geographic and temporal spawning distribution.

Fall chinook spawn naturally from RM 1 to RM 42.3. Typical spawn time for bright fall chinook (October and November).

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

Year		Number of Spawners	
1990		2,975	
1991		1,823	
1992		2,357	
1993		1,196	
1994		2,617	
1995		1,608	
1996		5,337	
1997		5,699	

1998		7,538	

2.2.3) Progeny-to-parent ratios, survival data by life-stage, or other measures of productivity for as many brood years as available.

There is no information relating to survival rates for naturally produced fall chinook, but the survival to fisheries of Klickitat Hatchery fall chinook ranged from 0.03% to over 1.0% (Byrne et al., 1997).

2.2.4) Annual proportions of hatchery and natural fish on natural spawning grounds for as many years as possible.

Klickitat Hatchery rears Upriver Bright fall chinook that are imported from Lyons Ferry Hatchery. Any natural production of this stock is the product of hatchery chinook.

2.2.5) Status of natural population relative to critical and viable population thresholds. *See Instruction A.*

A long term escapement goal for this stock was set at 2,500 natural spawners. This goal has been achieved in 5 of the last 9 years.

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 largest harvest of Klickitat Hatchery fall chinook is in the Canadian Troll fishery, but they are also harvested in the Canadian sport and net fisheries, the Washington/Oregon coastal sport and troll fisheries, Alaskan fisheries, Columbia River net fisheries, and freshwater sport fisheries. Harvest rates have not been estimated for Klickitat Hatchery fall chinook, but they were originally the product of Upriver Bright fall chinook and it is likely that their harvest profiles are similar. The total ocean and freshwater adult equivalent harvest rates for Upriver Bright fall chinook for return years 1989-1996 ranged from 33% to 73%. The 1989-1993 average was 62% and the 1991-1996 average was 48%. Harvest rates are expected to remain similar to the 1991-1996 average.

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.

None known.

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 congregate at the mouth of the Klickitat River. Predation on the juvenile chinook outmigrants by the northern pikeminnow may have a negative impact on this stock. Avian predation by common mergansers, double crested cormorants, and especially caspian terns pose a large threat.

(2) be negatively impacted by program The tule stock in the Klickitat River returns and spawns before the bright stock. This also allows for earlier emergence for the tule stock which gives them a physical "head start" on the bright stock.

(3) positively impact program None known.

(4) be positively impacted by program This stock of fall chinook appears to be well suited for this river and is probably providing food for scavenging wildlife and raptors, as well as providing nutrient enhancement that could increase the productivity of the watershed.

SECTION 3. WATER SOURCE

The Klickitat River, which is the home water source for the target population. The water flowing into pond 24 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 incubuation and early rearing of all juveniles. Approximately 40% of the yearling production is reared in pond 24 through the final winter and spring, in the spring river water is introduced for acclimation for this pond. The remaining population is reared in pond 26 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, and three additional sets of information.

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 stock is not managed to provide adequate escapement to the Klickitat Hatchery.

For broodstock capture refer to Priest Rapids, Lyons Ferry, Bonneville, and Wells hatcheries HGMP.

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

4.1) Brood stock collection

This stock is not managed to provide adequate escapement to the Klickitat Hatchery.

For broodstock collection refer to Priest Rapids, Lyons Ferry, Bonneville, and Wells Hatchery HGMP.

4.2) Spawning

This stock is not managed to provide adequate escapement to the Klickitat Hatchery.

For broodstock collection refer to Priest Rapids, Lyons Ferry, Bonneville, and Wells Hatchery HGMP.

4.3) Incubation

Klickitat Hatchery has 72 stack of FAL incubators and up to 9 of these are used for fall chinook incubation and hatching.

4.4) Rearing

Fall chinook fry are ponded in up to 4 raceways and reared from April through August. In Mid March the fingerling are transferred to release ponds 24 - 26 until release, @ 80fpp.

4.5) Acclimation/release

Fall chinook 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

Due to straying rates of fall chinook into the Snake River system NMFS is requiring that all fall chinook released at Klickitat Hatchery be BWT(Snout) Blank Wire Tagged. At this time Bonneville Hatchery, Little White Salmon Hatchery, Elochoman Hatchery, and Washougal Hatchery assist Klickitat Hatchery in the tagging. Time constraints prohibit all tagging take place at Klickitat Hatchery.

SECTION 5. ORIGIN AND IDENTITY OF BROOD STOCK

5.1) Source

This stock is not managed to provide adequate escapement to the Klickitat Hatchery.
For broodstock information refer to Priest Rapids, Lyons Ferry, Bonneville, and Wells Hatchery HGMP.

5.2) Supporting information

5.2.1) History

Provide a brief narrative history of the brood stock sources. For natural populations, specify its status relative to critical and viable population thresholds (use section 2.2.5 if appropriate). For existing hatchery stocks, include information on how and when they were founded, and sources of brood stock since founding. If stock crosses, list stock of each sex.

5.2.2) Annual size

Include past brood stock sizes as well as proposed future sizes. Specify number of each sex, or total number and sex ratio, if known. For natural population brood stocks, explain how their use will affect their population status relative to critical and viable thresholds.

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

If using an existing hatchery stock, include specific information on how many natural fish were incorporated into the brood stock annually.

5.2.4) Genetic or ecological differences

Describe any known genotypic, phenotypic, or behavioral differences between proposed hatchery stocks and natural stocks in the target area.

There are no known differences between hatchery and natural bright chinook in this river. There are significant genotypic and phenotypic differences between the bright and tule fall chinook, but the stocks are separated by timing and distribution.

5.2.5) Reasons for choosing

Describe any special traits or characteristics for which brood stock was selected.

The bright stock was selected for this program because these fish are more desirable for commercial and sport harvesters.

5.3) Unknowns

Identify areas where a lack of data leads to uncertainties about the choice of brood stock.

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

This stock is not managed to provide adequate escapement to the Klickitat Hatchery.

For broodstock information refer to Priest Rapids, Lyons Ferry, Bonneville, and Wells Hatchery HGMP.

6.2) Supporting information

6.2.1) Proposed number of each sex.

6.2.2) Life-history stage to be collected (e.g., eggs, adults, etc.)

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.

6.2.4) Identity

Describe method for identifying (a) target population if more than one population may be present; and (b) hatchery origin fish from naturally spawned fish.

6.2.5) Holding

Describe procedures for holding fish, especially if captured unripe or as juveniles. Quantify as take trapping, holding, stress or mortality of listed fish.

6.2.6) Disposition of carcasses

Include information for spawned and unspawned carcasses, sale or other disposal methods, and use for stream reseeding.

6.3) Unknowns

Identify any data gaps that lead to uncertainties about brood stock collection.

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

This stock is not managed to provide adequate escapement to the Klickitat Hatchery.

For broodstock information refer to Priest Rapids, Lyons Ferry, Bonneville, and Wells Hatchery HGMP.

7.2) Males

Specify expected use of backup males and repeat spawners.

7.3) Fertilization

Describe fertilization scheme, such as equal sex ratios and 1:1 individual matings; equal sex ratios and pooled gametes; or some other. Explain any fish health procedures used for disease prevention.

7.4) Cryopreserved gametes

If used, describe number of donors, year of collection, number of times donors were used in the past, and expected and observed fertility.

7.5) Unknowns

Identify any data gaps that lead to uncertainty in mating protocols.

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

8.2) Loading density

Include description of the incubator(refer to Section 4.4). Also, provide measurement of egg size.

8.3) Influent and effluent gas concentration

(Dissolved Oxygen, and any other parameters monitored)

8.4) Ponding

Describe 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.

8.5) Fish Health monitoring

Describe any diseases, yolk-sac malformation, and mortality.

REARING:

8.6) Number of fish ponded and survival objective to release

8.7) Density and loading.

Include a description of the rearing containers, such as start tanks, circulation, circulating ponds, flow through, etc. Refer to section 4.4.

8.8) Influent and effluent gas concentrations

(oxygen, carbon dioxide, total gas pressure).

8.9) Length, weight, and condition factor.

8.10) Growth rate, energy reserves

(hepatosomatic index - liver weight/body weight) and body moisture content as an estimate of body fat concentration.

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

8.12) Health and disease monitoring.

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 4.0 million sub-yearling fall chinook smolts at an average size of 5.7 gms (80fpp). Fish have been reared approximately 180 days prior to mid -June release. Table 2 presents Klickitat sub-yearling size at release data for brood years 1989-98.

Table 2. Size at release data for brood year 1989-98 fall chinook sub-yearling releases from Klickitat hatchery.

Brood Year	Size at Release Avg. Range (gms) (fpp)
1989	5.8gms 78fpp
1990	6.0gms 75fpp
1991	8.6gms 53fpp
1992	6.0gms 75fpp
1993	6.4gms 71fpp

Brood Year	Size at Release Avg. Range (gms) (fpp)
1994	6.2gms 73fpp
1995	7.1gms 64fpp
1996	7.0gms 65fpp
1997	7.0gms 65fpp
1998	7.3gms 62fpp

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

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. URB fall chinook sub-yearlings are volitionally released into the Klickitat River adjacent to the hatchery. Table 3 presents release date ranges for 1989-98 brood year sub-yearling chinook produced at Klickitat Hatchery. Sub-yearlings are presently allowed to volitionally migrate from the hatchery rearing ponds in mid May to late June.

Table 3. Release date ranges for brood year 1989-98 fall chinook sub-yearling volitional releases from Klickitat Hatchery.

Brood Year	Release Date Range
1989	May 17 - June 7
1990	May 24 - June 19
1991	June 9 - June 15
1992	May 21 - June 25
1993	May 17 - June 13
1994	May 17 - June 9
1995	May 16 - June 8

Brood Year	Release Date Range
1996	May 22 - June 14
1997	May 21 - June 10
1998	June 2 - June 28

9.4) Location(s) or release.

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

9.5) Acclimation procedures.

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

9.6) Number of fish released

Table 4 presents annual release numbers for the Klickitat Hatchery sub-yearling fall chinook program brood year 1989-98.

Table 4.

Brood Year	Number Released
1989	4,212,900
1990	4,314,800
1991	4,196,000
1992	4,152,000
1993	4,463,000
1994	4,207,000
1995	4,380,000
1996	3,625,870
1997	4,044,100
1998	4,289,100

9.7) Marks used to identify hatchery adults.

A proportion of each year's release of fall chinook from Klickitat Hatchery receives an adipose clip-coded wire tag marking combination. Brood years 1989-96 approximately 5% of the total release of 4 million fish has received this marking combination, brood year '97 -50% mark combination and brood year '98 -100% mark combinations of adipose clip-coded wire tag approximately19%, adipose clip-blank wire tag (snout) approximately 81%. The fall chinook are marked with a marking combination to determine the stray rates into the Snake River system 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 year's release of fall chinook from Klickitat Hatchery receives an adipose clip-coded wire tag marking combination. Brood years 1989-96 approximately 5% of the total release of 4 million fish has received this marking combination, brood year '97 -50% mark combination and brood year '98 -100% mark combinations of adipose clip-coded wire tag approximately19%, adipose clip-blank wire tag (snout) approximately 81%. The fall chinook are marked with a marking combination to determine the stray rates into the Snake River system 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.

10.3) Survival and fecundity

Provide data on goals and past performances.

10.3.1) Average fecundity

10.3.2) Survival

a) Collection to spawning
b) Green eggs to eyed eggs
c) Eyed eggs to release
d) Release to adult, to include contribution to
    (I) harvest
    (ii) hatchery brood stock
    (iii) natural spawning

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).
This stock was introduced to the Klickitat River for fishery mitigation and all natural spawners are the product of this introduction.

10.4.2) Ecological interactions between program fish and natural fish (same and other species) in target area.
The Klickitat River is below carrying capacity for all species of salmonids so there is little crowding of a species out of its own niche and the food supply is probably not overly taxed.

10.4.3) Disease control in the hatchery, and potential effects on natural populations.

10.4.4) Behavior (migration, spawning, etc.) of program fish.
Bright stock begin entering the Klickitat in early to mid-August with peak migration into the river in mid-September. Spawning occurs from October through November.

10.4.5) Homing or straying rates for program fish.
This fish do not appear to do much straying. There have been no CWT recoveries from this stock at other facilities outside of this system.

10.4.6) Gene flow from program fish into natural populations.
There is extensive mixing of genes since this stock does not readily return to the hatchery, choosing rather to spawn naturally.

10.5) Unknowns or uncertainties identified in Sections 5 through 9

10.6) Other relevant monitoring projects
The sport and tribal fisheries and the spawning population are sampled at a low rate to gather information related to population/harvest size and age structure, as well as the recovery of CWTs.

SECTION 11. RESEARCH

(Note: This section is being reviewed against Section 10 requirements and will be edited as needed.)

Provide the following information for any research programs conducted in association with the HGMP. Correlate with research described in any ESU hatchery plan approved by the co-managers and NMFS.

11.1) Objective or purpose
Need for data; benefit or effect on wild population; broad significance of project.

11.2) Cooperating and funding agencies

11.3) Principle investigator or project supervisor and staff

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

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

11.6) Dates or time period in which research activity occurs

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

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

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

11.10) Alternative methods to achieve project objectives

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

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.

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.
Fuss, H.J. and P. Seidel. 1987. Hatchery incubation techniques at WDF hatcheries. Washington Department of Fisheries, Technical Report 100. 86 p.

Marshall, A. R., C. Smith, R. Brix, W. Dammers, J. Hymer, and L. LaVoy *in* Busack, C. and J.B. Shaklee, editors. 1995. Genetic diversity units and major ancestral lineages of salmonid fishes in Washington. Washington Department of Fish and Wildlife, Fish Management Program, Technical Report # RAD 95-02. 62 pp.

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.

Washington Department of Fish and Wildlife and Western Washington Treaty Indian Tribes. 1998. Co-managers of Washington fish health policy. Fish Health Division, Hatcheries Program. Washington Dept. Fish and Wildlife, Olympia.

Wood, J.W. 1979. Diseases of Pacific Salmon, their prevention and treatment, 3rd edition. Washington Department of Fisheries, Hatchery Division, Olympia, Washington. 82 p.